Sion Court,

Twickenham, TW1

Energy Statement for Planning

Job No: 5656

Issued: June, 2024

Issue No: 2

Contents

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06.06.24	06.06.24
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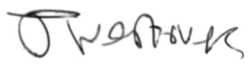
	

1.0 Introduction

1.1 T16 Design has been appointed to produce this Energy Statement for the proposed development at Sion Court, Twickenham, TW1 3DD.

1.2 The report assesses the predicted energy performance and carbon dioxide emissions of the proposed development in the context of local and London-wide policy requirements and best practice methods.

1.3 The methodology used to demonstrate the effects of the proposed energy efficiency measures is the 4-stage Energy Hierarchy expounded by the London Plan, Policy SI 2.

1.4 Emissions reductions are shown for the proposed scheme at each of these stages and the strategy underpinning them is detailed in the relevant sections of the report.

1.5 The overarching position within these policies is that all developments should reduce emissions through the following two stages.

- Residential development should achieve a 10% reduction in regulated emissions through energy efficiency measures.
- On site regulated emissions should be reduced by at least 35%.
- There is a benchmark target of reducing emissions by at least 50%.

2.0 Project Summary

2.1 The proposal site is at Sion Court, Twickenham, TW1.

2.2 The site currently consists of an existing vacant residential flat and 19 lock-up garages.

2.3 The proposal involves the demolition of the existing buildings and the erection of a new block containing five dwellings.

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 The London Plan (2021)

- Policy SI 2 – Minimizing greenhouse gas emissions – developments should achieve a minimum of 35% reduction in on site CO2 emissions.

3.1.2 LBRuT Sustainable Construction Checklist

- Smaller residential schemes must achieve a 35% reduction in CO2 emissions a Building Regulations Part L baseline.

3.1.3 National Planning Policy Framework (NPPF 2023)

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 targets

4.0 Energy Strategy and Approach

4.1 The London Plan document titled "Energy Assessment Guidance", updated in June 2022 updated to take into account of the update to building regulations 2021. This provides the parameters by which Energy Statements should be formulated and the approach to be adopted

4.2 The four stages of the hierarchy are referred to as Be Lean (Use Less Energy), Be Clean (Supply Energy Efficiently), Be Green (Use Renewable Energy) and Be Seen (Monitor, verify and report on energy performance).

4.3 The Be Lean stage of the hierarchy requires development must initially reduce the energy demand of the building through architectural and building fabric measures (passive design) and energy efficient services (active design).

4.4 The second part of the Hierarchy (Be Clean), is interested in the how energy systems will exploit local energy resources and supply energy efficiently and cleanly to reduce CO_2.

4.5 The third stage is the addition, where feasible to introduce renewable technology, which may include Heat pumps (Air and Ground), PV panel, Solar Hot Water panels and Wind Power.

4.6 The Be Seen stage of the assessment will ensure that the whole life cycle of the building will maintain low Carbon Emissions.

4.7 The first stage of this process is to establish the baseline emissions on which the reductions will be based.

4.8 This is done using SAP (Standard Assessment Procedure) for residential buildings.

5.0 Baseline Emissions

5.1 The baseline emissions on which reduction figures are based are calculated using SAP for residential buildings.

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 parameters used are defined by the methodology and represent a target upon which improvements can be measured.

5.4 The GLA emissions reporting tool provides the baseline emissions. The baseline emissions are shown below.

Sion Court Baseline Emissions	
	SAP 10 (Tonnes CO_2/Year
Regulated	3.5 Tonnes CO_2

Table 1 – Baseline Emissions

6.0 Be Lean Strategy

6.1 The next stage, once the baseline has been established, is to make improvements within the "Be Lean" category. This includes improving the U Values and the reduction of thermal bridging.

6.2 Gas combi boilers with an 89.5% efficiency have been assumed at this stage.

6.3 Electrical lighting also represents a significant energy use within a building. 100% low energy lighting is proposed to reduce emissions.

6.4 Improvements to the heat loss junctions are proposed throughout the development to reduce heat loss through thermal bridging.

6.5 It is proposed that Waste Water Heat Recovery will be installed and this will have an efficiency of 44.7%.

6.6 It is also proposed that Mechanical Ventilation with Heat Recovery will be installed. This will have a Specific Fan Power of 1.06 and an efficiency of 86%.

6.7 The proposed U-values, with the relevant Part L backstop are shown on the following page.

6.8 Following the implementation of these passive design measures including the building services the reduction in emissions at the 'Be Lean' stage have been calculated these are shown below.

Sion Court- Be Lean Emissions			
	Baseline Emissions (Tonnes CO_2/Year)	Be Lean Emissions (Tonnes CO_2/Year)	% Reduction
Regulated	3.5	2.6	26%

Table 3 - Be Lean Emissions

Scon Court- Be Lean Fabric Specification			
Element or system	Notional Value	Proposed Value	% Improvement
External walls	U = 0.18 W/(m²k)	U = 0.15 W/(m²k)	16.7%
Party walls	U = 0.00	N/A	N/A
Ground Floor	U = 0.13 W/(m²k)	U = 0.10 W/(m²k)	23.1%
Glazing	U = 1.2 W/(m²k)	U = 1.2 W/(m²k) with g value of 0.63	0.00%
Roofs	U = 0.11 W/(m²k)	U = 0.1 W/(m²k)	9.10%
Air Permeability	5 m³/(hm²) at 50 Pa	3 m³/(hm²) at 50 Pa	40.00%
Lighting	Efficacy of all fixed lighting = 80 lm/W	Efficacy of all fixed lighting = 120 lm/W	50.00%

Table 4 – Be Lean Fabric Specification

7.0 Be Clean Strategy

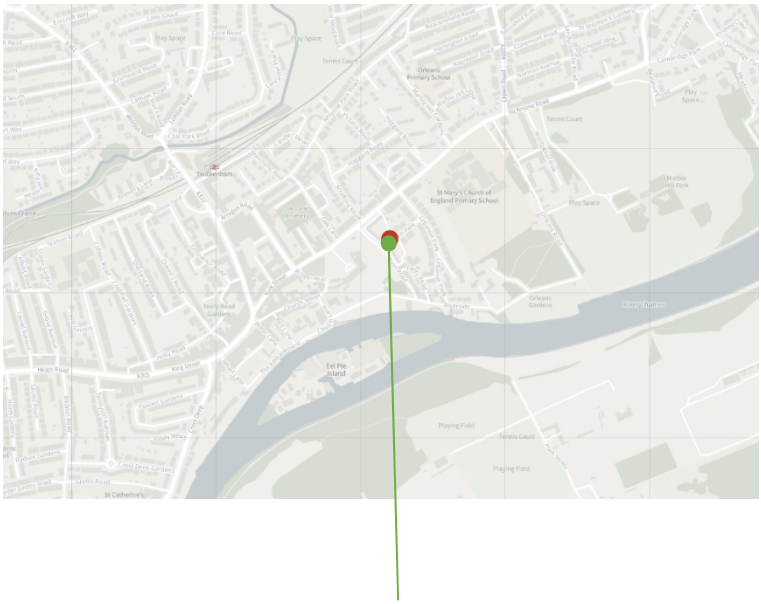
7.1 The Be Clean element of the hierarchy refers to supplying energy in a clean manner. This encompasses the use of energy efficient heating sources (such as heat pumps), decentralised energy and heat networks and the consideration of Combined Heat and Power.

7.2 The site does not sit within 800m of any existing decentralized energy or heating networks (as shown on the map below)

7.3 The site is also not located near any proposed heat networks

7.4 Due to the small scale of the proposal, CHP is also not a viable solution. London Plan guidance suggests that CHP is most suitable for developments of at least 500 units.

7.5 As there are currently no existing opportunities to connect to a heat network, and CHP is not suitable here, no changes have been made at the Be Clean stage.



Site Location

8.0 Be Green Strategy

8.1 The Be Green element of the hierarchy requires the consideration of renewable technologies to reduce emissions still further beyond the savings made at the Be Lean and Be Clean stages.

8.2 The technologies that are considered here are wind power and solar panels (photovoltaic (PV) or Solar Thermal and ground and air source heat pumps.

8.3 Wind power is not suitable in a location such as this. Wind turbines tend to perform poorly in built-up areas.

8.4 Any wind that is received on the site would be too intermittent and turbulent to provide any meaningful reduction in emissions.

8.5 Ground Source Heat pumps are also unlikely to be a viable proposition due to the ground disturbance required in their installation.

8.6 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.

8.7 It is proposed that individual ASHPs with an efficiency of 330% will provide heating and hot water to the dwellings. .

8.8 Photovoltaics panels are not considered feasible for this site due to a lack of available suitable roof space, and are also not required in order to achieve zero carbon.

8.9 The reductions in emissions at the Be Green stage are shown below

Sion Court– Be Green Emissions			
	Be Lean Emissions (Tonnes CO_2/Year)	Be Green Emissions (Tonnes CO_2/Year)	% Reduction
Regulated	2.6	1.5	33%

Table 5 - Be Green Emissions

9.0 Summary of Results

9.1 The tables below give the percentage improvement in emissions at each stage of the hierarchy and the overall savings made over Part L of the Building Regulations.

9.2 It is proposed that the building will be provided with increased U values (as shown above), and ASHPs.

9.3 The figures below have been calculated using the GLA carbon emission reporting tool and show the total CO2 emissions expected.

Sion Court	CO_2 Emissions (Tonnes)	% Reduction
Baseline (Part L 2022)	3.5	
After energy demand reduction	2.6	26%
After heat network / CHP	2.6	0%
After renewable energy	1.5	33%
Total Savings	3.5	59%

Table 6 – Carbon emissions savings at each stage of the Energy Hierarchy

10.0 Conclusions

10.1 This Energy Statement has been produced to accompany an application |for the proposed development at Sion Court, Twickenham, TW1 to show how the site will meet the policy requirement of achieving a 35% reduction in emissions through the Be Lean, Be Clean, Be Green hierarchy.

10.2 In doing so, preliminary SAP calculations have been undertaken using the information available and sensible assumptions on construction and M&E parameters.

10.3 The baseline figures have been calculated and improvements made to the fabric and plant proposed for the scheme.

10.4 The measures proposed are detailed above summarise at Be Lean as

- Significant fabric improvements
- MVHR
- WWHR
- Good air tightness

10.5 The measures proposed at Be Green can be summarised as

- ASHP with an efficiency of at least 330%

10.6 The results in Section 10 show that an overall reduction of 100% of regulated CO2 emissions is achieved, using the GLA's carbon emission reporting spreadsheet. This greatly exceeds the target and provides room for changes should they be required through the detailed design process.

10.7 The requirement for a 10% improvement at the Be Lean stage has also been achieved.

10.8 The remaining regulated emissions that needs to be offset via the carbon offset payment is 1.5 Tonnes/CO_2

10.9 The Carbon offset payment requires developments to pay £95 per tonne of CO_2 over 30 years. For Sion Court this is equal to 1.5 x 95 x 30 = £4,275.

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Appendix A – GHA Overheating calculation

EARLY STAGE OVERHEATING RISK TOOL

Version 1.0, July 2019

This tool provides guidance on how to assess overheating risk in residential schemes at the early stages of design. It is specifically a pre-detail design assessment intended to help identify factors that could contribute to or mitigate the likelihood of overheating.

The questions can be answered for an overall scheme or for individual units. Score zero wherever the question does not apply. Additional information is provided in the accompanying guidance, with examples of scoring and advice on next steps.

Find out more information and download accompanying guidance at goodhomes.org.uk/overheating-in-new-homes.

Good Homes Alliance

KEY FACTORS INCREASING THE LIKELIHOOD OF OVERHEATING | **KEY FACTORS REDUCING THE LIKELIHOOD OF OVERHEATING**

Geographical and local context

#1 Where is the scheme in the UK?
See guidance for map

South east	4	4
Northern England, Scotland & NI	0	
Rest of England and Wales	2	

#2 Is the site likely to see an Urban Heat Island effect?
See guidance for details

Central London (see guidance)	3	2
Grtr London, Manchester, B'ham	2	
Other cities, towns & dense sub-urban areas	1	

#8 Do the site surroundings feature significant blue/green infrastructure?
Proximity to green spaces and large water bodies has beneficial effects on local temperatures; as guidance, this would require at least 50% of surroundings within a 100m radius to be blue/green, or a rural context

1	1

Site characteristics

#3 Does the site have barriers to windows opening?
- Noise/Acoustic risks
- Poor air quality/smells e.g. near factory or car park or very busy road
- Security risks/crime
- Adjacent to heat rejection plant

Day - reasons to keep all windows closed	8	0
Day - barriers some of the time, or for some windows e.g. on quiet side	4	
Night - reasons to keep all windows closed	8	4
Night - bedroom windows OK to open, but other windows are likely to stay closed	4	

#9 Are immediate surrounding surfaces in majority pale in colour, or blue/green?
Lighter surfaces reflect more heat and absorb less so their temperatures remain lower; consider horizontal and vertical surfaces within 10m of the scheme

1	1

#10 Does the site have existing tall trees or buildings that will shade solar-exposed glazed areas?
Shading onto east, south and west facing areas can reduce solar gains, but may also reduce daylight levels

1	1

Scheme characteristics and dwelling design

#4 Are the dwellings flats?
Flats often combine a number of factors contributing to overheating risk e.g. dwelling size, heat gains from surrounding areas; other dense and enclosed dwellings may be similarly affected - see guidance for examples

3	0

#5 Does the scheme have community heating?
i.e. with hot pipework operating during summer, especially in internal areas, leading to heat gains and higher temperatures

3	0

#11 Do dwellings have high exposed thermal mass AND a means for secure and quiet night ventilation?
Thermal mass can help slow down temperature rises, but it can also cause properties to be slower to cool, so needs to be used with care - see guidance

1	1

#12 Do floor-to-ceiling heights allow ceiling fans, now or in the future?
Higher ceilings increase stratification and air movement, and offer the potential for ceiling fans

>2.8m and fan installed	2	1
> 2.8m	1	

Solar heat gains and ventilation

#6 What is the estimated average glazing ratio for the dwellings?
(as a proportion of the facade on solar-exposed areas i.e. orientations facing east, south, west, and anything in between). Higher proportions of glazing allow higher heat gains into the space

>65%	12	4
>50%	7	
>35%	4	

#7 Are the dwellings single aspect?
Single aspect dwellings have all openings on the same facade. This reduces the potential for ventilation

Single-aspect	3	0
Dual aspect	0	

#13 Is there useful external shading?
Shading should apply to solar exposed (E/S/W) glazing. It may include shading devices, balconies above, facade articulation etc. See guidance on "full" and "part". Scoring depends on glazing proportions as per **#6**

	Full	Part	
>65%	6	3	0
>50%	4	2	
>35%	2	1	

#14 Do windows & openings support effective ventilation?
Larger, effective and secure openings will help dissipate heat - see guidance

	Openings compared to Part F purge rates			
	= Part F	+50%	+100%	2
Single-aspect	minimum required	3	4	
Dual aspect		2	3	

TOTAL SCORE 3 = Sum of contributing factors: 10 *minus* Sum of mitigating factors: 7

High 12 **Medium** 8 **Low**

score >12:
Incorporate design changes to reduce risk factors and increase mitigation factors
AND Carry out a detailed assessment (e.g. dynamic modelling against CIBSE TM59)

score between 8 and 12:
Seek design changes to reduce risk factors and/or increase mitigation factors
AND Carry out a detailed assessment (e.g. dynamic modelling against CIBSE TM59)

score <8:
Ensure the mitigating measures are retained, and that risk factors do not increase (e.g. in planning conditions)

Appendix B – SAP Calculations

Block Compliance

Block Reference	Be Lean	**Issued on Date**	04/05/2024
Block Name			
Calculation Type	New Build (As Designed)		
Assessor Details	Mr. Samuel Westover	**Assessor ID**	AX13-0001
Client			

Block Compliance Report - DER

Block Reference: Be Lean	**Block Name:**			
Property-Assessment Reference	**Floor area (m^2)**	**DER ($kgCO_2/m^2$)**	**TER ($kgCO_2/m^2$)**	**% DER/TER**
Unit 1 - Unit 1 - Be Lean	55.50	15.07	11.36	-32.66 %
Unit 2 - Unit 2 - Be Lean	79.10	11.30	10.18	-11.00 %
Unit 3 - Unit 3 - Be Lean	79.10	10.84	9.35	-15.94 %
Unit 4 - Unit 4 - Be Lean	71.90	11.78	10.04	-17.33 %
Unit 5 - Unit 5 - Be Lean	65.90	12.96	9.72	-33.33 %
Totals:	351.50	61.95	50.65	
Average DER = 12.20 $kgCO_2/m^2$	**% DER/TER**	FAIL		
Average TER = 10.06 $kgCO_2/m^2$	-21.23 %			

Block Compliance Report - DFEE

Block Reference: Be Lean	**Block Name:**			
Property-Assessment Reference	**Floor area (m^2)**	**DFEE ($kWh/m^2/yr$)**	**TFEE ($kWh/m^2/yr$)**	**% DFEE/TFEE**
Unit 1 - Unit 1 - Be Lean	55.50	41.73	47.40	11.95 %
Unit 2 - Unit 2 - Be Lean	79.10	33.57	38.18	12.09 %
Unit 3 - Unit 3 - Be Lean	79.10	30.61	34.47	11.19 %
Unit 4 - Unit 4 - Be Lean	71.90	33.99	38.41	11.52 %
Unit 5 - Unit 5 - Be Lean	65.90	38.10	45.30	15.89 %
Totals:	351.50	178.00	203.77	
Average DFEE = 35.13 $kgCO_2/m^2$	**% DFEE/TFEE**	PASS		
Average TFEE = 40.19 $kgCO_2/m^2$	12.58 %			

Block Compliance Report - DPER

Block Reference: Be Lean	**Block Name:**

Block Compliance

Property-Assessment Reference	Floor area (m^2)	DPER ($kWh/m^2/yr$)	TPER ($kWh/m^2/yr$)	% DPER/TPER
Unit 1 - Unit 1 - Be Lean	55.50	85.07	60.64	-40.29 %
Unit 2 - Unit 2 - Be Lean	79.10	64.38	52.92	-21.66 %
Unit 3 - Unit 3 - Be Lean	79.10	62.07	48.44	-28.14 %
Unit 4 - Unit 4 - Be Lean	71.90	67.09	52.31	-28.25 %
Unit 5 - Unit 5 - Be Lean	65.90	73.52	51.92	-41.60 %
Totals:	351.50	352.13	266.23	
Average DPER = 69.39 $kgCO_2/m^2$	**% DPER/TPER**	FAIL		
Average TPER = 52.82 $kgCO_2/m^2$	-31.38 %			

Block Compliance

Block Reference	Be Green	**Issued on Date**	04/05/2024
Block Name			
Calculation Type	New Build (As Designed)		
Assessor Details	Mr. Samuel Westover	**Assessor ID**	AX13-0001
Client			

Block Compliance Report - DER

Block Reference: Be Green	**Block Name:**			
Property-Assessment Reference	**Floor area (m^2)**	**DER ($kgCO_2/m^2$)**	**TER ($kgCO_2/m^2$)**	**% DER/TER**
Unit 1 - Unit 1 - Be Green	55.50	4.97	11.36	56.25 %
Unit 2 - Unit 2 - Be Green	79.10	3.85	10.18	62.18 %
Unit 3 - Unit 3 - Be Green	79.10	3.78	9.35	59.57 %
Unit 4 - Unit 4 - Be Green	71.90	4.03	10.04	59.86 %
Unit 5 - Unit 5 - Be Green	65.90	4.35	9.72	55.25 %
Totals:	351.50	20.98	50.65	
Average DER = 4.14 $kgCO_2/m^2$	**% DER/TER**	PASS		
Average TER = 10.06 $kgCO_2/m^2$	58.85 %			

Block Compliance Report - DFEE

Block Reference: Be Green	**Block Name:**			
Property-Assessment Reference	**Floor area (m^2)**	**DFEE ($kWh/m^2/yr$)**	**TFEE ($kWh/m^2/yr$)**	**% DFEE/TFEE**
Unit 1 - Unit 1 - Be Green	55.50	41.73	47.40	11.95 %
Unit 2 - Unit 2 - Be Green	79.10	33.57	38.18	12.09 %
Unit 3 - Unit 3 - Be Green	79.10	30.61	34.47	11.19 %
Unit 4 - Unit 4 - Be Green	71.90	33.99	38.41	11.52 %
Unit 5 - Unit 5 - Be Green	65.90	38.10	45.30	15.89 %
Totals:	351.50	178.00	203.77	
Average DFEE = 35.13 $kgCO_2/m^2$	**% DFEE/TFEE**	PASS		
Average TFEE = 40.19 $kgCO_2/m^2$	12.58 %			

Block Compliance Report - DPER

Block Reference: Be Green	**Block Name:**

Block Compliance

Property-Assessment Reference	Floor area (m^2)	DPER ($kWh/m^2/yr$)	TPER ($kWh/m^2/yr$)	% DPER/TPER
Unit 1 - Unit 1 - Be Green	55.50	52.87	60.64	12.81 %
Unit 2 - Unit 2 - Be Green	79.10	41.06	52.92	22.41 %
Unit 3 - Unit 3 - Be Green	79.10	40.34	48.44	16.72 %
Unit 4 - Unit 4 - Be Green	71.90	42.98	52.31	17.84 %
Unit 5 - Unit 5 - Be Green	65.90	46.31	51.92	10.81 %
Totals:	351.50	223.56	266.23	
Average DPER = 44.14 $kgCO_2/m^2$	**% DPER/TPER**	PASS		
Average TPER = 52.82 $kgCO_2/m^2$	16.43 %			

Summary for Input Data

elmhurst energy

Property Reference	Unit 1	**Issued on Date**	04/05/2024
Assessment Reference	Unit 1 - Be Lean	**Prop Type Ref**	
Property			

SAP Rating	84 B	**DER**	15.07	**TER**	11.36
Environmental	89 B	**% DER < TER**			-32.66
CO_2 Emissions (t/year)	0.76	**DFEE**	41.73	**TFEE**	47.40
Compliance Check	See BREL	**% DFEE < TFEE**			11.95
% DPER < TPER	-40.29	**DPER**	85.07	**TPER**	60.64

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

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

Orientation	Southwest	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Suburban	
1.0 Property Type	Bungalow, End-Terrace	
Which Floor	0	
2.0 Number of Storeys	1	
3.0 Date Built	2024	
3.0 Property Age Band	L	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	N/A	kJ/m²K
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
Basement:	0.00 m	0.00 m²	0.00 m
Ground floor:	30.20 m	55.50 m²	2.50 m
1st Storey:	0.00 m	0.00 m²	0.00 m
2nd Storey:	0.00 m	0.00 m²	0.00 m
3rd Storey:	0.00 m	0.00 m²	0.00 m
4th Storey:	0.00 m	0.00 m²	0.00 m
5th Storey:	0.00 m	0.00 m²	0.00 m
6th Storey:	0.00 m	0.00 m²	0.00 m
7th Storey:	0.00 m	0.00 m²	0.00 m

8.0 Living Area	22.80	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
External Wall 1	Cavity Wall	Cavity wall : dense plaster, AAC block, filled cavity, any outside structure	0.15	70.00	75.50	61.60	0.00	None	13.90	Calculate Wall Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Plasterboard on dabs mounted on cement render on both sides, AAC blocks, cavity	0.00	45.00	19.25	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	64.00

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area	Shelter Code	Shelter Factor	Calculation Type	Openings

Summary for Input Data

FR	External Flat Roof	Plasterboard, insulated flat roof	0.10	9.00	55.50	55.50 (m²)	None	0.00	Enter Gross Area	0.00

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Heatloss Floor 1	Ground Floor - Solid	Lowest occupied	Suspended concrete floor, carpeted	0.10	None	0.00	75.00	55.50

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Windows	Manufacturer	Window	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.20
RLs	Manufacturer	Roof Light	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
SW	Windows	External Wall 1	South West	7.10	0
SE	Windows	External Wall 1	South East	0.90	0
NE	Windows	External Wall 1	North East	3.70	0
NW	Windows	External Wall 1	North West	2.20	0

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	
17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E5 Ground floor (normal)	Gov Approved Scheme	30.20	0.05	0.05	Yes
E14 Flat roof	Table K1 - Default	30.20	0.16	0.16	Yes
E16 Corner (normal)	Gov Approved Scheme	15.00	0.04	0.04	No
E18 Party wall between dwellings	Gov Approved Scheme	5.00	0.03	0.03	Yes
E1 Steel lintel with perforated steel base plate	Gov Approved Scheme	8.00	0.30	0.30	No
E3 Sill	Gov Approved Scheme	6.00	0.03	0.03	No
E4 Jamb	Gov Approved Scheme	23.20	0.02	0.02	No

Y-value	0.05	W/m²K
18.0 Pressure Testing	Yes	
Designed AP_{50}	3.00	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	No
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500811
Configuration	1
Manufacturer SFP	0.47
Duct Type	Rigid
MVHR Efficiency	89.00
Wet Rooms	1
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)
Duct Installation Specification	Level 1

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System	No

22.0 Lighting

No Fixed Lighting	No				
	Name	**Efficacy**	**Power**	**Capacity**	**Count**
	Lighting 1	120.00	6	720	40

Summary for Input Data

24.0 Main Heating 1	Manufacturer	
Percentage of Heat	100.00	%
Database Ref. No.	0	
Fuel Type	Mains gas	
SAP Code	102	
In Winter	89.50	
In Summer	82.00	
Model Name	GB	
Manufacturer	GB	
Controls SAP Code	2110	
Delayed Start Stat	Yes	
Burner Control	On/Off	
HETAS approved System	No	
Oil Pump Inside	No	
Flue Type	None or Unknown	
Fan Assisted Flue	No	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators	
Flow Temperature	Unknown	
Boiler Interlock	Yes	
Combi boiler type	No Combi	
25.0 Main Heating 2	None	
26.0 Heat Networks	None	
28.0 Water Heating		
Water Heating	Main Heating 1	
SAP Code	901	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
Summer Immersion	No	
Cold Water Source	From mains	
Bath Count	0	
Supplementary Immersion	No	
Immersion Only Heating Hot Water	No	

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
S1	Vented hot water system	7.00		Yes	Instantaneous System 1

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	

Summary for Input Data

Cylinder Volume	150.00	L
Loss	1.12	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	

31.0 Thermal Store	None

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Property Reference	Unit 1	**Issued on Date**	04/05/2024
Assessment Reference	Unit 1 - Be Lean	**Prop Type Ref**	
Property			

SAP Rating	84 B	**DER**	15.07	**TER**	11.36
Environmental	89 B	**% DER < TER**			-32.66
CO_2 Emissions (t/year)	0.76	**DFEE**	41.73	**TFEE**	47.40
Compliance Check	See BREL	**% DFEE < TFEE**			11.95
% DPER < TPER	-40.29	**DPER**	85.07	**TPER**	60.64

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

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		55.5000 (1b)	x	2.5000 (2b)	=	138.7500	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.5000						
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	138.7500	(5)

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2. Ventilation rate

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

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275 (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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000 (23c)

Effective ac	0.2621	0.2589	0.2557	0.2397	0.2366	0.2206	0.2206	0.2174	0.2270	0.2366	0.2429	0.2493	(25)

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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)			13.9000	1.1450	15.9160			(27)
Heatloss Floor 1			55.5000	0.1000	5.5500	75.0000	4162.5000	(28a)
External Wall 1	75.5000	13.9000	61.6000	0.1500	9.2400	70.0000	4312.0000	(29a)
FR	55.5000		55.5000	0.1000	5.5500	9.0000	499.5000	(30)
Total net area of external elements Aum(A, m2)			186.5000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.2560			(33)
Party Wall 1			19.2500	0.0000	0.0000	45.0000	866.2500	(32)
Internal Wall 1			64.0000			9.0000	576.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 10416.2500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	187.6802 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	30.2000	0.0480	1.4496
E14 Flat roof	30.2000	0.1600	4.8320

E16 Corner (normal)	15.0000	0.0350	0.5250	
E18 Party wall between dwellings	5.0000	0.0330	0.1650	
E1 Steel lintel with perforated steel base plate	8.0000	0.3020	2.4160	
E3 Sill	6.0000	0.0290	0.1740	
E4 Jamb	23.2000	0.0240	0.5568	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.1184 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 46.3744 (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	11.9992	11.8532	11.7073	10.9776	10.8316	10.1019	10.1019	9.9559	10.3938	10.8316	11.1235	11.4154	(38)
Heat transfer coeff	58.3736	58.2277	58.0817	57.3520	57.2060	56.4763	56.4763	56.3304	56.7682	57.2060	57.4979	57.7898	(39)

Average = Sum(39)m / 12 = 57.3155

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0518	1.0491	1.0465	1.0334	1.0307	1.0176	1.0176	1.0150	1.0229	1.0307	1.0360	1.0413	(40)
HLP (average)												1.0327	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8520 (42)

Hot water usage for mixer showers

70.9489	69.8827	68.3290	65.3562	63.1624	60.7159	59.3254	60.8673	62.5575	65.1843	68.2209	70.6770	(42a)

Hot water usage for baths

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)

Hot water usage for other uses

33.5963	32.3746	31.1529	29.9312	28.7095	27.4879	27.4879	28.7095	29.9312	31.1529	32.3746	33.5963	(42c)

Average daily hot water use (litres/day) 95.9546 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	104.5451	102.2572	99.4819	95.2875	91.8720	88.2038	86.8132	89.5768	92.4888	96.3372	100.5955	104.2733	(44)
Energy conte	165.5740	145.6129	152.8999	130.4438	123.6774	108.4569	104.9931	110.9148	114.0479	130.7287	143.3167	163.2668	(45)

Energy content (annual) Total = Sum(45)m = 1593.9329

Distribution loss (46)m = 0.15 x (45)m

24.8361	21.8419	22.9350	19.5666	18.5516	16.2685	15.7490	16.6372	17.1072	19.6093	21.4975	24.4900	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.1200 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.6048 (55)
Total storage loss

18.7488	16.9344	18.7488	18.1440	18.7488	18.1440	18.7488	18.7488	18.1440	18.7488	18.1440	18.7488	(56)

If cylinder contains dedicated solar storage

18.7488	16.9344	18.7488	18.1440	18.7488	18.1440	18.7488	18.7488	18.1440	18.7488	18.1440	18.7488	(57)
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)
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)

Primary loss
Combi loss
Total heat required for water heating calculated for each month

207.5852	183.5585	194.9111	171.0998	165.6886	149.1129	147.0043	152.9260	154.7039	172.7399	183.9727	205.2780	(62)
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)
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)
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)
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)

WWHRS
PV diverter
Solar input
FGHRS
Output from w/h

207.5852	183.5585	194.9111	171.0998	165.6886	149.1129	147.0043	152.9260	154.7039	172.7399	183.9727	205.2780	(64)

Total per year (kWh/year) = Sum(64)m = 2088.5809 (64)

12Total per year (kWh/year) 2089 (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

88.6623	78.7728	84.4482	75.8974	74.7317	68.5867	68.5192	70.4881	70.4457	77.0763	80.1776	87.8952	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	81.4447	90.1709	81.4447	84.1595	81.4447	84.1595	81.4447	81.4447	84.1595	81.4447	84.1595	81.4447	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	161.4732	163.1488	158.9264	149.9373	138.5903	127.9257	120.8010	119.1254	123.3479	132.3369	143.6840	154.3486	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	(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)	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	(71)
Water heating gains (Table 5)	119.1698	117.2214	113.5056	105.4130	100.4458	95.2593	92.0956	94.7421	97.8413	103.5971	111.3578	118.1387	(72)
Total internal gains	415.8676	424.3210	407.6566	393.2898	374.2607	358.1244	345.1213	346.0922	356.1286	371.1587	392.9812	407.7119	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	3.7000	11.2829	0.6300	0.7000	0.7700	12.7584	(75)
Southeast	0.9000	36.7938	0.6300	0.7000	0.7700	10.1202	(77)
Southwest	7.1000	36.7938	0.6300	0.7000	0.7700	79.8372	(79)
Northwest	2.2000	11.2829	0.6300	0.7000	0.7700	7.5861	(81)

Solar gains	110.3018	194.6425	284.2677	382.3074	455.6773	464.4613	442.7634	386.1795	317.9285	219.9610	133.3468	93.5991	(83)
Total gains	526.1694	618.9635	691.9243	775.5972	829.9380	822.5857	787.8847	732.2717	674.0571	591.1197	526.3280	501.3110	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	49.5670	49.6912	49.8161	50.4499	50.5786	51.2322	51.2322	51.3649	50.9687	50.5786	50.3219	50.0677	
alpha	4.3045	4.3127	4.3211	4.3633	4.3719	4.4155	4.4155	4.4243	4.3979	4.3719	4.3548	4.3378	
util living area	0.9663	0.9363	0.8823	0.7657	0.6048	0.4328	0.3141	0.3515	0.5575	0.8165	0.9380	0.9717	(86)
MIT	19.8526	20.1188	20.4293	20.7527	20.9256	20.9865	20.9974	20.9958	20.9606	20.7223	20.2455	19.8069	(87)
Th 2	20.0404	20.0426	20.0447	20.0556	20.0578	20.0687	20.0687	20.0709	20.0643	20.0578	20.0534	20.0491	(88)
util rest of house	0.9591	0.9235	0.8602	0.7280	0.5530	0.3723	0.2482	0.2816	0.4899	0.7761	0.9234	0.9655	(89)
MIT 2	18.7328	19.0630	19.4395	19.8174	19.9970	20.0605	20.0677	20.0691	20.0378	19.7969	19.2334	18.6822	(90)
Living area fraction										fLA = Living area / (4) =		0.4108	(91)
MIT	19.1928	19.4968	19.8461	20.2017	20.3785	20.4409	20.4496	20.4498	20.4169	20.1770	19.6492	19.1442	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.0428	19.3468	19.6961	20.0517	20.2285	20.2909	20.2996	20.2998	20.2669	20.0270	19.4992	18.9942	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9495	0.9125	0.8511	0.7279	0.5627	0.3869	0.2646	0.2990	0.5050	0.7747	0.9131	0.9567	(94)
Useful gains	499.6196	564.8014	588.9055	564.5407	466.9673	318.2958	208.5037	218.9293	340.3652	457.9401	480.5719	479.5863	(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	860.5913	841.2008	766.4514	639.5696	487.8791	321.4036	208.9415	219.6777	350.0812	539.2838	712.9290	854.9550	(97)
Space heating kWh	268.5629	185.7404	132.0941	54.0208	15.5584	0.0000	0.0000	0.0000	0.0000	60.5197	167.2971	279.2743	(98a)
Space heating requirement - total per year (kWh/year)												1163.0678	
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	268.5629	185.7404	132.0941	54.0208	15.5584	0.0000	0.0000	0.0000	0.0000	60.5197	167.2971	279.2743	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1163.0678	
Space heating per m2											(98c) / (4) =	20.9562	(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 %) 89.5000 (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	268.5629	185.7404	132.0941	54.0208	15.5584	0.0000	0.0000	0.0000	0.0000	60.5197	167.2971	279.2743	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	300.0703	207.5311	147.5912	60.3584	17.3837	0.0000	0.0000	0.0000	0.0000	67.6198	186.9241	312.0383	(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	207.5852	183.5585	194.9111	171.0998	165.6886	149.1129	147.0043	152.9260	154.7039	172.7399	183.9727	205.2780	(64)
Efficiency of water heater												82.0000	(216)
(217)m	86.0680	85.6081	84.8730	83.6828	82.5941	82.0000	82.0000	82.0000	82.0000	83.8225	85.4087	86.1614	(217)
Fuel for water heating, kWh/month	241.1873	214.4172	229.6503	204.4624	200.6057	181.8450	179.2735	186.4952	188.6633	206.0784	215.4028	238.2482	(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	12.9421	11.6897	12.9421	12.5246	12.9421	12.5246	12.9421	12.9421	12.5246	12.9421	12.5246	12.9421	(231)
Lighting	17.2067	13.8039	12.4289	9.1059	7.0337	5.7466	6.4164	8.3402	10.8331	14.2136	16.0543	17.6850	(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 1299.5170 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 82.0000

Water heating fuel used 2486.3292 (219)

Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6580)

mechanical ventilation fans (SFP = 0.6580) 111.3829 (230a)

central heating pump 41.0000 (230c)

Total electricity for the above, kWh/year 152.3829 (231)

Electricity for lighting (calculated in Appendix L) 138.8682 (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	4077.0974	(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	1299.5170	0.2100	272.8986	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2486.3292	0.2100	522.1291	(264)
Space and water heating			795.0277	(265)
Pumps, fans and electric keep-hot	152.3829	0.1387	21.1374	(267)
Energy for lighting	138.8682	0.1443	20.0430	(268)
Total CO2, kg/year			836.2081	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			15.0700	(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	1299.5170	1.1300	1468.4543	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2486.3292	1.1300	2809.5520	(278)
Space and water heating			4278.0063	(279)
Pumps, fans and electric keep-hot	152.3829	1.5128	230.5249	(281)
Energy for lighting	138.8682	1.5338	213.0007	(282)
Total Primary energy kWh/year			4721.5319	(286)
Dwelling Primary energy Rate (DPER)			85.0700	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	55.5000	(1b)	x 2.5000	(2b) =	138.7500	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.5000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		138.7500	(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)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1441	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3941	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3350	(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	0.4272	0.4188	0.4104	0.3685	0.3601	0.3183	0.3183	0.3099	0.3350	0.3601	0.3769	0.3937	(22b)
Effective ac	0.5912	0.5877	0.5842	0.5679	0.5649	0.5506	0.5506	0.5480	0.5561	0.5649	0.5710	0.5775	(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 Opening Type (Uw = 1.20)			13.8800	1.1450	15.8931			(27)
Heatloss Floor 1			55.5000	0.1300	7.2150			(28a)

External Wall 1	75.5000	13.8800	61.6200	0.1800	11.0916	(29a)
FR	55.5000		55.5000	0.1100	6.1050	(30)
Total net area of external elements Aum(A, m2)			186.5000			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.3047	(33)
Party Wall 1			19.2500	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 187.6802 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	30.2000	0.1600	4.8320
E14 Flat roof	30.2000	0.0800	2.4160
E16 Corner (normal)	15.0000	0.0900	1.3500
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E1 Steel lintel with perforated steel base plate	8.0000	0.0500	0.4000
E3 Sill	6.0000	0.0500	0.3000
E4 Jamb	23.2000	0.0500	1.1600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.7580 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 51.0627 (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	27.0710	26.9087	26.7498	26.0030	25.8632	25.2128	25.2128	25.0924	25.4633	25.8632	26.1459	26.4414	(38)
Heat transfer coeff	78.1337	77.9715	77.8125	77.0657	76.9260	76.2755	76.2755	76.1551	76.5261	76.9260	77.2086	77.5041	(39)
Average = Sum(39)m / 12 =												77.0650	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4078	1.4049	1.4020	1.3886	1.3861	1.3743	1.3743	1.3722	1.3788	1.3861	1.3911	1.3965	(40)
HLP (average)												1.3886	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8520 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	70.9489	69.8827	68.3290	65.3562	63.1624	60.7159	59.3254	60.8673	62.5575	65.1843	68.2209	70.6770	(42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses	33.5963	32.3746	31.1529	29.9312	28.7095	27.4879	27.4879	28.7095	29.9312	31.1529	32.3746	33.5963	(42c)
Average daily hot water use (litres/day)												95.9546	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	104.5451	102.2572	99.4819	95.2875	91.8720	88.2038	86.8132	89.5768	92.4888	96.3372	100.5955	104.2733	(44)
Energy conte	165.5740	145.6129	152.8999	130.4438	123.6774	108.4569	104.9931	110.9148	114.0479	130.7287	143.3167	163.2668	(45)
Energy content (annual)										Total = Sum(45)m =		1593.9329	
Distribution loss (46)m = 0.15 x (45)m	24.8361	21.8419	22.9350	19.5666	18.5516	16.2685	15.7490	16.6372	17.1072	19.6093	21.4975	24.4900	(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	212.1689	187.6987	199.4948	175.5356	170.2723	153.5487	151.5880	157.5097	159.1397	177.3236	188.4086	209.8617	(62)
WWHRS	-32.4349	-28.6857	-30.0380	-24.8726	-23.1804	-19.8356	-18.5927	-19.7715	-20.5227	-24.1940	-27.4089	-31.8342	(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	179.7340	159.0130	169.4569	150.6630	147.0919	133.7131	132.9952	137.7382	138.6170	153.1296	160.9997	178.0275	(64)
										Total per year (kWh/year) = Sum(64)m =		1841.1791	(64)
12Total per year (kWh/year)												1841	(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	92.3293	82.0849	88.1151	79.4460	78.3986	72.1354	72.1861	74.1551	73.9944	80.7432	83.7263	91.5621	(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	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	81.4447	90.1709	81.4447	84.1595	81.4447	84.1595	81.4447	81.4447	84.1595	81.4447	84.1595	81.4447	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	161.4732	163.1488	158.9264	149.9373	138.5903	127.9257	120.8010	119.1254	123.3479	132.3369	143.6840	154.3486	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	(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)	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	(71)
Water heating gains (Table 5)	124.0985	122.1501	118.4343	110.3417	105.3745	100.1880	97.0243	99.6708	102.7700	108.5258	116.2865	123.0674	(72)
Total internal gains	420.7963	429.2497	412.5853	398.2185	379.1894	363.0531	350.0500	351.0209	361.0573	376.0874	397.9099	412.6406	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W

Northeast				3.6900		11.2829		0.6300		0.7000		0.7700		12.7239 (75)
Southeast				0.9000		36.7938		0.6300		0.7000		0.7700		10.1202 (77)
Southwest				7.0900		36.7938		0.6300		0.7000		0.7700		79.7247 (79)
Northwest				2.2000		11.2829		0.6300		0.7000		0.7700		7.5861 (81)
Solar gains	110.1549	194.3807	283.8792	381.7750	455.0344	463.8026	442.1369	385.6385	317.4907	219.6635	133.1687	93.4747	(83)
Total gains	530.9512	623.6305	696.4645	779.9935	834.2238	826.8557	792.1869	736.6594	678.5480	595.7509	531.0786	506.1153	(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	37.0314	37.1085	37.1843	37.5446	37.6128	37.9336	37.9336	37.9936	37.8094	37.6128	37.4751	37.3322	
alpha	3.4688	3.4739	3.4790	3.5030	3.5075	3.5289	3.5289	3.5329	3.5206	3.5075	3.4983	3.4888	
util living area	0.9733	0.9537	0.9192	0.8417	0.7150	0.5489	0.4116	0.4569	0.6729	0.8765	0.9550	0.9770	(86)
MIT	19.2091	19.4978	19.8895	20.3701	20.7284	20.9215	20.9782	20.9685	20.8367	20.3656	19.7090	19.1602	(87)
Th 2	19.7573	19.7596	19.7618	19.7721	19.7740	19.7831	19.7831	19.7847	19.7796	19.7740	19.7701	19.7660	(88)
util rest of house	0.9668	0.9427	0.9000	0.8049	0.6526	0.4590	0.3032	0.3443	0.5852	0.8389	0.9424	0.9714	(89)
MIT 2	17.7322	18.0942	18.5790	19.1570	19.5494	19.7366	19.7754	19.7726	19.6693	19.1707	18.3719	17.6765	(90)
Living area fraction										fLA = Living area / (4) =		0.4108	(91)
MIT	18.3389	18.6708	19.1173	19.6554	20.0338	20.2234	20.2695	20.2639	20.1489	19.6616	18.9212	18.2860	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3389	18.6708	19.1173	19.6554	20.0338	20.2234	20.2695	20.2639	20.1489	19.6616	18.9212	18.2860	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9567	0.9304	0.8879	0.8009	0.6668	0.4928	0.3475	0.3899	0.6136	0.8349	0.9311	0.9621	(94)
Useful gains	507.9417	580.2196	618.3950	624.7291	556.2722	407.4634	275.2482	287.2369	416.3657	497.3693	494.4734	486.9306	(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	1096.9138	1073.7326	981.7868	828.8707	641.0831	428.9251	279.8947	294.2528	462.8970	697.0701	912.6970	1091.7249	(97)
Space heating kWh	438.1952	331.6407	270.3636	146.9819	63.0994	0.0000	0.0000	0.0000	0.0000	148.5774	301.1210	449.9670	(98a)
Space heating requirement - total per year (kWh/year)												2149.9461	
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	438.1952	331.6407	270.3636	146.9819	63.0994	0.0000	0.0000	0.0000	0.0000	148.5774	301.1210	449.9670	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2149.9461	
Space heating per m2											(98c) / (4) =	38.7378	(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	438.1952	331.6407	270.3636	146.9819	63.0994	0.0000	0.0000	0.0000	0.0000	148.5774	301.1210	449.9670	(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)	474.7511	359.3073	292.9183	159.2437	68.3633	0.0000	0.0000	0.0000	0.0000	160.9722	326.2416	487.5049	(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	179.7340	159.0130	169.4569	150.6630	147.0919	133.7131	132.9952	137.7382	138.6170	153.1296	160.9997	178.0275	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.9795	85.6687	85.1020	84.0043	82.3042	79.8000	79.8000	79.8000	79.8000	83.9921	85.4427	86.0488	(217)
Fuel for water heating, kWh/month	209.0429	185.6138	199.1220	179.3515	178.7174	167.5603	166.6607	172.6043	173.7056	182.3143	188.4299	206.8912	(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	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.9226	13.5759	12.2236	8.9556	6.9175	5.6517	6.3104	8.2025	10.6542	13.9789	15.7892	17.3929	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-43.8036	-58.0415	-78.5237	-83.0127	-85.4138	-78.4063	-77.4939	-75.1214	-70.3948	-63.8178	-46.8470	-38.3305	(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	-37.4593	-76.8815	-149.3810	-219.5749	-285.8449	-285.5256	-282.0844	-240.7724	-179.1656	-108.1587	-49.4098	-29.7614	(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												2329.3024	(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	2210.0137	(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)	136.5751	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2743.2266	(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	2018.6646	(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	2329.3024	0.2100	489.1535	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2210.0137	0.2100	464.1029	(264)
Space and water heating			953.2564	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	136.5751	0.1443	19.7120	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-799.2070	0.1359	-108.5995	
PV Unit electricity exported	-1944.0195	0.1266	-246.0168	
Total			-354.6163	(269)
Total CO2, kg/year			630.2813	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.3600	(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	2329.3024	1.1300	2632.1117	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2210.0137	1.1300	2497.3155	(278)
Space and water heating			5129.4272	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	136.5751	1.5338	209.4834	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-799.2070	1.5023	-1200.6286	
PV Unit electricity exported	-1944.0195	0.4646	-903.1087	
Total			-2103.7373	(283)
Total Primary energy kWh/year			3365.2741	(286)
Target Primary Energy Rate (TPER)			60.6400	(287)

Full SAP Calculation Printout

Property Reference	Unit 1	**Issued on Date**	04/05/2024
Assessment Reference	Unit 1 - Be Lean	**Prop Type Ref**	
Property			

SAP Rating	84 B	**DER**	15.07	**TER**	11.36
Environmental	89 B	**% DER < TER**			-32.66
CO_2 Emissions (t/year)	0.76	**DFEE**	41.73	**TFEE**	47.40
Compliance Check	See BREL	**% DFEE < TFEE**			11.95
% DPER < TPER	-40.29	**DPER**	85.07	**TPER**	60.64

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	55.5000	(1b)	x 2.5000	(2b) =	138.7500	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.5000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	138.7500	(5)

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2. Ventilation rate

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	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)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1441	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2941	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2500	(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	0.3188	0.3125	0.3063	0.2750	0.2688	0.2375	0.2375	0.2313	0.2500	0.2688	0.2813	0.2938	(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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5508	0.5488	0.5469	0.5378	0.5361	0.5282	0.5282	0.5267	0.5313	0.5361	0.5396	0.5432	(25)

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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)			13.9000	1.1450	15.9160			(27)
Heatloss Floor 1			55.5000	0.1000	5.5500	75.0000	4162.5000	(28a)
External Wall 1	75.5000	13.9000	61.6000	0.1500	9.2400	70.0000	4312.0000	(29a)
FR	55.5000		55.5000	0.1000	5.5500	9.0000	499.5000	(30)
Total net area of external elements Aum(A, m2)			186.5000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.2560			(33)
Party Wall 1			19.2500	0.0000	0.0000	45.0000	866.2500	(32)
Internal Wall 1			64.0000			9.0000	576.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 10416.2500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	187.6802	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	30.2000	0.0480	1.4496
E14 Flat roof	30.2000	0.1600	4.8320
E16 Corner (normal)	15.0000	0.0350	0.5250
E18 Party wall between dwellings	5.0000	0.0330	0.1650
E1 Steel lintel with perforated steel base plate	8.0000	0.3020	2.4160

E3 Sill									6.0000	0.0290	0.1740		
E4 Jamb									23.2000	0.0240	0.5568		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												10.1184	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss										(33) + (36) + (36a) =		46.3744	(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	25.2202	25.1299	25.0413	24.6254	24.5476	24.1853	24.1853	24.1182	24.3249	24.5476	24.7050	24.8696	(38)
Heat transfer coeff	71.5946	71.5043	71.4158	70.9998	70.9220	70.5598	70.5598	70.4927	70.6993	70.9220	71.0794	71.2440	(39)
Average = Sum(39)m / 12 =												70.9995	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2900	1.2884	1.2868	1.2793	1.2779	1.2713	1.2713	1.2701	1.2739	1.2779	1.2807	1.2837	(40)
HLP (average)												1.2793	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.8520	(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	23.8917	23.5369	23.0372	22.1159	21.4261	20.6611	20.2480	20.7441	21.2844	22.1029	23.0432	23.8110	(42b)
Hot water usage for other uses	33.5963	32.3746	31.1529	29.9312	28.7095	27.4879	27.4879	28.7095	29.9312	31.1529	32.3746	33.5963	(42c)
Average daily hot water use (litres/day)												52.6935	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	57.4880	55.9115	54.1901	52.0472	50.1356	48.1490	47.7358	49.4537	51.2156	53.2558	55.4177	57.4072	(44)
Energy conte	91.0469	79.6172	83.2882	71.2500	67.4922	59.2048	57.7323	61.2340	63.1539	72.2676	78.9527	89.8859	(45)
Energy content (annual)										Total = Sum(45)m =		875.1258	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	77.3899	67.6746	70.7950	60.5625	57.3684	50.3241	49.0725	52.0489	53.6809	61.4275	67.1098	76.4030	(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	77.3899	67.6746	70.7950	60.5625	57.3684	50.3241	49.0725	52.0489	53.6809	61.4275	67.1098	76.4030	(64)
										Total per year (kWh/year) = Sum(64)m =		743.8569	(64)
12Total per year (kWh/year)												744	(64)
Electric shower(s)	44.2632	39.4388	43.0657	41.0971	41.8683	39.9382	41.2695	41.8683	41.0971	43.0657	42.2559	44.2632	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		503.4910	(64a)
Heat gains from water heating, kWh/month	30.4133	26.7784	28.4652	25.4149	24.8092	22.5656	22.5855	23.4793	23.6945	26.1233	27.3414	30.1665	(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	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	81.4447	90.1709	81.4447	84.1595	81.4447	84.1595	81.4447	81.4447	84.1595	81.4447	84.1595	81.4447	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	161.4732	163.1488	158.9264	149.9373	138.5903	127.9257	120.8010	119.1254	123.3479	132.3369	143.6840	154.3486	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	(71)
Water heating gains (Table 5)	40.8780	39.8488	38.2596	35.2985	33.3456	31.3411	30.3569	31.5582	32.9090	35.1120	37.9742	40.5464	(72)
Total internal gains	334.5759	343.9484	329.4106	320.1752	304.1605	294.2062	283.3825	282.9082	291.1963	299.6735	316.5976	327.1196	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	3.7000	11.2829	0.6300	0.7000	0.7700	12.7584	(75)
Southeast	0.9000	36.7938	0.6300	0.7000	0.7700	10.1202	(77)
Southwest	7.1000	36.7938	0.6300	0.7000	0.7700	79.8372	(79)
Northwest	2.2000	11.2829	0.6300	0.7000	0.7700	7.5861	(81)

Solar gains	110.3018	194.6425	284.2677	382.3074	455.6773	464.4613	442.7634	386.1795	317.9285	219.9610	133.3468	93.5991	(83)
Total gains	444.8777	538.5909	613.6784	702.4827	759.8378	758.6674	726.1459	669.0878	609.1248	519.6345	449.9444	420.7187	(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, ni1,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

tau	40.4137	40.4647	40.5149	40.7522	40.7970	41.0064	41.0064	41.0454	40.9255	40.7970	40.7066	40.6126	
alpha	3.6942	3.6976	3.7010	3.7168	3.7198	3.7338	3.7338	3.7364	3.7284	3.7198	3.7138	3.7075	
util living area													
	0.9836	0.9670	0.9358	0.8592	0.7292	0.5572	0.4171	0.4674	0.6937	0.9007	0.9699	0.9865	(86)
MIT	19.2326	19.5297	19.9238	20.4029	20.7533	20.9325	20.9822	20.9730	20.8472	20.3698	19.7113	19.1745	(87)
Th 2	19.8487	19.8500	19.8512	19.8571	19.8582	19.8633	19.8633	19.8643	19.8614	19.8582	19.8560	19.8536	(88)
util rest of house													
	0.9795	0.9590	0.9202	0.8262	0.6704	0.4716	0.3141	0.3596	0.6106	0.8693	0.9612	0.9831	(89)
MIT 2	18.2692	18.5614	18.9441	19.3954	19.6964	19.8314	19.8583	19.8558	19.7786	19.3792	18.7482	18.2155	(90)
Living area fraction										fLA = Living area / (4) =		0.4108	(91)
MIT	18.6650	18.9592	19.3466	19.8093	20.1306	20.2838	20.3200	20.3148	20.2176	19.7862	19.1438	18.6095	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6650	18.9592	19.3466	19.8093	20.1306	20.2838	20.3200	20.3148	20.2176	19.7862	19.1438	18.6095	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9738	0.9512	0.9120	0.8247	0.6854	0.5044	0.3563	0.4035	0.6384	0.8670	0.9543	0.9781	(94)
Useful gains	433.2301	512.3119	559.6452	579.3162	520.7780	382.6544	258.7008	269.9457	388.8843	450.5154	429.3700	411.4880	(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													
	1028.4537	1005.2939	917.4469	774.5601	597.9153	401.0464	262.4833	275.9625	432.5098	651.5033	856.0699	1026.5895	(97)
Space heating kWh													
	442.8464	331.2839	266.2044	140.5756	57.3901	0.0000	0.0000	0.0000	0.0000	149.5349	307.2239	457.6355	(98a)
Space heating requirement - total per year (kWh/year)												2152.6948	
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													
	442.8464	331.2839	266.2044	140.5756	57.3901	0.0000	0.0000	0.0000	0.0000	149.5349	307.2239	457.6355	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2152.6948	
Space heating per m2											(98c) / (4) =	38.7873	(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	663.2618	522.1423	535.7444	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8765	0.9239	0.8999	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	581.3683	482.3850	482.1057	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	857.2816	820.8764	755.7486	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	198.6576	251.8376	203.5903	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	49.6644	62.9594	50.8976	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												163.5214	(107)
Energy for space heating												38.7873	(99)
Energy for space cooling												2.9463	(108)
Total												41.7336	(109)
Fabric Energy Efficiency (DFEE)												41.7	(109)

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

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		55.5000 (1b)	x	2.5000 (2b)	=	138.7500	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.5000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	138.7500	(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)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1441	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3941	(18)
Number of sides sheltered		2	(19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3350 (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	0.4272	0.4188	0.4104	0.3685	0.3601	0.3183	0.3183	0.3099	0.3350	0.3601	0.3769	0.3937	(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	0.5912	0.5877	0.5842	0.5679	0.5649	0.5506	0.5506	0.5480	0.5561	0.5649	0.5710	0.5775	(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 Opening Type (Uw = 1.20)			13.8800	1.1450	15.8931			(27)
Heatloss Floor 1			55.5000	0.1300	7.2150			(28a)
External Wall 1	75.5000	13.8800	61.6200	0.1800	11.0916			(29a)
FR	55.5000		55.5000	0.1100	6.1050			(30)
Total net area of external elements Aum(A, m2)			186.5000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.3047			(33)
Party Wall 1			19.2500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 187.6802 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	30.2000	0.1600	4.8320
E14 Flat roof	30.2000	0.0800	2.4160
E16 Corner (normal)	15.0000	0.0900	1.3500
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E1 Steel lintel with perforated steel base plate	8.0000	0.0500	0.4000
E3 Sill	6.0000	0.0500	0.3000
E4 Jamb	23.2000	0.0500	1.1600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.7580 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 51.0627 (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	27.0710	26.9087	26.7498	26.0030	25.8632	25.2128	25.2128	25.0924	25.4633	25.8632	26.1459	26.4414	(38)
Heat transfer coeff	78.1337	77.9715	77.8125	77.0657	76.9260	76.2755	76.2755	76.1551	76.5261	76.9260	77.2086	77.5041	(39)

Average = Sum(39)m / 12 = 77.0650

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4078	1.4049	1.4020	1.3886	1.3861	1.3743	1.3743	1.3722	1.3788	1.3861	1.3911	1.3965	(40)
HLP (average)												1.3886	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8520 (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

	23.8917	23.5369	23.0372	22.1159	21.4261	20.6611	20.2480	20.7441	21.2844	22.1029	23.0432	23.8110	(42b)

Hot water usage for other uses

	33.5963	32.3746	31.1529	29.9312	28.7095	27.4879	27.4879	28.7095	29.9312	31.1529	32.3746	33.5963	(42c)

Average daily hot water use (litres/day) 52.6935 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	57.4880	55.9115	54.1901	52.0472	50.1356	48.1490	47.7358	49.4537	51.2156	53.2558	55.4177	57.4072	(44)
Energy conte	91.0469	79.6172	83.2882	71.2500	67.4922	59.2048	57.7323	61.2340	63.1539	72.2676	78.9527	89.8859	(45)

Energy content (annual) Total = Sum(45)m = 875.1258
Distribution loss (46)m = 0.15 x (45)m

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:
Total storage loss

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

	77.3899	67.6746	70.7950	60.5625	57.3684	50.3241	49.0725	52.0489	53.6809	61.4275	67.1098	76.4030	(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

	77.3899	67.6746	70.7950	60.5625	57.3684	50.3241	49.0725	52.0489	53.6809	61.4275	67.1098	76.4030	(64)

Total per year (kWh/year) = Sum(64)m = 743.8569 (64)
12Total per year (kWh/year) 744 (64)
Electric shower(s)

	44.2632	39.4388	43.0657	41.0971	41.8683	39.9382	41.2695	41.8683	41.0971	43.0657	42.2559	44.2632	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 503.4910 (64a)
Heat gains from water heating, kWh/month

	30.4133	26.7784	28.4652	25.4149	24.8092	22.5656	22.5855	23.4793	23.6945	26.1233	27.3414	30.1665	(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	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	81.4447	90.1709	81.4447	84.1595	81.4447	84.1595	81.4447	81.4447	84.1595	81.4447	84.1595	81.4447	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													

	161.4732	163.1488	158.9264	149.9373	138.5903	127.9257	120.8010	119.1254	123.3479	132.3369	143.6840	154.3486 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798 (71)
Water heating gains (Table 5)												
	40.8780	39.8488	38.2596	35.2985	33.3456	31.3411	30.3569	31.5582	32.9090	35.1120	37.9742	40.5464 (72)
Total internal gains												
	334.5759	343.9484	329.4106	320.1752	304.1605	294.2062	283.3825	282.9082	291.1963	299.6735	316.5976	327.1196 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	3.6900	11.2829	0.6300	0.7000	0.7700	12.7239	(75)
Southeast	0.9000	36.7938	0.6300	0.7000	0.7700	10.1202	(77)
Southwest	7.0900	36.7938	0.6300	0.7000	0.7700	79.7247	(79)
Northwest	2.2000	11.2829	0.6300	0.7000	0.7700	7.5861	(81)

Solar gains	110.1549	194.3807	283.8792	381.7750	455.0344	463.8026	442.1369	385.6385	317.4907	219.6635	133.1687	93.4747	(83)
Total gains	444.7308	538.3291	613.2898	701.9503	759.1949	758.0087	725.5194	668.5468	608.6870	519.3370	449.7664	420.5943	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	37.0314	37.1085	37.1843	37.5446	37.6128	37.9336	37.9336	37.9936	37.8094	37.6128	37.4751	37.3322	
alpha	3.4688	3.4739	3.4790	3.5030	3.5075	3.5289	3.5289	3.5329	3.5206	3.5075	3.4983	3.4888	
util living area													
	0.9841	0.9691	0.9414	0.8733	0.7545	0.5878	0.4457	0.4971	0.7205	0.9101	0.9717	0.9868	(86)
MIT	19.0293	19.3317	19.7465	20.2710	20.6744	20.9025	20.9720	20.9589	20.7954	20.2525	19.5491	18.9792	(87)
Th 2	19.7573	19.7596	19.7618	19.7721	19.7740	19.7831	19.7831	19.7847	19.7796	19.7740	19.7701	19.7660	(88)
util rest of house													
	0.9800	0.9614	0.9265	0.8411	0.6945	0.4951	0.3299	0.3773	0.6343	0.8797	0.9632	0.9834	(89)
MIT 2	18.0031	18.3018	18.7066	19.2075	19.5598	19.7371	19.7752	19.7721	19.6685	19.2059	18.5271	17.9598	(90)
Living area fraction										fLA = Living area / (4) =		0.4108	(91)
MIT	18.4247	18.7249	19.1338	19.6444	20.0177	20.2159	20.2669	20.2596	20.1315	19.6358	18.9469	18.3786	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4247	18.7249	19.1338	19.6444	20.0177	20.2159	20.2669	20.2596	20.1315	19.6358	18.9469	18.3786	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9740	0.9530	0.9171	0.8373	0.7075	0.5296	0.3772	0.4258	0.6613	0.8756	0.9558	0.9781	(94)
Useful gains	433.1845	513.0435	562.4674	587.7437	537.1158	401.4686	273.6644	284.6728	402.5509	454.7368	429.8684	411.3680	(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													
	1103.6131	1077.9464	983.0652	828.0221	639.8465	428.3545	279.6924	293.9292	461.5633	695.0906	914.6854	1098.9005	(97)
Space heating kWh													
	498.7989	379.6147	312.9248	173.0005	76.4317	0.0000	0.0000	0.0000	0.0000	178.8233	349.0682	511.5242	(98a)
Space heating requirement - total per year (kWh/year)												2480.1863	
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													
	498.7989	379.6147	312.9248	173.0005	76.4317	0.0000	0.0000	0.0000	0.0000	178.8233	349.0682	511.5242	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2480.1863	
Space heating per m2											(98c) / (4) =	44.6880	(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	716.9901	564.4390	578.7787	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8427	0.8978	0.8697	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	604.2264	506.7373	503.3736	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	856.5117	820.1441	755.1163	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	181.6455	233.1747	187.2965	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	45.4114	58.2937	46.8241	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												150.5292	(107)
Energy for space heating												44.6880	(99)
Energy for space cooling												2.7122	(108)
Total												47.4003	(109)
Fabric Energy Efficiency (TFEE)												47.4	(109)

Full SAP Calculation Printout

Property Reference	Unit 1	**Issued on Date**	04/05/2024
Assessment Reference	Unit 1 - Be Lean	**Prop Type Ref**	
Property			

SAP Rating	84 B	**DER**	15.07	**TER**	11.36
Environmental	89 B	**% DER < TER**			-32.66
CO_2 Emissions (t/year)	0.76	**DFEE**	41.73	**TFEE**	47.40
Compliance Check	See BREL	**% DFEE < TFEE**			11.95
% DPER < TPER	-40.29	**DPER**	85.07	**TPER**	60.64

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

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		55.5000 (1b)	x	2.5000 (2b)	=	138.7500	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.5000						
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	138.7500	(5)

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2. Ventilation rate

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

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275 (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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000 (23c)

Effective ac	0.2621	0.2589	0.2557	0.2397	0.2366	0.2206	0.2206	0.2174	0.2270	0.2366	0.2429	0.2493	(25)

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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)			13.9000	1.1450	15.9160			(27)
Heatloss Floor 1			55.5000	0.1000	5.5500	75.0000	4162.5000	(28a)
External Wall 1	75.5000	13.9000	61.6000	0.1500	9.2400	70.0000	4312.0000	(29a)
FR	55.5000		55.5000	0.1000	5.5500	9.0000	499.5000	(30)
Total net area of external elements Aum(A, m2)			186.5000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.2560			(33)
Party Wall 1			19.2500	0.0000	0.0000	45.0000	866.2500	(32)
Internal Wall 1			64.0000			9.0000	576.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 10416.2500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	187.6802 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	30.2000	0.0480	1.4496
E14 Flat roof	30.2000	0.1600	4.8320

E16 Corner (normal)	15.0000	0.0350	0.5250	
E18 Party wall between dwellings	5.0000	0.0330	0.1650	
E1 Steel lintel with perforated steel base plate	8.0000	0.3020	2.4160	
E3 Sill	6.0000	0.0290	0.1740	
E4 Jamb	23.2000	0.0240	0.5568	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.1184 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 46.3744 (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	11.9992	11.8532	11.7073	10.9776	10.8316	10.1019	10.1019	9.9559	10.3938	10.8316	11.1235	11.4154	(38)
Heat transfer coeff	58.3736	58.2277	58.0817	57.3520	57.2060	56.4763	56.4763	56.3304	56.7682	57.2060	57.4979	57.7898	(39)

Average = Sum(39)m / 12 = 57.3155

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0518	1.0491	1.0465	1.0334	1.0307	1.0176	1.0176	1.0150	1.0229	1.0307	1.0360	1.0413	(40)
HLP (average)												1.0327	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8520 (42)

Hot water usage for mixer showers

70.9489	69.8827	68.3290	65.3562	63.1624	60.7159	59.3254	60.8673	62.5575	65.1843	68.2209	70.6770	(42a)

Hot water usage for baths

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)

Hot water usage for other uses

33.5963	32.3746	31.1529	29.9312	28.7095	27.4879	27.4879	28.7095	29.9312	31.1529	32.3746	33.5963	(42c)

Average daily hot water use (litres/day) 95.9546 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	104.5451	102.2572	99.4819	95.2875	91.8720	88.2038	86.8132	89.5768	92.4888	96.3372	100.5955	104.2733	(44)
Energy conte	165.5740	145.6129	152.8999	130.4438	123.6774	108.4569	104.9931	110.9148	114.0479	130.7287	143.3167	163.2668	(45)

Energy content (annual) Total = Sum(45)m = 1593.9329

Distribution loss (46)m = 0.15 x (45)m

24.8361	21.8419	22.9350	19.5666	18.5516	16.2685	15.7490	16.6372	17.1072	19.6093	21.4975	24.4900	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.1200 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.6048 (55)
Total storage loss

18.7488	16.9344	18.7488	18.1440	18.7488	18.1440	18.7488	18.7488	18.1440	18.7488	18.1440	18.7488	(56)

If cylinder contains dedicated solar storage

18.7488	16.9344	18.7488	18.1440	18.7488	18.1440	18.7488	18.7488	18.1440	18.7488	18.1440	18.7488	(57)
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)
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)

Primary loss
Combi loss
Total heat required for water heating calculated for each month

207.5852	183.5585	194.9111	171.0998	165.6886	149.1129	147.0043	152.9260	154.7039	172.7399	183.9727	205.2780	(62)
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)
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)
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)
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)

WWHRS
PV diverter
Solar input
FGHRS
Output from w/h

207.5852	183.5585	194.9111	171.0998	165.6886	149.1129	147.0043	152.9260	154.7039	172.7399	183.9727	205.2780	(64)

Total per year (kWh/year) = Sum(64)m = 2088.5809 (64)

12Total per year (kWh/year) 2089 (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

88.6623	78.7728	84.4482	75.8974	74.7317	68.5867	68.5192	70.4881	70.4457	77.0763	80.1776	87.8952	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	81.4447	90.1709	81.4447	84.1595	81.4447	84.1595	81.4447	81.4447	84.1595	81.4447	84.1595	81.4447	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	161.4732	163.1488	158.9264	149.9373	138.5903	127.9257	120.8010	119.1254	123.3479	132.3369	143.6840	154.3486	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	(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)	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	(71)
Water heating gains (Table 5)	119.1698	117.2214	113.5056	105.4130	100.4458	95.2593	92.0956	94.7421	97.8413	103.5971	111.3578	118.1387	(72)
Total internal gains	415.8676	424.3210	407.6566	393.2898	374.2607	358.1244	345.1213	346.0922	356.1286	371.1587	392.9812	407.7119	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	3.7000	11.2829	0.6300	0.7000	0.7700	12.7584	(75)
Southeast	0.9000	36.7938	0.6300	0.7000	0.7700	10.1202	(77)
Southwest	7.1000	36.7938	0.6300	0.7000	0.7700	79.8372	(79)
Northwest	2.2000	11.2829	0.6300	0.7000	0.7700	7.5861	(81)

Solar gains	110.3018	194.6425	284.2677	382.3074	455.6773	464.4613	442.7634	386.1795	317.9285	219.9610	133.3468	93.5991	(83)
Total gains	526.1694	618.9635	691.9243	775.5972	829.9380	822.5857	787.8847	732.2717	674.0571	591.1197	526.3280	501.3110	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	49.5670	49.6912	49.8161	50.4499	50.5786	51.2322	51.2322	51.3649	50.9687	50.5786	50.3219	50.0677	
alpha	4.3045	4.3127	4.3211	4.3633	4.3719	4.4155	4.4155	4.4243	4.3979	4.3719	4.3548	4.3378	
util living area	0.9663	0.9363	0.8823	0.7657	0.6048	0.4328	0.3141	0.3515	0.5575	0.8165	0.9380	0.9717	(86)
MIT	19.8526	20.1188	20.4293	20.7527	20.9256	20.9865	20.9974	20.9958	20.9606	20.7223	20.2455	19.8069	(87)
Th 2	20.0404	20.0426	20.0447	20.0556	20.0578	20.0687	20.0687	20.0709	20.0643	20.0578	20.0534	20.0491	(88)
util rest of house	0.9591	0.9235	0.8602	0.7280	0.5530	0.3723	0.2482	0.2816	0.4899	0.7761	0.9234	0.9655	(89)
MIT 2	18.7328	19.0630	19.4395	19.8174	19.9970	20.0605	20.0677	20.0691	20.0378	19.7969	19.2334	18.6822	(90)
Living area fraction										fLA = Living area / (4) =		0.4108	(91)
MIT	19.1928	19.4968	19.8461	20.2017	20.3785	20.4409	20.4496	20.4498	20.4169	20.1770	19.6492	19.1442	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.0428	19.3468	19.6961	20.0517	20.2285	20.2909	20.2996	20.2998	20.2669	20.0270	19.4992	18.9942	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9495	0.9125	0.8511	0.7279	0.5627	0.3869	0.2646	0.2990	0.5050	0.7747	0.9131	0.9567	(94)
Useful gains	499.6196	564.8014	588.9055	564.5407	466.9673	318.2958	208.5037	218.9293	340.3652	457.9401	480.5719	479.5863	(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	860.5913	841.2008	766.4514	639.5696	487.8791	321.4036	208.9415	219.6777	350.0812	539.2838	712.9290	854.9550	(97)
Space heating kWh	268.5629	185.7404	132.0941	54.0208	15.5584	0.0000	0.0000	0.0000	0.0000	60.5197	167.2971	279.2743	(98a)
Space heating requirement - total per year (kWh/year)												1163.0678	
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	268.5629	185.7404	132.0941	54.0208	15.5584	0.0000	0.0000	0.0000	0.0000	60.5197	167.2971	279.2743	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1163.0678	
Space heating per m2											(98c) / (4) =	20.9562	(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 %) 89.5000 (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	268.5629	185.7404	132.0941	54.0208	15.5584	0.0000	0.0000	0.0000	0.0000	60.5197	167.2971	279.2743	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	300.0703	207.5311	147.5912	60.3584	17.3837	0.0000	0.0000	0.0000	0.0000	67.6198	186.9241	312.0383	(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	207.5852	183.5585	194.9111	171.0998	165.6886	149.1129	147.0043	152.9260	154.7039	172.7399	183.9727	205.2780	(64)
Efficiency of water heater												82.0000	(216)
(217)m	86.0680	85.6081	84.8730	83.6828	82.5941	82.0000	82.0000	82.0000	82.0000	83.8225	85.4087	86.1614	(217)
Fuel for water heating, kWh/month	241.1873	214.4172	229.6503	204.4624	200.6057	181.8450	179.2735	186.4952	188.6633	206.0784	215.4028	238.2482	(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	12.9421	11.6897	12.9421	12.5246	12.9421	12.5246	12.9421	12.9421	12.5246	12.9421	12.5246	12.9421	(231)
Lighting	17.2067	13.8039	12.4289	9.1059	7.0337	5.7466	6.4164	8.3402	10.8331	14.2136	16.0543	17.6850	(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 1299.5170 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 82.0000

Water heating fuel used 2486.3292 (219)

Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6580)

mechanical ventilation fans (SFP = 0.6580) 111.3829 (230a)

central heating pump 41.0000 (230c)

Total electricity for the above, kWh/year 152.3829 (231)

Electricity for lighting (calculated in Appendix L) 138.8682 (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	4077.0974	(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	1299.5170	0.2100	272.8986	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2486.3292	0.2100	522.1291	(264)
Space and water heating			795.0277	(265)
Pumps, fans and electric keep-hot	152.3829	0.1387	21.1374	(267)
Energy for lighting	138.8682	0.1443	20.0430	(268)
Total CO2, kg/year			836.2081	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			15.0700	(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	1299.5170	1.1300	1468.4543	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2486.3292	1.1300	2809.5520	(278)
Space and water heating			4278.0063	(279)
Pumps, fans and electric keep-hot	152.3829	1.5128	230.5249	(281)
Energy for lighting	138.8682	1.5338	213.0007	(282)
Total Primary energy kWh/year			4721.5319	(286)
Dwelling Primary energy Rate (DPER)			85.0700	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	55.5000	(1b)	x 2.5000	(2b) =	138.7500	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.5000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		138.7500	(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)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1441	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3941	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3350	(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	0.4272	0.4188	0.4104	0.3685	0.3601	0.3183	0.3183	0.3099	0.3350	0.3601	0.3769	0.3937	(22b)
Effective ac	0.5912	0.5877	0.5842	0.5679	0.5649	0.5506	0.5506	0.5480	0.5561	0.5649	0.5710	0.5775	(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 Opening Type (Uw = 1.20)			13.8800	1.1450	15.8931			(27)
Heatloss Floor 1			55.5000	0.1300	7.2150			(28a)

External Wall 1	75.5000	13.8800	61.6200	0.1800	11.0916	(29a)
FR	55.5000		55.5000	0.1100	6.1050	(30)
Total net area of external elements Aum(A, m2)			186.5000			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.3047	(33)
Party Wall 1			19.2500	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 187.6802 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	30.2000	0.1600	4.8320
E14 Flat roof	30.2000	0.0800	2.4160
E16 Corner (normal)	15.0000	0.0900	1.3500
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E1 Steel lintel with perforated steel base plate	8.0000	0.0500	0.4000
E3 Sill	6.0000	0.0500	0.3000
E4 Jamb	23.2000	0.0500	1.1600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.7580 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 51.0627 (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	27.0710	26.9087	26.7498	26.0030	25.8632	25.2128	25.2128	25.0924	25.4633	25.8632	26.1459	26.4414	(38)
Heat transfer coeff	78.1337	77.9715	77.8125	77.0657	76.9260	76.2755	76.2755	76.1551	76.5261	76.9260	77.2086	77.5041	(39)
Average = Sum(39)m / 12 =												77.0650	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4078	1.4049	1.4020	1.3886	1.3861	1.3743	1.3743	1.3722	1.3788	1.3861	1.3911	1.3965	(40)
HLP (average)												1.3886	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8520 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	70.9489	69.8827	68.3290	65.3562	63.1624	60.7159	59.3254	60.8673	62.5575	65.1843	68.2209	70.6770	(42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses	33.5963	32.3746	31.1529	29.9312	28.7095	27.4879	27.4879	28.7095	29.9312	31.1529	32.3746	33.5963	(42c)
Average daily hot water use (litres/day)												95.9546	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	104.5451	102.2572	99.4819	95.2875	91.8720	88.2038	86.8132	89.5768	92.4888	96.3372	100.5955	104.2733	(44)
Energy conte	165.5740	145.6129	152.8999	130.4438	123.6774	108.4569	104.9931	110.9148	114.0479	130.7287	143.3167	163.2668	(45)
Energy content (annual)										Total = Sum(45)m =		1593.9329	
Distribution loss (46)m = 0.15 x (45)m	24.8361	21.8419	22.9350	19.5666	18.5516	16.2685	15.7490	16.6372	17.1072	19.6093	21.4975	24.4900	(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	212.1689	187.6987	199.4948	175.5356	170.2723	153.5487	151.5880	157.5097	159.1397	177.3236	188.4086	209.8617	(62)
WWHRS	-32.4349	-28.6857	-30.0380	-24.8726	-23.1804	-19.8356	-18.5927	-19.7715	-20.5227	-24.1940	-27.4089	-31.8342	(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	179.7340	159.0130	169.4569	150.6630	147.0919	133.7131	132.9952	137.7382	138.6170	153.1296	160.9997	178.0275	(64)
										Total per year (kWh/year) = Sum(64)m =		1841.1791	(64)
12Total per year (kWh/year)												1841	(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	92.3293	82.0849	88.1151	79.4460	78.3986	72.1354	72.1861	74.1551	73.9944	80.7432	83.7263	91.5621	(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	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	81.4447	90.1709	81.4447	84.1595	81.4447	84.1595	81.4447	81.4447	84.1595	81.4447	84.1595	81.4447	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	161.4732	163.1488	158.9264	149.9373	138.5903	127.9257	120.8010	119.1254	123.3479	132.3369	143.6840	154.3486	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	(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)	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	(71)
Water heating gains (Table 5)	124.0985	122.1501	118.4343	110.3417	105.3745	100.1880	97.0243	99.6708	102.7700	108.5258	116.2865	123.0674	(72)
Total internal gains	420.7963	429.2497	412.5853	398.2185	379.1894	363.0531	350.0500	351.0209	361.0573	376.0874	397.9099	412.6406	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W

Northeast				3.6900		11.2829		0.6300		0.7000		0.7700		12.7239 (75)
Southeast				0.9000		36.7938		0.6300		0.7000		0.7700		10.1202 (77)
Southwest				7.0900		36.7938		0.6300		0.7000		0.7700		79.7247 (79)
Northwest				2.2000		11.2829		0.6300		0.7000		0.7700		7.5861 (81)
Solar gains	110.1549	194.3807	283.8792	381.7750	455.0344	463.8026	442.1369	385.6385	317.4907	219.6635	133.1687	93.4747	(83)
Total gains	530.9512	623.6305	696.4645	779.9935	834.2238	826.8557	792.1869	736.6594	678.5480	595.7509	531.0786	506.1153	(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	37.0314	37.1085	37.1843	37.5446	37.6128	37.9336	37.9336	37.9936	37.8094	37.6128	37.4751	37.3322	
alpha	3.4688	3.4739	3.4790	3.5030	3.5075	3.5289	3.5289	3.5329	3.5206	3.5075	3.4983	3.4888	
util living area	0.9733	0.9537	0.9192	0.8417	0.7150	0.5489	0.4116	0.4569	0.6729	0.8765	0.9550	0.9770	(86)
MIT	19.2091	19.4978	19.8895	20.3701	20.7284	20.9215	20.9782	20.9685	20.8367	20.3656	19.7090	19.1602	(87)
Th 2	19.7573	19.7596	19.7618	19.7721	19.7740	19.7831	19.7831	19.7847	19.7796	19.7740	19.7701	19.7660	(88)
util rest of house	0.9668	0.9427	0.9000	0.8049	0.6526	0.4590	0.3032	0.3443	0.5852	0.8389	0.9424	0.9714	(89)
MIT 2	17.7322	18.0942	18.5790	19.1570	19.5494	19.7366	19.7754	19.7726	19.6693	19.1707	18.3719	17.6765	(90)
Living area fraction										fLA = Living area / (4) =		0.4108	(91)
MIT	18.3389	18.6708	19.1173	19.6554	20.0338	20.2234	20.2695	20.2639	20.1489	19.6616	18.9212	18.2860	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3389	18.6708	19.1173	19.6554	20.0338	20.2234	20.2695	20.2639	20.1489	19.6616	18.9212	18.2860	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9567	0.9304	0.8879	0.8009	0.6668	0.4928	0.3475	0.3899	0.6136	0.8349	0.9311	0.9621	(94)
Useful gains	507.9417	580.2196	618.3950	624.7291	556.2722	407.4634	275.2482	287.2369	416.3657	497.3693	494.4734	486.9306	(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	1096.9138	1073.7326	981.7868	828.8707	641.0831	428.9251	279.8947	294.2528	462.8970	697.0701	912.6970	1091.7249	(97)
Space heating kWh	438.1952	331.6407	270.3636	146.9819	63.0994	0.0000	0.0000	0.0000	0.0000	148.5774	301.1210	449.9670	(98a)
Space heating requirement - total per year (kWh/year)												2149.9461	
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	438.1952	331.6407	270.3636	146.9819	63.0994	0.0000	0.0000	0.0000	0.0000	148.5774	301.1210	449.9670	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2149.9461	
Space heating per m2											(98c) / (4) =	38.7378	(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	438.1952	331.6407	270.3636	146.9819	63.0994	0.0000	0.0000	0.0000	0.0000	148.5774	301.1210	449.9670	(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)	474.7511	359.3073	292.9183	159.2437	68.3633	0.0000	0.0000	0.0000	0.0000	160.9722	326.2416	487.5049	(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	179.7340	159.0130	169.4569	150.6630	147.0919	133.7131	132.9952	137.7382	138.6170	153.1296	160.9997	178.0275	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.9795	85.6687	85.1020	84.0043	82.3042	79.8000	79.8000	79.8000	79.8000	83.9921	85.4427	86.0488	(217)
Fuel for water heating, kWh/month	209.0429	185.6138	199.1220	179.3515	178.7174	167.5603	166.6607	172.6043	173.7056	182.3143	188.4299	206.8912	(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	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.9226	13.5759	12.2236	8.9556	6.9175	5.6517	6.3104	8.2025	10.6542	13.9789	15.7892	17.3929	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-43.8036	-58.0415	-78.5237	-83.0127	-85.4138	-78.4063	-77.4939	-75.1214	-70.3948	-63.8178	-46.8470	-38.3305	(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	-37.4593	-76.8815	-149.3810	-219.5749	-285.8449	-285.5256	-282.0844	-240.7724	-179.1656	-108.1587	-49.4098	-29.7614	(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												2329.3024	(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	2210.0137	(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)	136.5751	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2743.2266	(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	2018.6646	(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	2329.3024	0.2100	489.1535	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2210.0137	0.2100	464.1029	(264)
Space and water heating			953.2564	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	136.5751	0.1443	19.7120	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-799.2070	0.1359	-108.5995	
PV Unit electricity exported	-1944.0195	0.1266	-246.0168	
Total			-354.6163	(269)
Total CO2, kg/year			630.2813	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.3600	(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	2329.3024	1.1300	2632.1117	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2210.0137	1.1300	2497.3155	(278)
Space and water heating			5129.4272	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	136.5751	1.5338	209.4834	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-799.2070	1.5023	-1200.6286	
PV Unit electricity exported	-1944.0195	0.4646	-903.1087	
Total			-2103.7373	(283)
Total Primary energy kWh/year			3365.2741	(286)
Target Primary Energy Rate (TPER)			60.6400	(287)

Summary for Input Data

elmhurst energy

Property Reference	Unit 1	**Issued on Date**	04/05/2024
Assessment Reference	Unit 1 - Be Green	**Prop Type Ref**	
Property			

SAP Rating	82 B	**DER**	4.97	**TER**	11.36
Environmental	96 A	**% DER < TER**			56.25
CO_2 Emissions (t/year)	0.26	**DFEE**	41.73	**TFEE**	47.40
Compliance Check	See BREL	**% DFEE < TFEE**			11.95
% DPER < TPER	12.82	**DPER**	52.87	**TPER**	60.64

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

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

Orientation	Southwest	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Suburban	
1.0 Property Type	Bungalow, End-Terrace	
Which Floor	0	
2.0 Number of Storeys	1	
3.0 Date Built	2024	
3.0 Property Age Band	L	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	N/A	kJ/m²K
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
Basement:	0.00 m	0.00 m²	0.00 m
Ground floor:	30.20 m	55.50 m²	2.50 m
1st Storey:	0.00 m	0.00 m²	0.00 m
2nd Storey:	0.00 m	0.00 m²	0.00 m
3rd Storey:	0.00 m	0.00 m²	0.00 m
4th Storey:	0.00 m	0.00 m²	0.00 m
5th Storey:	0.00 m	0.00 m²	0.00 m
6th Storey:	0.00 m	0.00 m²	0.00 m
7th Storey:	0.00 m	0.00 m²	0.00 m

8.0 Living Area	22.80	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
External Wall 1	Cavity Wall	Cavity wall : dense plaster, AAC block, filled cavity, any outside structure	0.15	70.00	75.50	61.60	0.00	None	13.90	Calculate Wall Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Plasterboard on dabs mounted on cement render on both sides, AAC blocks, cavity	0.00	45.00	19.25	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	64.00

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area	Shelter Code	Shelter Factor	Calculation Type	Openings

Summary for Input Data

FR	External Flat Roof	Plasterboard, insulated flat roof	0.10	9.00	55.50	55.50 (m²)	None	0.00	Enter Gross Area	0.00

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Heatloss Floor 1	Ground Floor - Solid	Lowest occupied	Suspended concrete floor, carpeted	0.10	None	0.00	75.00	55.50

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Windows	Manufacturer	Window	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.20
RLs	Manufacturer	Roof Light	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
SW	Windows	External Wall 1	South West	7.10	0
SE	Windows	External Wall 1	South East	0.90	0
NE	Windows	External Wall 1	North East	3.70	0
NW	Windows	External Wall 1	North West	2.20	0

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	
17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E5 Ground floor (normal)	Gov Approved Scheme	30.20	0.05	0.05	Yes
E14 Flat roof	Table K1 - Default	30.20	0.16	0.16	Yes
E16 Corner (normal)	Gov Approved Scheme	15.00	0.04	0.04	No
E18 Party wall between dwellings	Gov Approved Scheme	5.00	0.03	0.03	Yes
E1 Steel lintel with perforated steel base plate	Gov Approved Scheme	8.00	0.30	0.30	No
E3 Sill	Gov Approved Scheme	6.00	0.03	0.03	No
E4 Jamb	Gov Approved Scheme	23.20	0.02	0.02	No

Y-value	0.05	W/m²K
18.0 Pressure Testing	Yes	
Designed AP_{50}	3.00	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	No
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500811
Configuration	1
Manufacturer SFP	0.47
Duct Type	Rigid
MVHR Efficiency	89.00
Wet Rooms	1
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)
Duct Installation Specification	Level 1

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System	No

22.0 Lighting

No Fixed Lighting	No				
	Name	**Efficacy**	**Power**	**Capacity**	**Count**
	Lighting 1	120.00	6	720	40

Summary for Input Data

elmhurst energy

24.0 Main Heating 1	Database	
Percentage of Heat	100.00	%
Database Ref. No.	102608	
Fuel Type	Electricity	
SAP Code	0	
In Winter	321.54	
In Summer	163.54	
Model Name	aroTHERM 5kW	
Manufacturer	Vaillant Group UK Ltd	
System Type	Heat Pump	
Controls SAP Code	2207	
Delayed Start Stat	Yes	
Burner Control	On/Off	
HETAS approved System	No	
Oil Pump Inside	No	
FI Case	0.00	
Flue Type	None or Unknown	
Fan Assisted Flue	No	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators	
Flow Temperature	Enter value	
Flow Temperature Value	35.00	
Boiler Interlock	Yes	
Combi boiler type	No Combi	
25.0 Main Heating 2	None	
26.0 Heat Networks	None	
28.0 Water Heating		
Water Heating	Main Heating 1	
SAP Code	901	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
Summer Immersion	No	
Cold Water Source	From mains	
Bath Count	0	
Supplementary Immersion	No	
Immersion Only Heating Hot Water	No	

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
S1	Vented hot water system	7.00		Yes	Instantaneous System 1

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	Yes	

Summary for Input Data

Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	150.00	L
Loss	1.12	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	

31.0 Thermal Store	None	

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Property Reference	Unit 1	**Issued on Date**	04/05/2024
Assessment Reference	Unit 1 - Be Green	**Prop Type Ref**	
Property			

SAP Rating	82 B	**DER**	4.97	**TER**	11.36
Environmental	96 A	**% DER < TER**			56.25
CO_2 Emissions (t/year)	0.26	**DFEE**	41.73	**TFEE**	47.40
Compliance Check	See BREL	**% DFEE < TFEE**			11.95
% DPER < TPER	12.82	**DPER**	52.87	**TPER**	60.64

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	55.5000	(1b)	x 2.5000	(2b) =	138.7500	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.5000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	138.7500	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		80.1000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2621	0.2589	0.2557	0.2397	0.2366	0.2206	0.2206	0.2174	0.2270	0.2366	0.2429	0.2493	(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)			13.9000	1.1450	15.9160			(27)
Heatloss Floor 1			55.5000	0.1000	5.5500	75.0000	4162.5000	(28a)
External Wall 1	75.5000	13.9000	61.6000	0.1500	9.2400	70.0000	4312.0000	(29a)
FR	55.5000		55.5000	0.1000	5.5500	9.0000	499.5000	(30)
Total net area of external elements Aum(A, m2)			186.5000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.2560			(33)
Party Wall 1			19.2500	0.0000	0.0000	45.0000	866.2500	(32)
Internal Wall 1			64.0000			9.0000	576.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10416.2500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		187.6802 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	30.2000	0.0480	1.4496
E14 Flat roof	30.2000	0.1600	4.8320

E16 Corner (normal)	15.0000	0.0350	0.5250	
E18 Party wall between dwellings	5.0000	0.0330	0.1650	
E1 Steel lintel with perforated steel base plate	8.0000	0.3020	2.4160	
E3 Sill	6.0000	0.0290	0.1740	
E4 Jamb	23.2000	0.0240	0.5568	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.1184 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 46.3744 (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	11.9992	11.8532	11.7073	10.9776	10.8316	10.1019	10.1019	9.9559	10.3938	10.8316	11.1235	11.4154	(38)
Heat transfer coeff	58.3736	58.2277	58.0817	57.3520	57.2060	56.4763	56.4763	56.3304	56.7682	57.2060	57.4979	57.7898	(39)

Average = Sum(39)m / 12 = 57.3155

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0518	1.0491	1.0465	1.0334	1.0307	1.0176	1.0176	1.0150	1.0229	1.0307	1.0360	1.0413	(40)
HLP (average)												1.0327	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8520 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	70.9489	69.8827	68.3290	65.3562	63.1624	60.7159	59.3254	60.8673	62.5575	65.1843	68.2209	70.6770	(42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses	33.5963	32.3746	31.1529	29.9312	28.7095	27.4879	27.4879	28.7095	29.9312	31.1529	32.3746	33.5963	(42c)

Average daily hot water use (litres/day) 95.9546 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	104.5451	102.2572	99.4819	95.2875	91.8720	88.2038	86.8132	89.5768	92.4888	96.3372	100.5955	104.2733	(44)
Energy conte	165.5740	145.6129	152.8999	130.4438	123.6774	108.4569	104.9931	110.9148	114.0479	130.7287	143.3167	163.2668	(45)

Energy content (annual) Total = Sum(45)m = 1593.9329

Distribution loss (46)m = 0.15 x (45)m	24.8361	21.8419	22.9350	19.5666	18.5516	16.2685	15.7490	16.6372	17.1072	19.6093	21.4975	24.4900	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.1200 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.6048 (55)

Total storage loss	18.7488	16.9344	18.7488	18.1440	18.7488	18.1440	18.7488	18.7488	18.1440	18.7488	18.1440	18.7488	(56)
If cylinder contains dedicated solar storage	18.7488	16.9344	18.7488	18.1440	18.7488	18.1440	18.7488	18.7488	18.1440	18.7488	18.1440	18.7488	(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	207.5852	183.5585	194.9111	171.0998	165.6886	149.1129	147.0043	152.9260	154.7039	172.7399	183.9727	205.2780	(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	207.5852	183.5585	194.9111	171.0998	165.6886	149.1129	147.0043	152.9260	154.7039	172.7399	183.9727	205.2780	(64)

Total per year (kWh/year) = Sum(64)m = 2088.5809 (64)
12Total per year (kWh/year) 2089 (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	88.6623	78.7728	84.4482	75.8974	74.7317	68.5867	68.5192	70.4881	70.4457	77.0763	80.1776	87.8952	(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	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	81.4447	90.1709	81.4447	84.1595	81.4447	84.1595	81.4447	81.4447	84.1595	81.4447	84.1595	81.4447	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	161.4732	163.1488	158.9264	149.9373	138.5903	127.9257	120.8010	119.1254	123.3479	132.3369	143.6840	154.3486	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	(71)
Water heating gains (Table 5)	119.1698	117.2214	113.5056	105.4130	100.4458	95.2593	92.0956	94.7421	97.8413	103.5971	111.3578	118.1387	(72)
Total internal gains	412.8676	421.3210	404.6566	390.2898	371.2607	358.1244	345.1213	346.0922	356.1286	368.1587	389.9812	404.7119	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	3.7000	11.2829	0.6300	0.7000	0.7700	12.7584	(75)
Southeast	0.9000	36.7938	0.6300	0.7000	0.7700	10.1202	(77)
Southwest	7.1000	36.7938	0.6300	0.7000	0.7700	79.8372	(79)
Northwest	2.2000	11.2829	0.6300	0.7000	0.7700	7.5861	(81)

Solar gains	110.3018	194.6425	284.2677	382.3074	455.6773	464.4613	442.7634	386.1795	317.9285	219.9610	133.3468	93.5991	(83)
Total gains	523.1694	615.9635	688.9243	772.5972	826.9380	822.5857	787.8847	732.2717	674.0571	588.1197	523.3280	498.3110	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	49.5670	49.6912	49.8161	50.4499	50.5786	51.2322	51.2322	51.3649	50.9687	50.5786	50.3219	50.0677	
alpha	4.3045	4.3127	4.3211	4.3633	4.3719	4.4155	4.4155	4.4243	4.3979	4.3719	4.3548	4.3378	
util living area	0.9670	0.9372	0.8836	0.7675	0.6066	0.4328	0.3141	0.3515	0.5575	0.8185	0.9391	0.9722	(86)
Living	19.8462	20.1133	20.4250	20.7504	20.9248	20.9865	20.9974	20.9958	20.9606	20.7192	20.2400	19.8004	
Non living	18.7250	19.0564	19.4345	19.8150	19.9962	20.0605	20.0677	20.0691	20.0378	19.7937	19.2268	18.6741	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.4098	20.1133	20.4250	20.7504	20.9248	20.9865	20.9974	20.9958	20.9606	20.7192	20.2400	19.9682	(87)
Th 2	20.0404	20.0426	20.0447	20.0556	20.0578	20.0687	20.0687	20.0709	20.0643	20.0578	20.0534	20.0491	(88)
util rest of house	0.9598	0.9246	0.8617	0.7299	0.5547	0.3723	0.2482	0.2816	0.4899	0.7784	0.9247	0.9662	(89)
MIT 2	19.5160	19.0564	19.4345	19.8150	19.9962	20.0605	20.0677	20.0691	20.0378	19.7937	19.2268	18.9219	(90)
Living area fraction									fLA = Living area / (4) =			0.4108	(91)
MIT	19.8832	19.4906	19.8414	20.1993	20.3777	20.4409	20.4496	20.4498	20.4169	20.1739	19.6430	19.3517	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8832	19.4906	19.8414	20.1993	20.3777	20.4409	20.4496	20.4498	20.4169	20.1739	19.6430	19.3517	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9585	0.9161	0.8565	0.7359	0.5728	0.3967	0.2753	0.3103	0.5160	0.7838	0.9173	0.9607	(94)
Useful gains	501.4643	564.2750	590.0641	568.5710	473.6338	326.3542	216.8779	227.2237	347.7804	460.9438	480.0257	478.7272	(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	909.6460	849.5749	774.8930	648.0353	496.4155	329.8751	217.4130	228.1272	358.5964	547.6850	721.1968	875.6148	(97)
Space heating kWh	303.6871	191.7216	137.5127	57.2142	16.9496	0.0000	0.0000	0.0000	0.0000	64.5355	173.6432	295.2843	(98a)
Space heating requirement - total per year (kWh/year)												1240.5483	
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	303.6871	191.7216	137.5127	57.2142	16.9496	0.0000	0.0000	0.0000	0.0000	64.5355	173.6432	295.2843	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1240.5483	
Space heating per m2											(98c) / (4) =	22.3522	(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 %) 321.5396 (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	303.6871	191.7216	137.5127	57.2142	16.9496	0.0000	0.0000	0.0000	0.0000	64.5355	173.6432	295.2843	(98)
Space heating efficiency (main heating system 1)	321.5396	321.5396	321.5396	321.5396	321.5396	0.0000	0.0000	0.0000	0.0000	321.5396	321.5396	321.5396	(210)
Space heating fuel (main heating system)	94.4478	59.6261	42.7670	17.7938	5.2714	0.0000	0.0000	0.0000	0.0000	20.0708	54.0037	91.8345	(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	207.5852	183.5585	194.9111	171.0998	165.6886	149.1129	147.0043	152.9260	154.7039	172.7399	183.9727	205.2780	(64)
Efficiency of water heater												163.5362	(216)
(217)m	163.5362	163.5362	163.5362	163.5362	163.5362	163.5362	163.5362	163.5362	163.5362	163.5362	163.5362	163.5362	(217)
Fuel for water heating, kWh/month	126.9353	112.2434	119.1853	104.6250	101.3162	91.1804	89.8910	93.5121	94.5992	105.6280	112.4967	125.5245	(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	9.4599	8.5444	9.4599	9.1548	9.4599	9.1548	9.4599	9.4599	9.1548	9.4599	9.1548	9.4599	(231)
Lighting	17.2067	13.8039	12.4289	9.1059	7.0337	5.7466	6.4164	8.3402	10.8331	14.2136	16.0543	17.6850	(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 1 385.8150 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 163.5362

Water heating fuel used 1277.1371 (219)

Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6580)

mechanical ventilation fans (SFP = 0.6580)	111.3829	(230a)
Total electricity for the above, kWh/year	111.3829	(231)
Electricity for lighting (calculated in Appendix L)	138.8682	(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	1913.2033	(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	385.8150	0.1570	60.5721	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1277.1371	0.1409	179.9668	(264)
Space and water heating			240.5388	(265)
Pumps, fans and electric keep-hot	111.3829	0.1387	15.4502	(267)
Energy for lighting	138.8682	0.1443	20.0430	(268)
Total CO2, kg/year			276.0320	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.9700	(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	385.8150	1.5812	610.0382	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1277.1371	1.5211	1942.5898	(278)
Space and water heating			2552.6280	(279)
Pumps, fans and electric keep-hot	111.3829	1.5128	168.5001	(281)
Energy for lighting	138.8682	1.5338	213.0007	(282)
Total Primary energy kWh/year			2934.1288	(286)
Dwelling Primary energy Rate (DPER)			52.8700	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	55.5000 (1b)	x	2.5000 (2b)	=	138.7500	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 55.5000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	138.7500	(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)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1441	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3941	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.3350	(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	0.4272	0.4188	0.4104	0.3685	0.3601	0.3183	0.3183	0.3099	0.3350	0.3601	0.3769	0.3937	(22b)
Effective ac	0.5912	0.5877	0.5842	0.5679	0.5649	0.5506	0.5506	0.5480	0.5561	0.5649	0.5710	0.5775	(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 Opening Type (Uw = 1.20)			13.8800	1.1450	15.8931			(27)
Heatloss Floor 1			55.5000	0.1300	7.2150			(28a)
External Wall 1	75.5000	13.8800	61.6200	0.1800	11.0916			(29a)
FR	55.5000		55.5000	0.1100	6.1050			(30)
Total net area of external elements Aum(A, m2)			186.5000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.3047			(33)
Party Wall 1			19.2500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 187.6802 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	30.2000	0.1600	4.8320
E14 Flat roof	30.2000	0.0800	2.4160
E16 Corner (normal)	15.0000	0.0900	1.3500
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E1 Steel lintel with perforated steel base plate	8.0000	0.0500	0.4000
E3 Sill	6.0000	0.0500	0.3000
E4 Jamb	23.2000	0.0500	1.1600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.7580 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 51.0627 (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	27.0710	26.9087	26.7498	26.0030	25.8632	25.2128	25.2128	25.0924	25.4633	25.8632	26.1459	26.4414	(38)
Heat transfer coeff	78.1337	77.9715	77.8125	77.0657	76.9260	76.2755	76.2755	76.1551	76.5261	76.9260	77.2086	77.5041	(39)
Average = Sum(39)m / 12 =												77.0650	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4078	1.4049	1.4020	1.3886	1.3861	1.3743	1.3743	1.3722	1.3788	1.3861	1.3911	1.3965	(40)
HLP (average)												1.3886	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8520 (42)

Hot water usage for mixer showers

70.9489	69.8827	68.3290	65.3562	63.1624	60.7159	59.3254	60.8673	62.5575	65.1843	68.2209	70.6770	(42a)

Hot water usage for baths

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)

Hot water usage for other uses

33.5963	32.3746	31.1529	29.9312	28.7095	27.4879	27.4879	28.7095	29.9312	31.1529	32.3746	33.5963	(42c)

Average daily hot water use (litres/day) 95.9546 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	104.5451	102.2572	99.4819	95.2875	91.8720	88.2038	86.8132	89.5768	92.4888	96.3372	100.5955	104.2733	(44)
Energy conte	165.5740	145.6129	152.8999	130.4438	123.6774	108.4569	104.9931	110.9148	114.0479	130.7287	143.3167	163.2668	(45)
Energy content (annual)										Total = Sum(45)m =		1593.9329	
Distribution loss (46)m = 0.15 x (45)m	24.8361	21.8419	22.9350	19.5666	18.5516	16.2685	15.7490	16.6372	17.1072	19.6093	21.4975	24.4900	(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	212.1689	187.6987	199.4948	175.5356	170.2723	153.5487	151.5880	157.5097	159.1397	177.3236	188.4086	209.8617	(62)
WWHRS	-32.4349	-28.6857	-30.0380	-24.8726	-23.1804	-19.8356	-18.5927	-19.7715	-20.5227	-24.1940	-27.4089	-31.8342	(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	179.7340	159.0130	169.4569	150.6630	147.0919	133.7131	132.9952	137.7382	138.6170	153.1296	160.9997	178.0275	(64)
									Total per year (kWh/year) = Sum(64)m =			1841.1791	(64)
12Total per year (kWh/year)												1841	(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	92.3293	82.0849	88.1151	79.4460	78.3986	72.1354	72.1861	74.1551	73.9944	80.7432	83.7263	91.5621	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	81.4447	90.1709	81.4447	84.1595	81.4447	84.1595	81.4447	81.4447	84.1595	81.4447	84.1595	81.4447	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	161.4732	163.1488	158.9264	149.9373	138.5903	127.9257	120.8010	119.1254	123.3479	132.3369	143.6840	154.3486	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	(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)	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	(71)
Water heating gains (Table 5)	124.0985	122.1501	118.4343	110.3417	105.3745	100.1880	97.0243	99.6708	102.7700	108.5258	116.2865	123.0674	(72)
Total internal gains	420.7963	429.2497	412.5853	398.2185	379.1894	363.0531	350.0500	351.0209	361.0573	376.0874	397.9099	412.6406	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	3.6900	11.2829	0.6300	0.7000	0.7700	12.7239	(75)
Southeast	0.9000	36.7938	0.6300	0.7000	0.7700	10.1202	(77)
Southwest	7.0900	36.7938	0.6300	0.7000	0.7700	79.7247	(79)
Northwest	2.2000	11.2829	0.6300	0.7000	0.7700	7.5861	(81)

Solar gains	110.1549	194.3807	283.8792	381.7750	455.0344	463.8026	442.1369	385.6385	317.4907	219.6635	133.1687	93.4747	(83)
Total gains	530.9512	623.6305	696.4645	779.9935	834.2238	826.8557	792.1869	736.6594	678.5480	595.7509	531.0786	506.1153	(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	37.0314	37.1085	37.1843	37.5446	37.6128	37.9336	37.9336	37.9936	37.8094	37.6128	37.4751	37.3322	
alpha	3.4688	3.4739	3.4790	3.5030	3.5075	3.5289	3.5289	3.5329	3.5206	3.5075	3.4983	3.4888	
util living area	0.9733	0.9537	0.9192	0.8417	0.7150	0.5489	0.4116	0.4569	0.6729	0.8765	0.9550	0.9770	(86)
MIT	19.2091	19.4978	19.8895	20.3701	20.7284	20.9215	20.9782	20.9685	20.8367	20.3656	19.7090	19.1602	(87)
Th 2	19.7573	19.7596	19.7618	19.7721	19.7740	19.7831	19.7831	19.7847	19.7796	19.7740	19.7701	19.7660	(88)
util rest of house	0.9668	0.9427	0.9000	0.8049	0.6526	0.4590	0.3032	0.3443	0.5852	0.8389	0.9424	0.9714	(89)
MIT 2	17.7322	18.0942	18.5790	19.1570	19.5494	19.7366	19.7754	19.7726	19.6693	19.1707	18.3719	17.6765	(90)
Living area fraction									fLA = Living area / (4) =			0.4108	(91)
MIT	18.3389	18.6708	19.1173	19.6554	20.0338	20.2234	20.2695	20.2639	20.1489	19.6616	18.9212	18.2860	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3389	18.6708	19.1173	19.6554	20.0338	20.2234	20.2695	20.2639	20.1489	19.6616	18.9212	18.2860	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9567	0.9304	0.8879	0.8009	0.6668	0.4928	0.3475	0.3899	0.6136	0.8349	0.9311	0.9621	(94)
Useful gains	507.9417	580.2196	618.3950	624.7291	556.2722	407.4634	275.2482	287.2369	416.3657	497.3693	494.4734	486.9306	(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	1096.9138	1073.7326	981.7868	828.8707	641.0831	428.9251	279.8947	294.2528	462.8970	697.0701	912.6970	1091.7249	(97)
Space heating kWh	438.1952	331.6407	270.3636	146.9819	63.0994	0.0000	0.0000	0.0000	0.0000	148.5774	301.1210	449.9670	(98a)
Space heating requirement - total per year (kWh/year)												2149.9461	
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	438.1952	331.6407	270.3636	146.9819	63.0994	0.0000	0.0000	0.0000	0.0000	148.5774	301.1210	449.9670	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2149.9461	
Space heating per m2											(98c) / (4) =	38.7378	(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	438.1952	331.6407	270.3636	146.9819	63.0994	0.0000	0.0000	0.0000	0.0000	148.5774	301.1210	449.9670	(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)	474.7511	359.3073	292.9183	159.2437	68.3633	0.0000	0.0000	0.0000	0.0000	160.9722	326.2416	487.5049	(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	179.7340	159.0130	169.4569	150.6630	147.0919	133.7131	132.9952	137.7382	138.6170	153.1296	160.9997	178.0275	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.9795	85.6687	85.1020	84.0043	82.3042	79.8000	79.8000	79.8000	79.8000	83.9921	85.4427	86.0488	(217)
Fuel for water heating, kWh/month	209.0429	185.6138	199.1220	179.3515	178.7174	167.5603	166.6607	172.6043	173.7056	182.3143	188.4299	206.8912	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.9226	13.5759	12.2236	8.9556	6.9175	5.6517	6.3104	8.2025	10.6542	13.9789	15.7892	17.3929	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-43.8036	-58.0415	-78.5237	-83.0127	-85.4138	-78.4063	-77.4939	-75.1214	-70.3948	-63.8178	-46.8470	-38.3305	(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	-37.4593	-76.8815	-149.3810	-219.5749	-285.8449	-285.5256	-282.0844	-240.7724	-179.1656	-108.1587	-49.4098	-29.7614	(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	2329.3024	(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	2210.0137	(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)	136.5751	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2743.2266	(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	2018.6646	(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	2329.3024	0.2100	489.1535	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2210.0137	0.2100	464.1029	(264)
Space and water heating			953.2564	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	136.5751	0.1443	19.7120	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-799.2070	0.1359	-108.5995	
PV Unit electricity exported	-1944.0195	0.1266	-246.0168	
Total			-354.6163	(269)
Total CO2, kg/year			630.2813	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.3600	(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	2329.3024	1.1300	2632.1117	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2210.0137	1.1300	2497.3155	(278)
Space and water heating			5129.4272	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	136.5751	1.5338	209.4834	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-799.2070	1.5023	-1200.6286	
PV Unit electricity exported	-1944.0195	0.4646	-903.1087	
Total			-2103.7373	(283)
Total Primary energy kWh/year			3365.2741	(286)
Target Primary Energy Rate (TPER)			60.6400	(287)

Full SAP Calculation Printout

Property Reference	Unit 1	**Issued on Date**	04/05/2024
Assessment Reference	Unit 1 - Be Green	**Prop Type Ref**	
Property			

SAP Rating	82 B	**DER**	4.97	**TER**	11.36
Environmental	96 A	**% DER < TER**			56.25
CO_2 Emissions (t/year)	0.26	**DFEE**	41.73	**TFEE**	47.40
Compliance Check	See BREL	**% DFEE < TFEE**			11.95
% DPER < TPER	12.82	**DPER**	52.87	**TPER**	60.64

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	55.5000 (1b)	x	2.5000 (2b)	=	138.7500	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.5000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	138.7500	(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)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1441	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2941	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2500	(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	0.3188	0.3125	0.3063	0.2750	0.2688	0.2375	0.2375	0.2313	0.2500	0.2688	0.2813	0.2938	(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	0.5508	0.5488	0.5469	0.5378	0.5361	0.5282	0.5282	0.5267	0.5313	0.5361	0.5396	0.5432	(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)			13.9000	1.1450	15.9160			(27)
Heatloss Floor 1			55.5000	0.1000	5.5500	75.0000	4162.5000	(28a)
External Wall 1	75.5000	13.9000	61.6000	0.1500	9.2400	70.0000	4312.0000	(29a)
FR	55.5000		55.5000	0.1000	5.5500	9.0000	499.5000	(30)
Total net area of external elements Aum(A, m2)			186.5000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.2560			(33)
Party Wall 1			19.2500	0.0000	0.0000	45.0000	866.2500	(32)
Internal Wall 1			64.0000			9.0000	576.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10416.2500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		187.6802 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	30.2000	0.0480	1.4496
E14 Flat roof	30.2000	0.1600	4.8320
E16 Corner (normal)	15.0000	0.0350	0.5250
E18 Party wall between dwellings	5.0000	0.0330	0.1650
E1 Steel lintel with perforated steel base plate	8.0000	0.3020	2.4160

E3 Sill									6.0000	0.0290	0.1740		
E4 Jamb									23.2000	0.0240	0.5568		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												10.1184	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss										(33) + (36) + (36a) =		46.3744	(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	25.2202	25.1299	25.0413	24.6254	24.5476	24.1853	24.1853	24.1182	24.3249	24.5476	24.7050	24.8696	(38)
Heat transfer coeff	71.5946	71.5043	71.4158	70.9998	70.9220	70.5598	70.5598	70.4927	70.6993	70.9220	71.0794	71.2440	(39)
Average = Sum(39)m / 12 =												70.9995	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2900	1.2884	1.2868	1.2793	1.2779	1.2713	1.2713	1.2701	1.2739	1.2779	1.2807	1.2837	(40)
HLP (average)												1.2793	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.8520	(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	23.8917	23.5369	23.0372	22.1159	21.4261	20.6611	20.2480	20.7441	21.2844	22.1029	23.0432	23.8110	(42b)
Hot water usage for other uses	33.5963	32.3746	31.1529	29.9312	28.7095	27.4879	27.4879	28.7095	29.9312	31.1529	32.3746	33.5963	(42c)
Average daily hot water use (litres/day)												52.6935	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	57.4880	55.9115	54.1901	52.0472	50.1356	48.1490	47.7358	49.4537	51.2156	53.2558	55.4177	57.4072	(44)
Energy conte	91.0469	79.6172	83.2882	71.2500	67.4922	59.2048	57.7323	61.2340	63.1539	72.2676	78.9527	89.8859	(45)
Energy content (annual)										Total = Sum(45)m =		875.1258	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	77.3899	67.6746	70.7950	60.5625	57.3684	50.3241	49.0725	52.0489	53.6809	61.4275	67.1098	76.4030	(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	77.3899	67.6746	70.7950	60.5625	57.3684	50.3241	49.0725	52.0489	53.6809	61.4275	67.1098	76.4030	(64)
										Total per year (kWh/year) = Sum(64)m =		743.8569	(64)
12Total per year (kWh/year)												744	(64)
Electric shower(s)	44.2632	39.4388	43.0657	41.0971	41.8683	39.9382	41.2695	41.8683	41.0971	43.0657	42.2559	44.2632	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		503.4910	(64a)
Heat gains from water heating, kWh/month	30.4133	26.7784	28.4652	25.4149	24.8092	22.5656	22.5855	23.4793	23.6945	26.1233	27.3414	30.1665	(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	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	81.4447	90.1709	81.4447	84.1595	81.4447	84.1595	81.4447	81.4447	84.1595	81.4447	84.1595	81.4447	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	161.4732	163.1488	158.9264	149.9373	138.5903	127.9257	120.8010	119.1254	123.3479	132.3369	143.6840	154.3486	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	(71)
Water heating gains (Table 5)	40.8780	39.8488	38.2596	35.2985	33.3456	31.3411	30.3569	31.5582	32.9090	35.1120	37.9742	40.5464	(72)
Total internal gains	334.5759	343.9484	329.4106	320.1752	304.1605	294.2062	283.3825	282.9082	291.1963	299.6735	316.5976	327.1196	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	3.7000	11.2829	0.6300	0.7000	0.7700	12.7584	(75)
Southeast	0.9000	36.7938	0.6300	0.7000	0.7700	10.1202	(77)
Southwest	7.1000	36.7938	0.6300	0.7000	0.7700	79.8372	(79)
Northwest	2.2000	11.2829	0.6300	0.7000	0.7700	7.5861	(81)

Solar gains	110.3018	194.6425	284.2677	382.3074	455.6773	464.4613	442.7634	386.1795	317.9285	219.9610	133.3468	93.5991	(83)
Total gains	444.8777	538.5909	613.6784	702.4827	759.8378	758.6674	726.1459	669.0878	609.1248	519.6345	449.9444	420.7187	(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, ni1,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

tau	40.4137	40.4647	40.5149	40.7522	40.7970	41.0064	41.0064	41.0454	40.9255	40.7970	40.7066	40.6126	
alpha	3.6942	3.6976	3.7010	3.7168	3.7198	3.7338	3.7338	3.7364	3.7284	3.7198	3.7138	3.7075	
util living area													
	0.9836	0.9670	0.9358	0.8592	0.7292	0.5572	0.4171	0.4674	0.6937	0.9007	0.9699	0.9865	(86)
MIT	19.2326	19.5297	19.9238	20.4029	20.7533	20.9325	20.9822	20.9730	20.8472	20.3698	19.7113	19.1745	(87)
Th 2	19.8487	19.8500	19.8512	19.8571	19.8582	19.8633	19.8633	19.8643	19.8614	19.8582	19.8560	19.8536	(88)
util rest of house													
	0.9795	0.9590	0.9202	0.8262	0.6704	0.4716	0.3141	0.3596	0.6106	0.8693	0.9612	0.9831	(89)
MIT 2	18.2692	18.5614	18.9441	19.3954	19.6964	19.8314	19.8583	19.8558	19.7786	19.3792	18.7482	18.2155	(90)
Living area fraction										fLA = Living area / (4) =		0.4108	(91)
MIT	18.6650	18.9592	19.3466	19.8093	20.1306	20.2838	20.3200	20.3148	20.2176	19.7862	19.1438	18.6095	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6650	18.9592	19.3466	19.8093	20.1306	20.2838	20.3200	20.3148	20.2176	19.7862	19.1438	18.6095	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9738	0.9512	0.9120	0.8247	0.6854	0.5044	0.3563	0.4035	0.6384	0.8670	0.9543	0.9781	(94)
Useful gains	433.2301	512.3119	559.6452	579.3162	520.7780	382.6544	258.7008	269.9457	388.8843	450.5154	429.3700	411.4880	(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													
	1028.4537	1005.2939	917.4469	774.5601	597.9153	401.0464	262.4833	275.9625	432.5098	651.5033	856.0699	1026.5895	(97)
Space heating kWh													
	442.8464	331.2839	266.2044	140.5756	57.3901	0.0000	0.0000	0.0000	0.0000	149.5349	307.2239	457.6355	(98a)
Space heating requirement - total per year (kWh/year)												2152.6948	
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													
	442.8464	331.2839	266.2044	140.5756	57.3901	0.0000	0.0000	0.0000	0.0000	149.5349	307.2239	457.6355	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2152.6948	
Space heating per m2											(98c) / (4) =	38.7873	(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	663.2618	522.1423	535.7444	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8765	0.9239	0.8999	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	581.3683	482.3850	482.1057	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	857.2816	820.8764	755.7486	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	198.6576	251.8376	203.5903	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	49.6644	62.9594	50.8976	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												163.5214	(107)
Energy for space heating												38.7873	(99)
Energy for space cooling												2.9463	(108)
Total												41.7336	(109)
Fabric Energy Efficiency (DFEE)												41.7	(109)

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

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		55.5000 (1b)	x	2.5000 (2b)	=	138.7500	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.5000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	138.7500	(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)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1441	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3941	(18)
Number of sides sheltered		2	(19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3350 (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	0.4272	0.4188	0.4104	0.3685	0.3601	0.3183	0.3183	0.3099	0.3350	0.3601	0.3769	0.3937	(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	0.5912	0.5877	0.5842	0.5679	0.5649	0.5506	0.5506	0.5480	0.5561	0.5649	0.5710	0.5775	(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 Opening Type (Uw = 1.20)			13.8800	1.1450	15.8931			(27)
Heatloss Floor 1			55.5000	0.1300	7.2150			(28a)
External Wall 1	75.5000	13.8800	61.6200	0.1800	11.0916			(29a)
FR	55.5000		55.5000	0.1100	6.1050			(30)
Total net area of external elements Aum(A, m2)			186.5000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.3047			(33)
Party Wall 1			19.2500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 187.6802 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	30.2000	0.1600	4.8320
E14 Flat roof	30.2000	0.0800	2.4160
E16 Corner (normal)	15.0000	0.0900	1.3500
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E1 Steel lintel with perforated steel base plate	8.0000	0.0500	0.4000
E3 Sill	6.0000	0.0500	0.3000
E4 Jamb	23.2000	0.0500	1.1600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.7580 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 51.0627 (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	27.0710	26.9087	26.7498	26.0030	25.8632	25.2128	25.2128	25.0924	25.4633	25.8632	26.1459	26.4414	(38)
Heat transfer coeff	78.1337	77.9715	77.8125	77.0657	76.9260	76.2755	76.2755	76.1551	76.5261	76.9260	77.2086	77.5041	(39)

Average = Sum(39)m / 12 = 77.0650

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4078	1.4049	1.4020	1.3886	1.3861	1.3743	1.3743	1.3722	1.3788	1.3861	1.3911	1.3965	(40)
HLP (average)												1.3886	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8520 (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

	23.8917	23.5369	23.0372	22.1159	21.4261	20.6611	20.2480	20.7441	21.2844	22.1029	23.0432	23.8110	(42b)

Hot water usage for other uses

	33.5963	32.3746	31.1529	29.9312	28.7095	27.4879	27.4879	28.7095	29.9312	31.1529	32.3746	33.5963	(42c)

Average daily hot water use (litres/day) 52.6935 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	57.4880	55.9115	54.1901	52.0472	50.1356	48.1490	47.7358	49.4537	51.2156	53.2558	55.4177	57.4072	(44)
Energy conte	91.0469	79.6172	83.2882	71.2500	67.4922	59.2048	57.7323	61.2340	63.1539	72.2676	78.9527	89.8859	(45)

Energy content (annual) Total = Sum(45)m = 875.1258
Distribution loss (46)m = 0.15 x (45)m

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:
Total storage loss

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

	77.3899	67.6746	70.7950	60.5625	57.3684	50.3241	49.0725	52.0489	53.6809	61.4275	67.1098	76.4030	(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

	77.3899	67.6746	70.7950	60.5625	57.3684	50.3241	49.0725	52.0489	53.6809	61.4275	67.1098	76.4030	(64)

Total per year (kWh/year) = Sum(64)m = 743.8569 (64)
12Total per year (kWh/year) 744 (64)
Electric shower(s)

	44.2632	39.4388	43.0657	41.0971	41.8683	39.9382	41.2695	41.8683	41.0971	43.0657	42.2559	44.2632	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 503.4910 (64a)
Heat gains from water heating, kWh/month

	30.4133	26.7784	28.4652	25.4149	24.8092	22.5656	22.5855	23.4793	23.6945	26.1233	27.3414	30.1665	(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	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	81.4447	90.1709	81.4447	84.1595	81.4447	84.1595	81.4447	81.4447	84.1595	81.4447	84.1595	81.4447	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													

	161.4732	163.1488	158.9264	149.9373	138.5903	127.9257	120.8010	119.1254	123.3479	132.3369	143.6840	154.3486 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798 (71)
Water heating gains (Table 5)												
	40.8780	39.8488	38.2596	35.2985	33.3456	31.3411	30.3569	31.5582	32.9090	35.1120	37.9742	40.5464 (72)
Total internal gains												
	334.5759	343.9484	329.4106	320.1752	304.1605	294.2062	283.3825	282.9082	291.1963	299.6735	316.5976	327.1196 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	3.6900	11.2829	0.6300	0.7000	0.7700	12.7239	(75)
Southeast	0.9000	36.7938	0.6300	0.7000	0.7700	10.1202	(77)
Southwest	7.0900	36.7938	0.6300	0.7000	0.7700	79.7247	(79)
Northwest	2.2000	11.2829	0.6300	0.7000	0.7700	7.5861	(81)

Solar gains	110.1549	194.3807	283.8792	381.7750	455.0344	463.8026	442.1369	385.6385	317.4907	219.6635	133.1687	93.4747	(83)
Total gains	444.7308	538.3291	613.2898	701.9503	759.1949	758.0087	725.5194	668.5468	608.6870	519.3370	449.7664	420.5943	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	37.0314	37.1085	37.1843	37.5446	37.6128	37.9336	37.9336	37.9936	37.8094	37.6128	37.4751	37.3322	
alpha	3.4688	3.4739	3.4790	3.5030	3.5075	3.5289	3.5289	3.5329	3.5206	3.5075	3.4983	3.4888	
util living area													
	0.9841	0.9691	0.9414	0.8733	0.7545	0.5878	0.4457	0.4971	0.7205	0.9101	0.9717	0.9868	(86)
MIT	19.0293	19.3317	19.7465	20.2710	20.6744	20.9025	20.9720	20.9589	20.7954	20.2525	19.5491	18.9792	(87)
Th 2	19.7573	19.7596	19.7618	19.7721	19.7740	19.7831	19.7831	19.7847	19.7796	19.7740	19.7701	19.7660	(88)
util rest of house													
	0.9800	0.9614	0.9265	0.8411	0.6945	0.4951	0.3299	0.3773	0.6343	0.8797	0.9632	0.9834	(89)
MIT 2	18.0031	18.3018	18.7066	19.2075	19.5598	19.7371	19.7752	19.7721	19.6685	19.2059	18.5271	17.9598	(90)
Living area fraction										fLA = Living area / (4) =		0.4108	(91)
MIT	18.4247	18.7249	19.1338	19.6444	20.0177	20.2159	20.2669	20.2596	20.1315	19.6358	18.9469	18.3786	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4247	18.7249	19.1338	19.6444	20.0177	20.2159	20.2669	20.2596	20.1315	19.6358	18.9469	18.3786	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9740	0.9530	0.9171	0.8373	0.7075	0.5296	0.3772	0.4258	0.6613	0.8756	0.9558	0.9781	(94)
Useful gains	433.1845	513.0435	562.4674	587.7437	537.1158	401.4686	273.6644	284.6728	402.5509	454.7368	429.8684	411.3680	(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													
	1103.6131	1077.9464	983.0652	828.0221	639.8465	428.3545	279.6924	293.9292	461.5633	695.0906	914.6854	1098.9005	(97)
Space heating kWh													
	498.7989	379.6147	312.9248	173.0005	76.4317	0.0000	0.0000	0.0000	0.0000	178.8233	349.0682	511.5242	(98a)
Space heating requirement - total per year (kWh/year)												2480.1863	
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													
	498.7989	379.6147	312.9248	173.0005	76.4317	0.0000	0.0000	0.0000	0.0000	178.8233	349.0682	511.5242	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2480.1863	
Space heating per m2											(98c) / (4) =	44.6880	(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	716.9901	564.4390	578.7787	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8427	0.8978	0.8697	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	604.2264	506.7373	503.3736	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	856.5117	820.1441	755.1163	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	181.6455	233.1747	187.2965	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	45.4114	58.2937	46.8241	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												150.5292	(107)
Energy for space heating												44.6880	(99)
Energy for space cooling												2.7122	(108)
Total												47.4003	(109)
Fabric Energy Efficiency (TFEE)												47.4	(109)

Full SAP Calculation Printout

Property Reference	Unit 1	**Issued on Date**	04/05/2024
Assessment Reference	Unit 1 - Be Green	**Prop Type Ref**	
Property			

SAP Rating	82 B	**DER**	4.97	**TER**	11.36
Environmental	96 A	**% DER < TER**			56.25
CO_2 Emissions (t/year)	0.26	**DFEE**	41.73	**TFEE**	47.40
Compliance Check	See BREL	**% DFEE < TFEE**			11.95
% DPER < TPER	12.82	**DPER**	52.87	**TPER**	60.64

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	55.5000	(1b)	x 2.5000	(2b) =	138.7500	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.5000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	138.7500	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		80.1000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2621	0.2589	0.2557	0.2397	0.2366	0.2206	0.2206	0.2174	0.2270	0.2366	0.2429	0.2493	(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)			13.9000	1.1450	15.9160			(27)
Heatloss Floor 1			55.5000	0.1000	5.5500	75.0000	4162.5000	(28a)
External Wall 1	75.5000	13.9000	61.6000	0.1500	9.2400	70.0000	4312.0000	(29a)
FR	55.5000		55.5000	0.1000	5.5500	9.0000	499.5000	(30)
Total net area of external elements Aum(A, m2)			186.5000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.2560			(33)
Party Wall 1			19.2500	0.0000	0.0000	45.0000	866.2500	(32)
Internal Wall 1			64.0000			9.0000	576.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10416.2500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		187.6802 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	30.2000	0.0480	1.4496
E14 Flat roof	30.2000	0.1600	4.8320

E16 Corner (normal)	15.0000	0.0350	0.5250	
E18 Party wall between dwellings	5.0000	0.0330	0.1650	
E1 Steel lintel with perforated steel base plate	8.0000	0.3020	2.4160	
E3 Sill	6.0000	0.0290	0.1740	
E4 Jamb	23.2000	0.0240	0.5568	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.1184 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 46.3744 (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	11.9992	11.8532	11.7073	10.9776	10.8316	10.1019	10.1019	9.9559	10.3938	10.8316	11.1235	11.4154	(38)
Heat transfer coeff	58.3736	58.2277	58.0817	57.3520	57.2060	56.4763	56.4763	56.3304	56.7682	57.2060	57.4979	57.7898	(39)

Average = Sum(39)m / 12 = 57.3155

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0518	1.0491	1.0465	1.0334	1.0307	1.0176	1.0176	1.0150	1.0229	1.0307	1.0360	1.0413	(40)
HLP (average)												1.0327	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8520 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	70.9489	69.8827	68.3290	65.3562	63.1624	60.7159	59.3254	60.8673	62.5575	65.1843	68.2209	70.6770	(42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses	33.5963	32.3746	31.1529	29.9312	28.7095	27.4879	27.4879	28.7095	29.9312	31.1529	32.3746	33.5963	(42c)

Average daily hot water use (litres/day) 95.9546 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	104.5451	102.2572	99.4819	95.2875	91.8720	88.2038	86.8132	89.5768	92.4888	96.3372	100.5955	104.2733	(44)
Energy conte	165.5740	145.6129	152.8999	130.4438	123.6774	108.4569	104.9931	110.9148	114.0479	130.7287	143.3167	163.2668	(45)

Energy content (annual) Total = Sum(45)m = 1593.9329

Distribution loss (46)m = 0.15 x (45)m	24.8361	21.8419	22.9350	19.5666	18.5516	16.2685	15.7490	16.6372	17.1072	19.6093	21.4975	24.4900	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.1200 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.6048 (55)

Total storage loss	18.7488	16.9344	18.7488	18.1440	18.7488	18.1440	18.7488	18.7488	18.1440	18.7488	18.1440	18.7488	(56)
If cylinder contains dedicated solar storage	18.7488	16.9344	18.7488	18.1440	18.7488	18.1440	18.7488	18.7488	18.1440	18.7488	18.1440	18.7488	(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	207.5852	183.5585	194.9111	171.0998	165.6886	149.1129	147.0043	152.9260	154.7039	172.7399	183.9727	205.2780	(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	207.5852	183.5585	194.9111	171.0998	165.6886	149.1129	147.0043	152.9260	154.7039	172.7399	183.9727	205.2780	(64)

Total per year (kWh/year) = Sum(64)m = 2088.5809 (64)
12Total per year (kWh/year) 2089 (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	88.6623	78.7728	84.4482	75.8974	74.7317	68.5867	68.5192	70.4881	70.4457	77.0763	80.1776	87.8952	(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	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	81.4447	90.1709	81.4447	84.1595	81.4447	84.1595	81.4447	81.4447	84.1595	81.4447	84.1595	81.4447	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	161.4732	163.1488	158.9264	149.9373	138.5903	127.9257	120.8010	119.1254	123.3479	132.3369	143.6840	154.3486	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	(71)
Water heating gains (Table 5)	119.1698	117.2214	113.5056	105.4130	100.4458	95.2593	92.0956	94.7421	97.8413	103.5971	111.3578	118.1387	(72)
Total internal gains	412.8676	421.3210	404.6566	390.2898	371.2607	358.1244	345.1213	346.0922	356.1286	368.1587	389.9812	404.7119	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	3.7000	11.2829	0.6300	0.7000	0.7700	12.7584	(75)
Southeast	0.9000	36.7938	0.6300	0.7000	0.7700	10.1202	(77)
Southwest	7.1000	36.7938	0.6300	0.7000	0.7700	79.8372	(79)
Northwest	2.2000	11.2829	0.6300	0.7000	0.7700	7.5861	(81)

Solar gains	110.3018	194.6425	284.2677	382.3074	455.6773	464.4613	442.7634	386.1795	317.9285	219.9610	133.3468	93.5991	(83)
Total gains	523.1694	615.9635	688.9243	772.5972	826.9380	822.5857	787.8847	732.2717	674.0571	588.1197	523.3280	498.3110	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	49.5670	49.6912	49.8161	50.4499	50.5786	51.2322	51.2322	51.3649	50.9687	50.5786	50.3219	50.0677	
alpha	4.3045	4.3127	4.3211	4.3633	4.3719	4.4155	4.4155	4.4243	4.3979	4.3719	4.3548	4.3378	
util living area	0.9670	0.9372	0.8836	0.7675	0.6066	0.4328	0.3141	0.3515	0.5575	0.8185	0.9391	0.9722	(86)
Living	19.8462	20.1133	20.4250	20.7504	20.9248	20.9865	20.9974	20.9958	20.9606	20.7192	20.2400	19.8004	
Non living	18.7250	19.0564	19.4345	19.8150	19.9962	20.0605	20.0677	20.0691	20.0378	19.7937	19.2268	18.6741	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.4098	20.1133	20.4250	20.7504	20.9248	20.9865	20.9974	20.9958	20.9606	20.7192	20.2400	19.9682	(87)
Th 2	20.0404	20.0426	20.0447	20.0556	20.0578	20.0687	20.0687	20.0709	20.0643	20.0578	20.0534	20.0491	(88)
util rest of house	0.9598	0.9246	0.8617	0.7299	0.5547	0.3723	0.2482	0.2816	0.4899	0.7784	0.9247	0.9662	(89)
MIT 2	19.5160	19.0564	19.4345	19.8150	19.9962	20.0605	20.0677	20.0691	20.0378	19.7937	19.2268	18.9219	(90)
Living area fraction									fLA = Living area / (4) =			0.4108	(91)
MIT	19.8832	19.4906	19.8414	20.1993	20.3777	20.4409	20.4496	20.4498	20.4169	20.1739	19.6430	19.3517	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8832	19.4906	19.8414	20.1993	20.3777	20.4409	20.4496	20.4498	20.4169	20.1739	19.6430	19.3517	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9585	0.9161	0.8565	0.7359	0.5728	0.3967	0.2753	0.3103	0.5160	0.7838	0.9173	0.9607	(94)
Useful gains	501.4643	564.2750	590.0641	568.5710	473.6338	326.3542	216.8779	227.2237	347.7804	460.9438	480.0257	478.7272	(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	909.6460	849.5749	774.8930	648.0353	496.4155	329.8751	217.4130	228.1272	358.5964	547.6850	721.1968	875.6148	(97)
Space heating kWh	303.6871	191.7216	137.5127	57.2142	16.9496	0.0000	0.0000	0.0000	0.0000	64.5355	173.6432	295.2843	(98a)
Space heating requirement - total per year (kWh/year)												1240.5483	
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	303.6871	191.7216	137.5127	57.2142	16.9496	0.0000	0.0000	0.0000	0.0000	64.5355	173.6432	295.2843	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1240.5483	
Space heating per m2											(98c) / (4) =	22.3522	(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 %) 321.5396 (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	303.6871	191.7216	137.5127	57.2142	16.9496	0.0000	0.0000	0.0000	0.0000	64.5355	173.6432	295.2843	(98)
Space heating efficiency (main heating system 1)	321.5396	321.5396	321.5396	321.5396	321.5396	0.0000	0.0000	0.0000	0.0000	321.5396	321.5396	321.5396	(210)
Space heating fuel (main heating system)	94.4478	59.6261	42.7670	17.7938	5.2714	0.0000	0.0000	0.0000	0.0000	20.0708	54.0037	91.8345	(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	207.5852	183.5585	194.9111	171.0998	165.6886	149.1129	147.0043	152.9260	154.7039	172.7399	183.9727	205.2780	(64)
Efficiency of water heater												163.5362	(216)
(217)m	163.5362	163.5362	163.5362	163.5362	163.5362	163.5362	163.5362	163.5362	163.5362	163.5362	163.5362	163.5362	(217)
Fuel for water heating, kWh/month	126.9353	112.2434	119.1853	104.6250	101.3162	91.1804	89.8910	93.5121	94.5992	105.6280	112.4967	125.5245	(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	9.4599	8.5444	9.4599	9.1548	9.4599	9.1548	9.4599	9.4599	9.1548	9.4599	9.1548	9.4599	(231)
Lighting	17.2067	13.8039	12.4289	9.1059	7.0337	5.7466	6.4164	8.3402	10.8331	14.2136	16.0543	17.6850	(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 1 385.8150 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 163.5362

Water heating fuel used 1277.1371 (219)

Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6580)

mechanical ventilation fans (SFP = 0.6580)	111.3829	(230a)
Total electricity for the above, kWh/year	111.3829	(231)
Electricity for lighting (calculated in Appendix L)	138.8682	(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	1913.2033	(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	385.8150	0.1570	60.5721	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1277.1371	0.1409	179.9668	(264)
Space and water heating			240.5388	(265)
Pumps, fans and electric keep-hot	111.3829	0.1387	15.4502	(267)
Energy for lighting	138.8682	0.1443	20.0430	(268)
Total CO2, kg/year			276.0320	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.9700	(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	385.8150	1.5812	610.0382	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1277.1371	1.5211	1942.5898	(278)
Space and water heating			2552.6280	(279)
Pumps, fans and electric keep-hot	111.3829	1.5128	168.5001	(281)
Energy for lighting	138.8682	1.5338	213.0007	(282)
Total Primary energy kWh/year			2934.1288	(286)
Dwelling Primary energy Rate (DPER)			52.8700	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	55.5000 (1b)	x	2.5000 (2b)	=	138.7500	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 55.5000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	138.7500	(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)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1441	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3941	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.3350	(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	0.4272	0.4188	0.4104	0.3685	0.3601	0.3183	0.3183	0.3099	0.3350	0.3601	0.3769	0.3937	(22b)
Effective ac	0.5912	0.5877	0.5842	0.5679	0.5649	0.5506	0.5506	0.5480	0.5561	0.5649	0.5710	0.5775	(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 Opening Type (Uw = 1.20)			13.8800	1.1450	15.8931			(27)
Heatloss Floor 1			55.5000	0.1300	7.2150			(28a)
External Wall 1	75.5000	13.8800	61.6200	0.1800	11.0916			(29a)
FR	55.5000		55.5000	0.1100	6.1050			(30)
Total net area of external elements Aum(A, m2)			186.5000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.3047			(33)
Party Wall 1			19.2500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 187.6802 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	30.2000	0.1600	4.8320
E14 Flat roof	30.2000	0.0800	2.4160
E16 Corner (normal)	15.0000	0.0900	1.3500
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E1 Steel lintel with perforated steel base plate	8.0000	0.0500	0.4000
E3 Sill	6.0000	0.0500	0.3000
E4 Jamb	23.2000	0.0500	1.1600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.7580 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 51.0627 (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	27.0710	26.9087	26.7498	26.0030	25.8632	25.2128	25.2128	25.0924	25.4633	25.8632	26.1459	26.4414	(38)
Heat transfer coeff	78.1337	77.9715	77.8125	77.0657	76.9260	76.2755	76.2755	76.1551	76.5261	76.9260	77.2086	77.5041	(39)
Average = Sum(39)m / 12 =												77.0650	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4078	1.4049	1.4020	1.3886	1.3861	1.3743	1.3743	1.3722	1.3788	1.3861	1.3911	1.3965	(40)
HLP (average)												1.3886	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8520 (42)

Hot water usage for mixer showers

70.9489	69.8827	68.3290	65.3562	63.1624	60.7159	59.3254	60.8673	62.5575	65.1843	68.2209	70.6770	(42a)

Hot water usage for baths

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)

Hot water usage for other uses

33.5963	32.3746	31.1529	29.9312	28.7095	27.4879	27.4879	28.7095	29.9312	31.1529	32.3746	33.5963	(42c)

Average daily hot water use (litres/day) 95.9546 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	104.5451	102.2572	99.4819	95.2875	91.8720	88.2038	86.8132	89.5768	92.4888	96.3372	100.5955	104.2733	(44)
Energy conte	165.5740	145.6129	152.8999	130.4438	123.6774	108.4569	104.9931	110.9148	114.0479	130.7287	143.3167	163.2668	(45)
Energy content (annual)										Total = Sum(45)m =		1593.9329	
Distribution loss (46)m = 0.15 x (45)m	24.8361	21.8419	22.9350	19.5666	18.5516	16.2685	15.7490	16.6372	17.1072	19.6093	21.4975	24.4900	(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	212.1689	187.6987	199.4948	175.5356	170.2723	153.5487	151.5880	157.5097	159.1397	177.3236	188.4086	209.8617	(62)
WWHRS	-32.4349	-28.6857	-30.0380	-24.8726	-23.1804	-19.8356	-18.5927	-19.7715	-20.5227	-24.1940	-27.4089	-31.8342	(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	179.7340	159.0130	169.4569	150.6630	147.0919	133.7131	132.9952	137.7382	138.6170	153.1296	160.9997	178.0275	(64)
									Total per year (kWh/year) = Sum(64)m =			1841.1791	(64)
12Total per year (kWh/year)												1841	(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	92.3293	82.0849	88.1151	79.4460	78.3986	72.1354	72.1861	74.1551	73.9944	80.7432	83.7263	91.5621	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	92.5997	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	81.4447	90.1709	81.4447	84.1595	81.4447	84.1595	81.4447	81.4447	84.1595	81.4447	84.1595	81.4447	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	161.4732	163.1488	158.9264	149.9373	138.5903	127.9257	120.8010	119.1254	123.3479	132.3369	143.6840	154.3486	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	32.2600	(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)	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	-74.0798	(71)
Water heating gains (Table 5)	124.0985	122.1501	118.4343	110.3417	105.3745	100.1880	97.0243	99.6708	102.7700	108.5258	116.2865	123.0674	(72)
Total internal gains	420.7963	429.2497	412.5853	398.2185	379.1894	363.0531	350.0500	351.0209	361.0573	376.0874	397.9099	412.6406	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	3.6900	11.2829	0.6300	0.7000	0.7700	12.7239	(75)
Southeast	0.9000	36.7938	0.6300	0.7000	0.7700	10.1202	(77)
Southwest	7.0900	36.7938	0.6300	0.7000	0.7700	79.7247	(79)
Northwest	2.2000	11.2829	0.6300	0.7000	0.7700	7.5861	(81)

Solar gains	110.1549	194.3807	283.8792	381.7750	455.0344	463.8026	442.1369	385.6385	317.4907	219.6635	133.1687	93.4747	(83)
Total gains	530.9512	623.6305	696.4645	779.9935	834.2238	826.8557	792.1869	736.6594	678.5480	595.7509	531.0786	506.1153	(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	37.0314	37.1085	37.1843	37.5446	37.6128	37.9336	37.9336	37.9936	37.8094	37.6128	37.4751	37.3322	
alpha	3.4688	3.4739	3.4790	3.5030	3.5075	3.5289	3.5289	3.5329	3.5206	3.5075	3.4983	3.4888	
util living area	0.9733	0.9537	0.9192	0.8417	0.7150	0.5489	0.4116	0.4569	0.6729	0.8765	0.9550	0.9770	(86)
MIT	19.2091	19.4978	19.8895	20.3701	20.7284	20.9215	20.9782	20.9685	20.8367	20.3656	19.7090	19.1602	(87)
Th 2	19.7573	19.7596	19.7618	19.7721	19.7740	19.7831	19.7831	19.7847	19.7796	19.7740	19.7701	19.7660	(88)
util rest of house	0.9668	0.9427	0.9000	0.8049	0.6526	0.4590	0.3032	0.3443	0.5852	0.8389	0.9424	0.9714	(89)
MIT 2	17.7322	18.0942	18.5790	19.1570	19.5494	19.7366	19.7754	19.7726	19.6693	19.1707	18.3719	17.6765	(90)
Living area fraction									fLA = Living area / (4) =			0.4108	(91)
MIT	18.3389	18.6708	19.1173	19.6554	20.0338	20.2234	20.2695	20.2639	20.1489	19.6616	18.9212	18.2860	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3389	18.6708	19.1173	19.6554	20.0338	20.2234	20.2695	20.2639	20.1489	19.6616	18.9212	18.2860	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9567	0.9304	0.8879	0.8009	0.6668	0.4928	0.3475	0.3899	0.6136	0.8349	0.9311	0.9621	(94)
Useful gains	507.9417	580.2196	618.3950	624.7291	556.2722	407.4634	275.2482	287.2369	416.3657	497.3693	494.4734	486.9306	(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	1096.9138	1073.7326	981.7868	828.8707	641.0831	428.9251	279.8947	294.2528	462.8970	697.0701	912.6970	1091.7249	(97)
Space heating kWh	438.1952	331.6407	270.3636	146.9819	63.0994	0.0000	0.0000	0.0000	0.0000	148.5774	301.1210	449.9670	(98a)
Space heating requirement - total per year (kWh/year)												2149.9461	
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	438.1952	331.6407	270.3636	146.9819	63.0994	0.0000	0.0000	0.0000	0.0000	148.5774	301.1210	449.9670	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2149.9461	
Space heating per m2											(98c) / (4) =	38.7378	(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	438.1952	331.6407	270.3636	146.9819	63.0994	0.0000	0.0000	0.0000	0.0000	148.5774	301.1210	449.9670	(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)	474.7511	359.3073	292.9183	159.2437	68.3633	0.0000	0.0000	0.0000	0.0000	160.9722	326.2416	487.5049	(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	179.7340	159.0130	169.4569	150.6630	147.0919	133.7131	132.9952	137.7382	138.6170	153.1296	160.9997	178.0275	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.9795	85.6687	85.1020	84.0043	82.3042	79.8000	79.8000	79.8000	79.8000	83.9921	85.4427	86.0488	(217)
Fuel for water heating, kWh/month	209.0429	185.6138	199.1220	179.3515	178.7174	167.5603	166.6607	172.6043	173.7056	182.3143	188.4299	206.8912	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	16.9226	13.5759	12.2236	8.9556	6.9175	5.6517	6.3104	8.2025	10.6542	13.9789	15.7892	17.3929	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-43.8036	-58.0415	-78.5237	-83.0127	-85.4138	-78.4063	-77.4939	-75.1214	-70.3948	-63.8178	-46.8470	-38.3305	(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	-37.4593	-76.8815	-149.3810	-219.5749	-285.8449	-285.5256	-282.0844	-240.7724	-179.1656	-108.1587	-49.4098	-29.7614	(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	2329.3024	(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	2210.0137	(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)	136.5751	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2743.2266	(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	2018.6646	(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	2329.3024	0.2100	489.1535	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2210.0137	0.2100	464.1029	(264)
Space and water heating			953.2564	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	136.5751	0.1443	19.7120	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-799.2070	0.1359	-108.5995	
PV Unit electricity exported	-1944.0195	0.1266	-246.0168	
Total			-354.6163	(269)
Total CO2, kg/year			630.2813	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.3600	(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	2329.3024	1.1300	2632.1117	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2210.0137	1.1300	2497.3155	(278)
Space and water heating			5129.4272	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	136.5751	1.5338	209.4834	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-799.2070	1.5023	-1200.6286	
PV Unit electricity exported	-1944.0195	0.4646	-903.1087	
Total			-2103.7373	(283)
Total Primary energy kWh/year			3365.2741	(286)
Target Primary Energy Rate (TPER)			60.6400	(287)

Summary for Input Data

elmhurst energy

Property Reference	Unit 2	**Issued on Date**	04/05/2024
Assessment Reference	Unit 2 - Be Green	**Prop Type Ref**	
Property			

SAP Rating	84 B	**DER**	3.85	**TER**	10.18
Environmental	97 A	**% DER < TER**			62.18
CO_2 Emissions (t/year)	0.29	**DFEE**	33.57	**TFEE**	38.18
Compliance Check	See BREL	**% DFEE < TFEE**			12.09
% DPER < TPER	22.41	**DPER**	41.06	**TPER**	52.92

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

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

Orientation	Southwest	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Suburban	
1.0 Property Type	Bungalow, End-Terrace	
Which Floor	0	
2.0 Number of Storeys	2	
3.0 Date Built	2024	
3.0 Property Age Band	L	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	N/A	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Basement:	0.00 m	0.00 m²	0.00 m
Ground floor:	13.80 m	44.90 m²	2.50 m
1st Storey:	20.00 m	34.20 m²	2.50 m
2nd Storey:	0.00 m	0.00 m²	0.00 m
3rd Storey:	0.00 m	0.00 m²	0.00 m
4th Storey:	0.00 m	0.00 m²	0.00 m
5th Storey:	0.00 m	0.00 m²	0.00 m
6th Storey:	0.00 m	0.00 m²	0.00 m
7th Storey:	0.00 m	0.00 m²	0.00 m

8.0 Living Area	22.80	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
External Wall 1	Cavity Wall	Cavity wall : dense plaster, AAC block, filled cavity, any outside structure	0.16	70.00	84.50	70.40	0.00	None	14.10	Calculate Wall Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Plasterboard on dabs mounted on cement render on both sides, AAC blocks, cavity	0.00	45.00	19.25	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	64.00

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area	Shelter Code	Shelter Factor	Calculation Type	Openings

Summary for Input Data

						(m²)				
FR	External Flat Roof	Plasterboard, insulated flat roof	0.10	9.00	44.90	37.50	None	0.00	Enter Gross Area	7.40

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Heatloss Floor 1	Ground Floor - Solid	Lowest occupied	Suspended concrete floor, carpeted	0.10	None	0.00	75.00	44.90

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Windows	Manufacturer	Window	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.20
RLs	Manufacturer	Roof Window	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
SW	Windows	External Wall 1	South West	10.10	0
SE	Windows	External Wall 1	South East	1.80	0
NW	Windows	External Wall 1	North West	2.20	0
RL	RLs	FR	Horizontal	7.40	0

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	
17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E5 Ground floor (normal)	Gov Approved Scheme	30.20	0.05	0.05	Yes
E14 Flat roof	Table K1 - Default	30.20	0.16	0.16	Yes
E16 Corner (normal)	Gov Approved Scheme	15.00	0.04	0.04	No
E18 Party wall between dwellings	Gov Approved Scheme	5.00	0.03	0.03	Yes
E1 Steel lintel with perforated steel base plate	Gov Approved Scheme	7.00	0.30	0.30	No
E3 Sill	Gov Approved Scheme	3.80	0.03	0.03	No
E4 Jamb	Gov Approved Scheme	23.20	0.02	0.02	No
E6 Intermediate floor within a dwelling	Gov Approved Scheme	20.10	0.00	0.00	No

Y-value	0.06	W/m²K
18.0 Pressure Testing	Yes	
Designed AP_{50}	3.00	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500811
Configuration	2
Manufacturer SFP	0.54
Duct Type	Rigid
MVHR Efficiency	88.00
Wet Rooms	2
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)
Duct Installation Specification	Level 1

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System	No

22.0 Lighting

No Fixed Lighting	No

Name	Efficacy	Power	Capacity	Count
Lighting 1	120.00	6	720	40

Summary for Input Data

24.0 Main Heating 1	Database	
Percentage of Heat	100.00	%
Database Ref. No.	102608	
Fuel Type	Electricity	
SAP Code	0	
In Winter	325.70	
In Summer	163.62	
Model Name	aroTHERM 5kW	
Manufacturer	Vaillant Group UK Ltd	
System Type	Heat Pump	
Controls SAP Code	2207	
Delayed Start Stat	Yes	
Burner Control	On/Off	
HETAS approved System	No	
Oil Pump Inside	No	
FI Case	0.00	
Flue Type	None or Unknown	
Fan Assisted Flue	No	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators	
Flow Temperature	Enter value	
Flow Temperature Value	35.00	
Boiler Interlock	Yes	
Combi boiler type	No Combi	
25.0 Main Heating 2	None	
26.0 Heat Networks	None	
28.0 Water Heating		
Water Heating	Main Heating 1	
SAP Code	901	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	Yes	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
Summer Immersion	No	
Cold Water Source	From mains	
Bath Count	0	
Supplementary Immersion	No	
Immersion Only Heating Hot Water	No	

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
S1	Vented hot water system + pump	12.00		Yes	Instantaneous System 1
S2	Vented hot water system + pump	12.00		Yes	Instantaneous System 1

28.3 Waste Water Heat Recovery System Instantaneous System 1		
Database ID	80194	

Summary for Input Data

Brand Model	Zypho, Slim DW50	
Details	Year: 2022 + current Efficiency: 44.7 Utilisation factor: 0.987	
29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	150.00	L
Loss	1.12	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	
31.0 Thermal Store	None	

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Property Reference	Unit 2	**Issued on Date**	04/05/2024
Assessment Reference	Unit 2 - Be Green	**Prop Type Ref**	
Property			

SAP Rating	84 B	**DER**	3.85	**TER**	10.18
Environmental	97 A	**% DER < TER**			62.18
CO_2 Emissions (t/year)	0.29	**DFEE**	33.57	**TFEE**	38.18
Compliance Check	See BREL	**% DFEE < TFEE**			12.09
% DPER < TPER	22.41	**DPER**	41.06	**TPER**	52.92

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	44.9000 (1b)	x	2.5000 (2b)	=	112.2500	(1b) - (3b)
First floor	34.2000 (1c)	x	2.5000 (2c)	=	85.5000	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.1000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	197.7500	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				3.0000	(17)
Infiltration rate				0.1500	(18)
Number of sides sheltered				2	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.1275	(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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	79.2000	(23c)

Effective ac	0.2666	0.2634	0.2602	0.2442	0.2411	0.2251	0.2251	0.2219	0.2315	0.2411	0.2474	0.2538	(25)

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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)			14.1000	1.1450	16.1450			(27)
RL			7.4000	1.1450	8.4733			(27a)
Heatloss Floor 1			44.9000	0.1000	4.4900	75.0000	3367.5000	(28a)
External Wall 1	84.5000	14.1000	70.4000	0.1600	11.2640	70.0000	4928.0000	(29a)
FR	44.9000	7.4000	37.5000	0.1000	3.7500	9.0000	337.5000	(30)
Total net area of external elements Aum(A, m2)			174.3000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		44.1223			(33)
Party Wall 1			19.2500	0.0000	0.0000	45.0000	866.2500	(32)
Internal Wall 1			64.0000			9.0000	576.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 10075.2500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	127.3736	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E5 Ground floor (normal)	30.2000	0.0480	1.4496	
E14 Flat roof	30.2000	0.1600	4.8320	
E16 Corner (normal)	15.0000	0.0350	0.5250	
E18 Party wall between dwellings	5.0000	0.0330	0.1650	
E1 Steel lintel with perforated steel base plate	7.0000	0.3020	2.1140	
E3 Sill	3.8000	0.0290	0.1102	
E4 Jamb	23.2000	0.0240	0.5568	
E6 Intermediate floor within a dwelling	20.1000	0.0010	0.0201	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				9.7727 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	53.8950 (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	17.3952	17.1872	16.9792	15.9391	15.7311	14.6911	14.6911	14.4831	15.1071	15.7311	16.1472	16.5632	(38)
Heat transfer coeff	71.2902	71.0822	70.8742	69.8342	69.6262	68.5861	68.5861	68.3781	69.0021	69.6262	70.0422	70.4582	(39)
Average = Sum(39)m / 12 =												69.7822	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9013	0.8986	0.8960	0.8829	0.8802	0.8671	0.8671	0.8645	0.8723	0.8802	0.8855	0.8907	(40)
HLP (average)												0.8822	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4456	(42)
Hot water usage for mixer showers	125.6645	123.7761	121.0241	115.7589	111.8732	107.5400	105.0770	107.8081	110.8018	115.4544	120.8328	125.1831	(42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses	39.6750	38.2323	36.7896	35.3468	33.9041	32.4614	32.4614	33.9041	35.3468	36.7896	38.2323	39.6750	(42c)
Average daily hot water use (litres/day)												151.9267	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	165.3396	162.0083	157.8137	151.1057	145.7773	140.0014	137.5384	141.7122	146.1487	152.2440	159.0651	164.8581	(44)
Energy conte	261.8574	230.6977	242.5538	206.8561	196.2443	172.1480	166.3407	175.4693	180.2159	206.5936	226.6173	258.1279	(45)
Energy content (annual)										Total = Sum(45)m =		2523.7221	
Distribution loss (46)m = 0.15 x (45)m	39.2786	34.6047	36.3831	31.0284	29.4366	25.8222	24.9511	26.3204	27.0324	30.9890	33.9926	38.7192	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.1200	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.6048	(55)
Total storage loss	18.7488	16.9344	18.7488	18.1440	18.7488	18.1440	18.7488	18.7488	18.1440	18.7488	18.1440	18.7488	(56)
If cylinder contains dedicated solar storage	18.7488	16.9344	18.7488	18.1440	18.7488	18.1440	18.7488	18.7488	18.1440	18.7488	18.1440	18.7488	(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	303.8686	268.6433	284.5650	247.5121	238.2555	212.8040	208.3519	217.4805	220.8719	248.6048	267.2733	300.1391	(62)
WWHRS	-71.8415	-63.5372	-66.5325	-55.0915	-51.3433	-43.9349	-41.1819	-43.7929	-45.4567	-53.5884	-60.7092	-70.5111	(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	232.0271	205.1061	218.0325	192.4206	186.9122	168.8692	167.1700	173.6876	175.4152	195.0164	206.5641	229.6280	(64)
										Total per year (kWh/year) = Sum(64)m =		2350.8489	(64)
12Total per year (kWh/year)												2351	(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	120.6766	107.0635	114.2581	101.3045	98.8602	89.7640	88.9173	91.9525	92.4466	102.3013	107.8751	119.4365	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	109.7286	121.4853	109.7286	113.3862	109.7286	113.3862	109.7286	109.7286	113.3862	109.7286	113.3862	109.7286	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	217.5493	219.8067	214.1180	202.0072	186.7196	172.3514	162.7525	160.4951	166.1838	178.2946	193.5822	207.9504	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	(71)
Water heating gains (Table 5)	162.1997	159.3206	153.5727	140.7006	132.8766	124.6722	119.5124	123.5921	128.3980	137.5018	149.8265	160.5329	(72)
Total internal gains	549.1610	560.2961	537.1027	515.7776	489.0083	470.0933	451.6770	453.4992	467.6516	485.2084	516.4784	537.8954	(73)

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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	
Southeast	1.8000	36.7938	0.6300	0.7000	0.7700	20.2404	(77)
Southwest	10.1000	36.7938	0.6300	0.7000	0.7700	113.5712	(79)
Northwest	2.2000	11.2829	0.6300	0.7000	0.7700	7.5861	(81)
Horizontal	7.4000	26.0000	0.6300	0.7000	1.0000	76.3636	(82)

Solar gains	217.7612	401.9736	621.6434	872.6645	1058.1494	1082.5760	1030.6208	889.5958	709.3457	464.6289	266.7437	182.3883	(83)

Total gains	766.9222	962.2697	1158.7462	1388.4421	1547.1577	1552.6693	1482.2979	1343.0949	1176.9973	949.8373	783.2221	720.2837	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	39.2576	39.3724	39.4880	40.0761	40.1958	40.8054	40.8054	40.9295	40.5593	40.1958	39.9571	39.7212	
alpha	3.6172	3.6248	3.6325	3.6717	3.6797	3.7204	3.7204	3.7286	3.7040	3.6797	3.6638	3.6481	
util living area													
	0.9165	0.8460	0.7348	0.5659	0.4085	0.2809	0.2032	0.2334	0.3960	0.6695	0.8618	0.9290	(86)
Living	19.8343	20.2098	20.5781	20.8576	20.9626	20.9931	20.9984	20.9974	20.9757	20.7878	20.2825	19.7659	
Non living	18.8265	19.2836	19.7190	20.0408	20.1513	20.1906	20.1948	20.1964	20.1725	19.9775	19.3897	18.7488	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.4037	20.2098	20.5781	20.8576	20.9626	20.9931	20.9984	20.9974	20.9757	20.7878	20.2825	19.9385	(87)
Th 2	20.1664	20.1687	20.1709	20.1821	20.1843	20.1956	20.1956	20.1978	20.1911	20.1843	20.1799	20.1754	(88)
util rest of house													
	0.9053	0.8283	0.7092	0.5345	0.3749	0.2461	0.1662	0.1930	0.3520	0.6320	0.8425	0.9192	(89)
MIT 2	19.6322	19.2836	19.7190	20.0408	20.1513	20.1906	20.1948	20.1964	20.1725	19.9775	19.3897	19.0059	(90)
Living area fraction										fLA = Living area / (4) =		0.2882	(91)
MIT	19.8546	19.5505	19.9666	20.2762	20.3852	20.4219	20.4264	20.4273	20.4040	20.2110	19.6470	19.2747	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8546	19.5505	19.9666	20.2762	20.3852	20.4219	20.4264	20.4273	20.4040	20.2110	19.6470	19.2747	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9006	0.8136	0.7026	0.5382	0.3833	0.2559	0.1768	0.2046	0.3637	0.6333	0.8283	0.9066	(94)
Useful gains	690.7193	782.9191	814.1252	747.2094	592.9567	397.4029	262.0947	274.7829	428.0562	601.5533	648.7748	653.0117	(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													
	1108.8916	1041.3916	954.4351	794.4477	604.7164	399.3028	262.4392	275.3780	434.9896	669.1801	878.8221	1062.1354	(97)
Space heating kWh													
	311.1202	173.6936	104.3906	34.0116	8.7492	0.0000	0.0000	0.0000	0.0000	50.3144	165.6341	304.3880	(98a)
Space heating requirement - total per year (kWh/year)												1152.3016	
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													
	311.1202	173.6936	104.3906	34.0116	8.7492	0.0000	0.0000	0.0000	0.0000	50.3144	165.6341	304.3880	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1152.3016	
Space heating per m2											(98c) / (4) =	14.5677	(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 %)												325.7036	(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													
	311.1202	173.6936	104.3906	34.0116	8.7492	0.0000	0.0000	0.0000	0.0000	50.3144	165.6341	304.3880	(98)
Space heating efficiency (main heating system 1)													
	325.7036	325.7036	325.7036	325.7036	325.7036	0.0000	0.0000	0.0000	0.0000	325.7036	325.7036	325.7036	(210)
Space heating fuel (main heating system)													
	95.5225	53.3287	32.0508	10.4425	2.6862	0.0000	0.0000	0.0000	0.0000	15.4479	50.8542	93.4555	(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													
	232.0271	205.1061	218.0325	192.4206	186.9122	168.8692	167.1700	173.6876	175.4152	195.0164	206.5641	229.6280	(64)
Efficiency of water heater												163.6155	(216)
(217)m	163.6155	163.6155	163.6155	163.6155	163.6155	163.6155	163.6155	163.6155	163.6155	163.6155	163.6155	163.6155	(217)
Fuel for water heating, kWh/month													
	141.8125	125.3586	133.2591	117.6054	114.2387	103.2110	102.1725	106.1560	107.2119	119.1919	126.2498	140.3462	(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	13.8309	12.4924	13.8309	13.3847	13.8309	13.3847	13.8309	13.8309	13.3847	13.8309	13.3847	13.8309	(231)
Lighting	20.7044	16.6098	14.9553	10.9569	8.4634	6.9147	7.7206	10.0356	13.0352	17.1029	19.3177	21.2798	(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												353.7884	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												163.6155	
Water heating fuel used												1436.8134	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6750)		
mechanical ventilation fans (SFP = 0.6750)	162.8471	(230a)
Total electricity for the above, kWh/year	162.8471	(231)
Electricity for lighting (calculated in Appendix L)	167.0964	(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	2120.5454	(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	353.7884	0.1579	55.8675	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1436.8134	0.1408	202.3046	(264)
Space and water heating			258.1721	(265)
Pumps, fans and electric keep-hot	162.8471	0.1387	22.5889	(267)
Energy for lighting	167.0964	0.1443	24.1172	(268)
Total CO2, kg/year			304.8782	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.8500	(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	353.7884	1.5845	560.5740	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1436.8134	1.5206	2184.8549	(278)
Space and water heating			2745.4289	(279)
Pumps, fans and electric keep-hot	162.8471	1.5128	246.3551	(281)
Energy for lighting	167.0964	1.5338	256.2981	(282)
Total Primary energy kWh/year			3248.0821	(286)
Dwelling Primary energy Rate (DPER)			41.0600	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	44.9000 (1b)	x	2.5000 (2b)	=	112.2500	(1b) - (3b)
First floor	34.2000 (1c)	x	2.5000 (2c)	=	85.5000	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 79.1000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	197.7500	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)
Number of flues attached to other heater	0 * 35 = 0.0000	(6e)
Number of blocked chimneys	0 * 20 = 0.0000	(6f)
Number of intermittent extract fans	3 * 10 = 30.0000	(7a)
Number of passive vents	0 * 10 = 0.0000	(7b)
Number of flueless gas fires	0 * 40 = 0.0000	(7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1517	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.4017	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.3415	(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	0.4353	0.4268	0.4183	0.3756	0.3671	0.3244	0.3244	0.3158	0.3415	0.3671	0.3841	0.4012	(22b)
Effective ac	0.5948	0.5911	0.5875	0.5705	0.5674	0.5526	0.5526	0.5499	0.5583	0.5674	0.5738	0.5805	(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 Opening Type (Uw = 1.20)			12.9700	1.1450	14.8511			(27)
RL			6.8100	1.5918	10.8399			(27a)
Heatloss Floor 1			44.9000	0.1300	5.8370			(28a)
External Wall 1	84.5000	12.9700	71.5300	0.1800	12.8754			(29a)
FR	44.9000	6.8100	38.0900	0.1100	4.1899			(30)
Total net area of external elements Aum(A, m2)			174.3000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		48.5933			(33)
Party Wall 1			19.2500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 127.3736 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	30.2000	0.1600	4.8320
E14 Flat roof	30.2000	0.0800	2.4160
E16 Corner (normal)	15.0000	0.0900	1.3500
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E1 Steel lintel with perforated steel base plate	7.0000	0.0500	0.3500
E3 Sill	3.8000	0.0500	0.1900
E4 Jamb	23.2000	0.0500	1.1600
E6 Intermediate floor within a dwelling	20.1000	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.5980 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 59.1913 (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	38.8129	38.5727	38.3373	37.2318	37.0249	36.0620	36.0620	35.8837	36.4329	37.0249	37.4434	37.8808	(38)
Heat transfer coeff	98.0042	97.7641	97.5287	96.4231	96.2162	95.2533	95.2533	95.0750	95.6242	96.2162	96.6347	97.0722	(39)

Average = Sum(39)m / 12 = 96.4221

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2390	1.2360	1.2330	1.2190	1.2164	1.2042	1.2042	1.2020	1.2089	1.2164	1.2217	1.2272	(40)
HLP (average)												1.2190	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4456 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
83.7764	82.5174	80.6828	77.1726	74.5822	71.6933	70.0513	71.8720	73.8679	76.9696	80.5552	83.4554	(42a)

Hot water usage for baths

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)

Hot water usage for other uses

39.6750	38.2323	36.7896	35.3468	33.9041	32.4614	32.4614	33.9041	35.3468	36.7896	38.2323	39.6750	(42c)

Average daily hot water use (litres/day) 113.3072 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	123.4514	120.7496	117.4723	112.5194	108.4862	104.1547	102.5127	105.7761	109.2147	113.7592	118.7875	123.1304	(44)
Energy conte	195.5168	171.9459	180.5506	154.0334	146.0433	128.0704	123.9802	130.9730	134.6727	154.3701	169.2345	192.7924	(45)
Energy content (annual)										Total = Sum(45)m =		1882.1833	
Distribution loss (46)m = 0.15 x (45)m	29.3275	25.7919	27.0826	23.1050	21.9065	19.2106	18.5970	19.6459	20.2009	23.1555	25.3852	28.9189	(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

242.1117	214.0316	227.1455	199.1253	192.6382	173.1622	170.5751	177.5679	179.7645	200.9650	214.3264	239.3873	(62)
WWHRS -38.2991	-33.8720	-35.4688	-29.3696	-27.3714	-23.4219	-21.9543	-23.3462	-24.2332	-28.5683	-32.3644	-37.5898	(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

203.8126	180.1596	191.6767	169.7557	165.2669	149.7403	148.6208	154.2217	155.5313	172.3967	181.9620	201.7975	(64)
									Total per year (kWh/year) = Sum(64)m =		2074.9419	(64)
12Total per year (kWh/year)											2075	(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

102.2853	90.8406	97.3090	87.2896	85.8353	78.6569	78.4993	80.8244	80.8521	88.6040	92.3440	101.3794	(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	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	109.7286	121.4853	109.7286	113.3862	109.7286	113.3862	109.7286	109.7286	113.3862	109.7286	113.3862	109.7286	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	217.5493	219.8067	214.1180	202.0072	186.7196	172.3514	162.7525	160.4951	166.1838	178.2946	193.5822	207.9504	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	(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)	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	(71)
Water heating gains (Table 5)	137.4802	135.1794	130.7916	121.2355	115.3701	109.2456	105.5099	108.6350	112.2946	119.0914	128.2555	136.2626	(72)
Total internal gains	527.4415	539.1549	517.3217	499.3125	474.5017	454.6667	437.6745	438.5421	451.5481	469.7980	497.9074	516.6251	(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	
Southeast	1.6600	36.7938	0.6300	0.7000	0.7700	18.6662	(77)
Southwest	9.2900	36.7938	0.6300	0.7000	0.7700	104.4630	(79)
Northwest	2.0200	11.2829	0.6300	0.7000	0.7700	6.9654	(81)
Horizontal	6.8100	26.0000	0.6300	0.7000	1.0000	70.2751	(82)

Solar gains	200.3697	369.8688	571.9900	802.9523	973.6110	996.0818	948.2795	818.5278	652.6845	427.5190	245.4400	167.8219	(83)
Total gains	727.8112	909.0237	1089.3117	1302.2647	1448.1127	1450.7485	1385.9539	1257.0699	1104.2326	897.3170	743.3473	684.4470	(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	28.5567	28.6269	28.6960	29.0250	29.0874	29.3814	29.3814	29.4366	29.2675	29.0874	28.9614	28.8309	
alpha	2.9038	2.9085	2.9131	2.9350	2.9392	2.9588	2.9588	2.9624	2.9512	2.9392	2.9308	2.9221	
util living area	0.9449	0.9031	0.8322	0.7036	0.5504	0.4009	0.2962	0.3378	0.5370	0.7853	0.9126	0.9525	(86)
MIT	18.9536	19.3746	19.9033	20.4567	20.7879	20.9388	20.9813	20.9723	20.8546	20.3574	19.5591	18.8819	(87)
Th 2	19.8889	19.8913	19.8937	19.9048	19.9069	19.9166	19.9166	19.9184	19.9129	19.9069	19.9027	19.8983	(88)
util rest of house	0.9356	0.8880	0.8077	0.6653	0.4994	0.3388	0.2257	0.2622	0.4681	0.7454	0.8963	0.9445	(89)
MIT 2	17.5457	18.0679	18.7115	19.3629	19.7217	19.8751	19.9080	19.9048	19.8040	19.2756	18.3149	17.4620	(90)
Living area fraction									fLA = Living area / (4) =			0.2882	(91)
MIT	17.9515	18.4446	19.0550	19.6782	20.0290	20.1817	20.2174	20.2125	20.1068	19.5875	18.6736	17.8713	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.9515	18.4446	19.0550	19.6782	20.0290	20.1817	20.2174	20.2125	20.1068	19.5875	18.6736	17.8713	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9142	0.8637	0.7862	0.6568	0.5053	0.3543	0.2456	0.2832	0.4809	0.7322	0.8733	0.9244	(94)
Useful gains	665.3609	785.1109	856.4438	855.2897	731.7327	514.0619	340.3384	355.9445	531.0733	656.9993	649.1438	632.7154	(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	1337.9060	1324.1722	1224.4756	1039.2651	801.3843	531.6728	344.5690	362.4718	574.3996	864.7390	1118.4069	1327.1019	(97)
Space heating kWh	500.3735	362.2492	273.8156	132.4623	51.8207	0.0000	0.0000	0.0000	0.0000	154.5583	337.8695	516.6235	(98a)
Space heating requirement - total per year (kWh/year)												2329.7727	
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	500.3735	362.2492	273.8156	132.4623	51.8207	0.0000	0.0000	0.0000	0.0000	154.5583	337.8695	516.6235	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2329.7727	
Space heating per m2										(98c) / (4) =		29.4535	(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	500.3735	362.2492	273.8156	132.4623	51.8207	0.0000	0.0000	0.0000	0.0000	154.5583	337.8695	516.6235	(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)	542.1165	392.4693	296.6583	143.5128	56.1438	0.0000	0.0000	0.0000	0.0000	167.4521	366.0558	559.7222	(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	203.8126	180.1596	191.6767	169.7557	165.2669	149.7403	148.6208	154.2217	155.5313	172.3967	181.9620	201.7975	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.9930	85.5936	84.8591	83.5097	81.7785	79.8000	79.8000	79.8000	79.8000	83.8157	85.4275	86.0733	(217)
Fuel for water heating, kWh/month	237.0108	210.4825	225.8764	203.2766	202.0908	187.6445	186.2416	193.2602	194.9014	205.6856	213.0017	234.4486	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	22.7994	18.2906	16.4686	12.0656	9.3198	7.6144	8.5019	11.0510	14.3542	18.8335	21.2724	23.4331	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-40.6065	-56.5468	-80.3079	-89.1910	-95.2670	-88.6010	-87.4904	-83.0185	-75.0158	-64.1189	-44.3859	-35.1884	(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	-25.1360	-52.6071	-104.0690	-155.6051	-205.0846	-205.8232	-203.4117	-172.5424	-126.8808	-75.0117	-33.4867	-19.8985	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2524.1308	(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	2493.9208	(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)	184.0045	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2219.2950	(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	3068.7611	(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	2524.1308	0.2100	530.0675	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2493.9208	0.2100	523.7234	(264)
Space and water heating			1053.7908	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	184.0045	0.1443	26.5575	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-839.7381	0.1348	-113.2347	
PV Unit electricity exported	-1379.5569	0.1260	-173.8629	
Total			-287.0976	(269)
Total CO2, kg/year			805.1800	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.1800	(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	2524.1308	1.1300	2852.2678	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2493.9208	1.1300	2818.1305	(278)
Space and water heating			5670.3983	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	184.0045	1.5338	282.2323	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-839.7381	1.4984	-1258.2464	
PV Unit electricity exported	-1379.5569	0.4626	-638.2049	
Total			-1896.4513	(283)
Total Primary energy kWh/year			4186.2801	(286)
Target Primary Energy Rate (TPER)			52.9200	(287)

Full SAP Calculation Printout

Property Reference	Unit 2	**Issued on Date**	04/05/2024
Assessment Reference	Unit 2 - Be Green	**Prop Type Ref**	
Property			

SAP Rating	84 B	**DER**	3.85	**TER**	10.18
Environmental	97 A	**% DER < TER**			62.18
CO_2 Emissions (t/year)	0.29	**DFEE**	33.57	**TFEE**	38.18
Compliance Check	See BREL	**% DFEE < TFEE**			12.09
% DPER < TPER	22.41	**DPER**	41.06	**TPER**	52.92

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	44.9000 (1b)	x	2.5000 (2b)	=	112.2500	(1b) - (3b)
First floor	34.2000 (1c)	x	2.5000 (2c)	=	85.5000	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.1000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	197.7500	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1517	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3017	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2565	(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	0.3270	0.3206	0.3142	0.2821	0.2757	0.2436	0.2436	0.2372	0.2565	0.2757	0.2885	0.3013	(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	0.5535	0.5514	0.5493	0.5398	0.5380	0.5297	0.5297	0.5281	0.5329	0.5380	0.5416	0.5454	(25)

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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)			14.1000	1.1450	16.1450			(27)
RL			7.4000	1.1450	8.4733			(27a)
Heatloss Floor 1			44.9000	0.1000	4.4900	75.0000	3367.5000	(28a)
External Wall 1	84.5000	14.1000	70.4000	0.1600	11.2640	70.0000	4928.0000	(29a)
FR	44.9000	7.4000	37.5000	0.1000	3.7500	9.0000	337.5000	(30)
Total net area of external elements Aum(A, m2)			174.3000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		44.1223			(33)
Party Wall 1			19.2500	0.0000	0.0000	45.0000	866.2500	(32)
Internal Wall 1			64.0000			9.0000	576.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10075.2500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		127.3736 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	30.2000	0.0480	1.4496
E14 Flat roof	30.2000	0.1600	4.8320
E16 Corner (normal)	15.0000	0.0350	0.5250

E18 Party wall between dwellings	5.0000	0.0330	0.1650	
E1 Steel lintel with perforated steel base plate	7.0000	0.3020	2.1140	
E3 Sill	3.8000	0.0290	0.1102	
E4 Jamb	23.2000	0.0240	0.5568	
E6 Intermediate floor within a dwelling	20.1000	0.0010	0.0201	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.7727 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 53.8950 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.1172	35.9817	35.8489	35.2253	35.1086	34.5654	34.5654	34.4648	34.7746	35.1086	35.3446	35.5914	(38)
Heat transfer coeff	90.0122	89.8767	89.7440	89.1203	89.0036	88.4604	88.4604	88.3599	88.6697	89.0036	89.2397	89.4864	(39)
Average = Sum(39)m / 12 =												89.1197	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1380	1.1362	1.1346	1.1267	1.1252	1.1183	1.1183	1.1171	1.1210	1.1252	1.1282	1.1313	(40)
HLP (average)												1.1267	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4456 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

28.1716	27.7532	27.1640	26.0777	25.2642	24.3623	23.8751	24.4601	25.0971	26.0623	27.1710	28.0763	(42b)

Hot water usage for other uses

39.6750	38.2323	36.7896	35.3468	33.9041	32.4614	32.4614	33.9041	35.3468	36.7896	38.2323	39.6750	(42c)

Average daily hot water use (litres/day) 62.1877 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	67.8466	65.9855	63.9536	61.4245	59.1683	56.8236	56.3364	58.3642	60.4440	62.8518	65.4033	67.7513	(44)
Energy conte	107.4524	93.9624	98.2942	84.0871	79.6519	69.8713	68.1340	72.2671	74.5334	85.2893	93.1789	106.0822	(45)
Energy content (annual)											Total = Sum(45)m =	1032.8044	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

91.3345	79.8681	83.5501	71.4740	67.7042	59.3906	57.9139	61.4270	63.3534	72.4959	79.2021	90.1699	(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

91.3345	79.8681	83.5501	71.4740	67.7042	59.3906	57.9139	61.4270	63.3534	72.4959	79.2021	90.1699	(64)
									Total per year (kWh/year) = Sum(64)m =		877.8837	(64)
12Total per year (kWh/year)											878	(64)

Electric shower(s)

52.2334	46.5403	50.8203	48.4972	49.4072	47.1297	48.7007	49.4072	48.4972	50.8203	49.8647	52.2334	(64a)
				Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							594.1513	(64a)

Heat gains from water heating, kWh/month

35.8920	31.6021	33.5926	29.9928	29.2778	26.6301	26.6536	27.7086	27.9626	30.8291	32.2667	35.6008	(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	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	109.7286	121.4853	109.7286	113.3862	109.7286	113.3862	109.7286	109.7286	113.3862	109.7286	113.3862	109.7286	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	217.5493	219.8067	214.1180	202.0072	186.7196	172.3514	162.7525	160.4951	166.1838	178.2946	193.5822	207.9504	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	(71)
Water heating gains (Table 5)	48.2419	47.0269	45.1513	41.6567	39.3519	36.9862	35.8248	37.2427	38.8370	41.4369	44.8148	47.8506	(72)
Total internal gains	435.2032	448.0024	428.6814	416.7336	395.4836	382.4073	367.9894	367.1498	378.0905	389.1435	411.4667	425.2130	(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	
Southeast	1.8000	36.7938	0.6300	0.7000	0.7700	20.2404	(77)
Southwest	10.1000	36.7938	0.6300	0.7000	0.7700	113.5712	(79)
Northwest	2.2000	11.2829	0.6300	0.7000	0.7700	7.5861	(81)
Horizontal	7.4000	26.0000	0.6300	0.7000	1.0000	76.3636	(82)

Solar gains	217.7612	401.9736	621.6434	872.6645	1058.1494	1082.5760	1030.6208	889.5958	709.3457	464.6289	266.7437	182.3883	(83)
Total gains	652.9645	849.9760	1050.3248	1289.3981	1453.6330	1464.9832	1398.6102	1256.7456	1087.4362	853.7724	678.2104	607.6013	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	31.0922	31.1391	31.1852	31.4034	31.4446	31.6377	31.6377	31.6737	31.5630	31.4446	31.3614	31.2749	
alpha	3.0728	3.0759	3.0790	3.0936	3.0963	3.1092	3.1092	3.1116	3.1042	3.0963	3.0908	3.0850	
util living area	0.9549	0.9093	0.8289	0.6846	0.5218	0.3739	0.2745	0.3168	0.5170	0.7855	0.9234	0.9627	(86)
MIT	19.0457	19.5017	20.0423	20.5638	20.8456	20.9588	20.9882	20.9815	20.8893	20.4314	19.6316	18.9556	(87)
Th 2	19.9700	19.9713	19.9727	19.9791	19.9803	19.9859	19.9859	19.9869	19.9837	19.9803	19.9779	19.9753	(88)
util rest of house	0.9473	0.8955	0.8051	0.6476	0.4745	0.3185	0.2128	0.2496	0.4529	0.7474	0.9092	0.9563	(89)
MIT 2	18.2107	18.6525	19.1645	19.6394	19.8749	19.9638	19.9815	19.9796	19.9185	19.5414	18.7913	18.1265	(90)
Living area fraction										fLA = Living area / (4) =		0.2882	(91)
MIT	18.4514	18.8972	19.4175	19.9059	20.1547	20.2506	20.2717	20.2684	20.1984	19.7979	19.0335	18.3655	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4514	18.8972	19.4175	19.9059	20.1547	20.2506	20.2717	20.2684	20.1984	19.7979	19.0335	18.3655	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9331	0.8783	0.7907	0.6447	0.4828	0.3332	0.2303	0.2685	0.4670	0.7398	0.8931	0.9433	(94)
Useful gains	609.2582	746.5106	830.5222	831.3380	701.8258	488.0813	322.1284	337.4604	507.7878	631.6000	605.6979	573.1646	(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	1273.7991	1258.0270	1159.2683	980.8456	752.4981	499.8550	324.7980	341.8106	540.7403	818.6502	1064.9409	1267.6163	(97)
Space heating kWh	494.4184	343.7390	244.5871	107.6455	37.7002	0.0000	0.0000	0.0000	0.0000	139.1654	330.6550	516.6720	(98a)
Space heating requirement - total per year (kWh/year)												2214.5825	
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	494.4184	343.7390	244.5871	107.6455	37.7002	0.0000	0.0000	0.0000	0.0000	139.1654	330.6550	516.6720	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2214.5825	
Space heating per m2											(98c) / (4) =	27.9973	(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	831.5281	654.6073	671.5349	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9297	0.9558	0.9397	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	773.1081	625.6882	631.0321	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1571.0332	1501.0461	1353.2384	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	574.5061	651.2663	537.3215	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	143.6265	162.8166	134.3304	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												440.7735	(107)
Energy for space heating												27.9973	(99)
Energy for space cooling												5.5724	(108)
Total												33.5696	(109)
Fabric Energy Efficiency (DFEE)												33.6	(109)

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

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		44.9000 (1b)	x	2.5000 (2b)	=	112.2500	(1b) - (3b)
First floor		34.2000 (1c)	x	2.5000 (2c)	=	85.5000	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.1000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		197.7500	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1517	(8)
Pressure test		Yes	

Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.4017	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.3415	(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	0.4353	0.4268	0.4183	0.3756	0.3671	0.3244	0.3244	0.3158	0.3415	0.3671	0.3841	0.4012	(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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5948	0.5911	0.5875	0.5705	0.5674	0.5526	0.5526	0.5499	0.5583	0.5674	0.5738	0.5805	(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 Opening Type (Uw = 1.20)			12.9700	1.1450	14.8511			(27)
RL			6.8100	1.5918	10.8399			(27a)
Heatloss Floor 1			44.9000	0.1300	5.8370			(28a)
External Wall 1	84.5000	12.9700	71.5300	0.1800	12.8754			(29a)
FR	44.9000	6.8100	38.0900	0.1100	4.1899			(30)
Total net area of external elements Aum(A, m2)			174.3000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		48.5933			(33)
Party Wall 1			19.2500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	127.3736	(35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E5	Ground floor (normal)	30.2000	0.1600	4.8320
E14	Flat roof	30.2000	0.0800	2.4160
E16	Corner (normal)	15.0000	0.0900	1.3500
E18	Party wall between dwellings	5.0000	0.0600	0.3000
E1	Steel lintel with perforated steel base plate	7.0000	0.0500	0.3500
E3	Sill	3.8000	0.0500	0.1900
E4	Jamb	23.2000	0.0500	1.1600
E6	Intermediate floor within a dwelling	20.1000	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	10.5980	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	59.1913	(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	38.8129	38.5727	38.3373	37.2318	37.0249	36.0620	36.0620	35.8837	36.4329	37.0249	37.4434	37.8808	(38)
Heat transfer coeff	98.0042	97.7641	97.5287	96.4231	96.2162	95.2533	95.2533	95.0750	95.6242	96.2162	96.6347	97.0722	(39)
Average = Sum(39)m / 12 =												96.4221	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2390	1.2360	1.2330	1.2190	1.2164	1.2042	1.2042	1.2020	1.2089	1.2164	1.2217	1.2272	(40)
HLP (average)												1.2190	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4456	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	28.1716	27.7532	27.1640	26.0777	25.2642	24.3623	23.8751	24.4601	25.0971	26.0623	27.1710	28.0763	(42b)
Hot water usage for other uses	39.6750	38.2323	36.7896	35.3468	33.9041	32.4614	32.4614	33.9041	35.3468	36.7896	38.2323	39.6750	(42c)
Average daily hot water use (litres/day)												62.1877	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	67.8466	65.9855	63.9536	61.4245	59.1683	56.8236	56.3364	58.3642	60.4440	62.8518	65.4033	67.7513	(44)
Energy conte	107.4524	93.9624	98.2942	84.0871	79.6519	69.8713	68.1340	72.2671	74.5334	85.2893	93.1789	106.0822	(45)
Energy content (annual)										Total = Sum(45)m =		1032.8044	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	91.3345	79.8681	83.5501	71.4740	67.7042	59.3906	57.9139	61.4270	63.3534	72.4959	79.2021	90.1699	(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	91.3345	79.8681	83.5501	71.4740	67.7042	59.3906	57.9139	61.4270	63.3534	72.4959	79.2021	90.1699	(64)
									Total per year (kWh/year) = Sum(64)m =			877.8837	(64)
12Total per year (kWh/year)												878	(64)
Electric shower(s)	52.2334	46.5403	50.8203	48.4972	49.4072	47.1297	48.7007	49.4072	48.4972	50.8203	49.8647	52.2334	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			594.1513	(64a)
Heat gains from water heating, kWh/month	35.8920	31.6021	33.5926	29.9928	29.2778	26.6301	26.6536	27.7086	27.9626	30.8291	32.2667	35.6008	(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	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	109.7286	121.4853	109.7286	113.3862	109.7286	113.3862	109.7286	109.7286	113.3862	109.7286	113.3862	109.7286	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	217.5493	219.8067	214.1180	202.0072	186.7196	172.3514	162.7525	160.4951	166.1838	178.2946	193.5822	207.9504	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	(71)
Water heating gains (Table 5)													
	48.2419	47.0269	45.1513	41.6567	39.3519	36.9862	35.8248	37.2427	38.8370	41.4369	44.8148	47.8506	(72)
Total internal gains													
	435.2032	448.0024	428.6814	416.7336	395.4836	382.4073	367.9894	367.1498	378.0905	389.1435	411.4667	425.2130	(73)

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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	
Southeast	1.6600	36.7938	0.6300	0.7000	0.7700	18.6662	(77)
Southwest	9.2900	36.7938	0.6300	0.7000	0.7700	104.4630	(79)
Northwest	2.0200	11.2829	0.6300	0.7000	0.7700	6.9654	(81)
Horizontal	6.8100	26.0000	0.6300	0.7000	1.0000	70.2751	(82)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	200.3697	369.8688	571.9900	802.9523	973.6110	996.0818	948.2795	818.5278	652.6845	427.5190	245.4400	167.8219	(83)
Total gains	635.5729	817.8712	1000.6714	1219.6859	1369.0946	1378.4891	1316.2689	1185.6776	1030.7750	816.6625	656.9067	593.0349	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	28.5567	28.6269	28.6960	29.0250	29.0874	29.3814	29.3814	29.4366	29.2675	29.0874	28.9614	28.8309	
alpha	2.9038	2.9085	2.9131	2.9350	2.9392	2.9588	2.9588	2.9624	2.9512	2.9392	2.9308	2.9221	
util living area													
	0.9598	0.9224	0.8561	0.7291	0.5738	0.4193	0.3110	0.3565	0.5656	0.8163	0.9332	0.9663	(86)
MIT	18.7860	19.2311	19.7956	20.3982	20.7628	20.9310	20.9787	20.9680	20.8329	20.2750	19.4174	18.7111	(87)
Th 2	19.8889	19.8913	19.8937	19.9048	19.9069	19.9166	19.9166	19.9184	19.9129	19.9069	19.9027	19.8983	(88)
util rest of house													
	0.9527	0.9098	0.8338	0.6919	0.5221	0.3551	0.2373	0.2773	0.4953	0.7794	0.9200	0.9603	(89)
MIT 2	17.9001	18.3340	18.8742	19.4336	19.7444	19.8799	19.9089	19.9060	19.8142	19.3448	18.5311	17.8331	(90)
Living area fraction									fLA = Living area / (4) =			0.2882	(91)
MIT	18.1555	18.5926	19.1398	19.7116	20.0379	20.1829	20.2173	20.2121	20.1079	19.6129	18.7866	18.0862	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1555	18.5926	19.1398	19.7116	20.0379	20.1829	20.2173	20.2121	20.1079	19.6129	18.7866	18.0862	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9381	0.8913	0.8162	0.6847	0.5285	0.3713	0.2581	0.2993	0.5085	0.7681	0.9030	0.9470	(94)
Useful gains	596.2475	729.0038	816.7471	835.1696	723.6336	511.8216	339.7129	354.8549	524.2000	627.2629	593.1820	561.6293	(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													
	1357.8951	1338.6407	1232.7441	1042.4893	802.2454	531.7853	344.5588	362.4393	574.4961	867.1890	1129.3315	1347.9644	(97)
Space heating kWh													
	566.6658	409.6760	309.5018	149.2702	58.4872	0.0000	0.0000	0.0000	0.0000	178.5051	386.0276	585.0334	(98a)
Space heating requirement - total per year (kWh/year)												2643.1671	
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													
	566.6658	409.6760	309.5018	149.2702	58.4872	0.0000	0.0000	0.0000	0.0000	178.5051	386.0276	585.0334	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2643.1671	
Space heating per m2											(98c) / (4) =	33.4155	(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	895.3812	704.8746	722.5700	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8962	0.9315	0.9102	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	802.4779	656.6199	657.6492	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1477.8432	1412.2751	1276.3789	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	486.2630	562.2075	460.3349	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	121.5658	140.5519	115.0837	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												377.2014	(107)
Energy for space heating												33.4155	(99)
Energy for space cooling												4.7687	(108)
Total												38.1842	(109)
Fabric Energy Efficiency (TFEE)												38.2	(109)

Full SAP Calculation Printout

Property Reference	Unit 2	**Issued on Date**	04/05/2024
Assessment Reference	Unit 2 - Be Green	**Prop Type Ref**	
Property			

SAP Rating	84 B	**DER**	3.85	**TER**	10.18
Environmental	97 A	**% DER < TER**			62.18
CO_2 Emissions (t/year)	0.29	**DFEE**	33.57	**TFEE**	38.18
Compliance Check	See BREL	**% DFEE < TFEE**			12.09
% DPER < TPER	22.41	**DPER**	41.06	**TPER**	52.92

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	44.9000 (1b)	x	2.5000 (2b)	=	112.2500	(1b) - (3b)
First floor	34.2000 (1c)	x	2.5000 (2c)	=	85.5000	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.1000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	197.7500	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				3.0000	(17)
Infiltration rate				0.1500	(18)
Number of sides sheltered				2	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =	0.1275	(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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	79.2000	(23c)

Effective ac	0.2666	0.2634	0.2602	0.2442	0.2411	0.2251	0.2251	0.2219	0.2315	0.2411	0.2474	0.2538	(25)

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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)			14.1000	1.1450	16.1450			(27)
RL			7.4000	1.1450	8.4733			(27a)
Heatloss Floor 1			44.9000	0.1000	4.4900	75.0000	3367.5000	(28a)
External Wall 1	84.5000	14.1000	70.4000	0.1600	11.2640	70.0000	4928.0000	(29a)
FR	44.9000	7.4000	37.5000	0.1000	3.7500	9.0000	337.5000	(30)
Total net area of external elements Aum(A, m2)			174.3000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		44.1223			(33)
Party Wall 1			19.2500	0.0000	0.0000	45.0000	866.2500	(32)
Internal Wall 1			64.0000			9.0000	576.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 10075.2500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	127.3736	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E5 Ground floor (normal)	30.2000	0.0480	1.4496	
E14 Flat roof	30.2000	0.1600	4.8320	
E16 Corner (normal)	15.0000	0.0350	0.5250	
E18 Party wall between dwellings	5.0000	0.0330	0.1650	
E1 Steel lintel with perforated steel base plate	7.0000	0.3020	2.1140	
E3 Sill	3.8000	0.0290	0.1102	
E4 Jamb	23.2000	0.0240	0.5568	
E6 Intermediate floor within a dwelling	20.1000	0.0010	0.0201	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				9.7727 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	53.8950 (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	17.3952	17.1872	16.9792	15.9391	15.7311	14.6911	14.6911	14.4831	15.1071	15.7311	16.1472	16.5632	(38)
Heat transfer coeff	71.2902	71.0822	70.8742	69.8342	69.6262	68.5861	68.5861	68.3781	69.0021	69.6262	70.0422	70.4582	(39)
Average = Sum(39)m / 12 =												69.7822	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9013	0.8986	0.8960	0.8829	0.8802	0.8671	0.8671	0.8645	0.8723	0.8802	0.8855	0.8907	(40)
HLP (average)												0.8822	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4456	(42)
Hot water usage for mixer showers	125.6645	123.7761	121.0241	115.7589	111.8732	107.5400	105.0770	107.8081	110.8018	115.4544	120.8328	125.1831	(42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses	39.6750	38.2323	36.7896	35.3468	33.9041	32.4614	32.4614	33.9041	35.3468	36.7896	38.2323	39.6750	(42c)
Average daily hot water use (litres/day)												151.9267	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	165.3396	162.0083	157.8137	151.1057	145.7773	140.0014	137.5384	141.7122	146.1487	152.2440	159.0651	164.8581	(44)
Energy conte	261.8574	230.6977	242.5538	206.8561	196.2443	172.1480	166.3407	175.4693	180.2159	206.5936	226.6173	258.1279	(45)
Energy content (annual)										Total = Sum(45)m =		2523.7221	
Distribution loss (46)m = 0.15 x (45)m	39.2786	34.6047	36.3831	31.0284	29.4366	25.8222	24.9511	26.3204	27.0324	30.9890	33.9926	38.7192	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.1200	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.6048	(55)
Total storage loss	18.7488	16.9344	18.7488	18.1440	18.7488	18.1440	18.7488	18.7488	18.1440	18.7488	18.1440	18.7488	(56)
If cylinder contains dedicated solar storage	18.7488	16.9344	18.7488	18.1440	18.7488	18.1440	18.7488	18.7488	18.1440	18.7488	18.1440	18.7488	(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	303.8686	268.6433	284.5650	247.5121	238.2555	212.8040	208.3519	217.4805	220.8719	248.6048	267.2733	300.1391	(62)
WWHRS	-71.8415	-63.5372	-66.5325	-55.0915	-51.3433	-43.9349	-41.1819	-43.7929	-45.4567	-53.5884	-60.7092	-70.5111	(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	232.0271	205.1061	218.0325	192.4206	186.9122	168.8692	167.1700	173.6876	175.4152	195.0164	206.5641	229.6280	(64)
										Total per year (kWh/year) = Sum(64)m =		2350.8489	(64)
12Total per year (kWh/year)												2351	(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	120.6766	107.0635	114.2581	101.3045	98.8602	89.7640	88.9173	91.9525	92.4466	102.3013	107.8751	119.4365	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	109.7286	121.4853	109.7286	113.3862	109.7286	113.3862	109.7286	109.7286	113.3862	109.7286	113.3862	109.7286	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	217.5493	219.8067	214.1180	202.0072	186.7196	172.3514	162.7525	160.4951	166.1838	178.2946	193.5822	207.9504	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	(71)
Water heating gains (Table 5)	162.1997	159.3206	153.5727	140.7006	132.8766	124.6722	119.5124	123.5921	128.3980	137.5018	149.8265	160.5329	(72)
Total internal gains	549.1610	560.2961	537.1027	515.7776	489.0083	470.0933	451.6770	453.4992	467.6516	485.2084	516.4784	537.8954	(73)

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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	
Southeast	1.8000	36.7938	0.6300	0.7000	0.7700	20.2404	(77)
Southwest	10.1000	36.7938	0.6300	0.7000	0.7700	113.5712	(79)
Northwest	2.2000	11.2829	0.6300	0.7000	0.7700	7.5861	(81)
Horizontal	7.4000	26.0000	0.6300	0.7000	1.0000	76.3636	(82)

Solar gains	217.7612	401.9736	621.6434	872.6645	1058.1494	1082.5760	1030.6208	889.5958	709.3457	464.6289	266.7437	182.3883	(83)

Total gains	766.9222	962.2697	1158.7462	1388.4421	1547.1577	1552.6693	1482.2979	1343.0949	1176.9973	949.8373	783.2221	720.2837	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	39.2576	39.3724	39.4880	40.0761	40.1958	40.8054	40.8054	40.9295	40.5593	40.1958	39.9571	39.7212	
alpha	3.6172	3.6248	3.6325	3.6717	3.6797	3.7204	3.7204	3.7286	3.7040	3.6797	3.6638	3.6481	
util living area													
	0.9165	0.8460	0.7348	0.5659	0.4085	0.2809	0.2032	0.2334	0.3960	0.6695	0.8618	0.9290	(86)
Living	19.8343	20.2098	20.5781	20.8576	20.9626	20.9931	20.9984	20.9974	20.9757	20.7878	20.2825	19.7659	
Non living	18.8265	19.2836	19.7190	20.0408	20.1513	20.1906	20.1948	20.1964	20.1725	19.9775	19.3897	18.7488	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.4037	20.2098	20.5781	20.8576	20.9626	20.9931	20.9984	20.9974	20.9757	20.7878	20.2825	19.9385	(87)
Th 2	20.1664	20.1687	20.1709	20.1821	20.1843	20.1956	20.1956	20.1978	20.1911	20.1843	20.1799	20.1754	(88)
util rest of house													
	0.9053	0.8283	0.7092	0.5345	0.3749	0.2461	0.1662	0.1930	0.3520	0.6320	0.8425	0.9192	(89)
MIT 2	19.6322	19.2836	19.7190	20.0408	20.1513	20.1906	20.1948	20.1964	20.1725	19.9775	19.3897	19.0059	(90)
Living area fraction										fLA = Living area / (4) =		0.2882	(91)
MIT	19.8546	19.5505	19.9666	20.2762	20.3852	20.4219	20.4264	20.4273	20.4040	20.2110	19.6470	19.2747	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8546	19.5505	19.9666	20.2762	20.3852	20.4219	20.4264	20.4273	20.4040	20.2110	19.6470	19.2747	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9006	0.8136	0.7026	0.5382	0.3833	0.2559	0.1768	0.2046	0.3637	0.6333	0.8283	0.9066	(94)
Useful gains	690.7193	782.9191	814.1252	747.2094	592.9567	397.4029	262.0947	274.7829	428.0562	601.5533	648.7748	653.0117	(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													
	1108.8916	1041.3916	954.4351	794.4477	604.7164	399.3028	262.4392	275.3780	434.9896	669.1801	878.8221	1062.1354	(97)
Space heating kWh													
	311.1202	173.6936	104.3906	34.0116	8.7492	0.0000	0.0000	0.0000	0.0000	50.3144	165.6341	304.3880	(98a)
Space heating requirement - total per year (kWh/year)												1152.3016	
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													
	311.1202	173.6936	104.3906	34.0116	8.7492	0.0000	0.0000	0.0000	0.0000	50.3144	165.6341	304.3880	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1152.3016	
Space heating per m2											(98c) / (4) =	14.5677	(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 %)												325.7036	(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													
	311.1202	173.6936	104.3906	34.0116	8.7492	0.0000	0.0000	0.0000	0.0000	50.3144	165.6341	304.3880	(98)
Space heating efficiency (main heating system 1)													
	325.7036	325.7036	325.7036	325.7036	325.7036	0.0000	0.0000	0.0000	0.0000	325.7036	325.7036	325.7036	(210)
Space heating fuel (main heating system)													
	95.5225	53.3287	32.0508	10.4425	2.6862	0.0000	0.0000	0.0000	0.0000	15.4479	50.8542	93.4555	(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													
	232.0271	205.1061	218.0325	192.4206	186.9122	168.8692	167.1700	173.6876	175.4152	195.0164	206.5641	229.6280	(64)
Efficiency of water heater												163.6155	(216)
(217)m	163.6155	163.6155	163.6155	163.6155	163.6155	163.6155	163.6155	163.6155	163.6155	163.6155	163.6155	163.6155	(217)
Fuel for water heating, kWh/month													
	141.8125	125.3586	133.2591	117.6054	114.2387	103.2110	102.1725	106.1560	107.2119	119.1919	126.2498	140.3462	(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	13.8309	12.4924	13.8309	13.3847	13.8309	13.3847	13.8309	13.8309	13.3847	13.8309	13.3847	13.8309	(231)
Lighting	20.7044	16.6098	14.9553	10.9569	8.4634	6.9147	7.7206	10.0356	13.0352	17.1029	19.3177	21.2798	(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												353.7884	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												163.6155	
Water heating fuel used												1436.8134	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6750)		
mechanical ventilation fans (SFP = 0.6750)	162.8471	(230a)
Total electricity for the above, kWh/year	162.8471	(231)
Electricity for lighting (calculated in Appendix L)	167.0964	(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	2120.5454	(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	353.7884	0.1579	55.8675	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1436.8134	0.1408	202.3046	(264)
Space and water heating			258.1721	(265)
Pumps, fans and electric keep-hot	162.8471	0.1387	22.5889	(267)
Energy for lighting	167.0964	0.1443	24.1172	(268)
Total CO2, kg/year			304.8782	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.8500	(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	353.7884	1.5845	560.5740	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1436.8134	1.5206	2184.8549	(278)
Space and water heating			2745.4289	(279)
Pumps, fans and electric keep-hot	162.8471	1.5128	246.3551	(281)
Energy for lighting	167.0964	1.5338	256.2981	(282)
Total Primary energy kWh/year			3248.0821	(286)
Dwelling Primary energy Rate (DPER)			41.0600	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	44.9000 (1b)	x	2.5000 (2b)	=	112.2500	(1b) - (3b)
First floor	34.2000 (1c)	x	2.5000 (2c)	=	85.5000	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 79.1000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	197.7500	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)
Number of flues attached to other heater	0 * 35 = 0.0000	(6e)
Number of blocked chimneys	0 * 20 = 0.0000	(6f)
Number of intermittent extract fans	3 * 10 = 30.0000	(7a)
Number of passive vents	0 * 10 = 0.0000	(7b)
Number of flueless gas fires	0 * 40 = 0.0000	(7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1517	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.4017	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.3415	(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	0.4353	0.4268	0.4183	0.3756	0.3671	0.3244	0.3244	0.3158	0.3415	0.3671	0.3841	0.4012	(22b)
Effective ac	0.5948	0.5911	0.5875	0.5705	0.5674	0.5526	0.5526	0.5499	0.5583	0.5674	0.5738	0.5805	(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 Opening Type (Uw = 1.20)			12.9700	1.1450	14.8511			(27)
RL			6.8100	1.5918	10.8399			(27a)
Heatloss Floor 1			44.9000	0.1300	5.8370			(28a)
External Wall 1	84.5000	12.9700	71.5300	0.1800	12.8754			(29a)
FR	44.9000	6.8100	38.0900	0.1100	4.1899			(30)
Total net area of external elements Aum(A, m2)			174.3000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		48.5933			(33)
Party Wall 1			19.2500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 127.3736 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	30.2000	0.1600	4.8320
E14 Flat roof	30.2000	0.0800	2.4160
E16 Corner (normal)	15.0000	0.0900	1.3500
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E1 Steel lintel with perforated steel base plate	7.0000	0.0500	0.3500
E3 Sill	3.8000	0.0500	0.1900
E4 Jamb	23.2000	0.0500	1.1600
E6 Intermediate floor within a dwelling	20.1000	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.5980 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 59.1913 (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	38.8129	38.5727	38.3373	37.2318	37.0249	36.0620	36.0620	35.8837	36.4329	37.0249	37.4434	37.8808	(38)
Heat transfer coeff	98.0042	97.7641	97.5287	96.4231	96.2162	95.2533	95.2533	95.0750	95.6242	96.2162	96.6347	97.0722	(39)

Average = Sum(39)m / 12 = 96.4221

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2390	1.2360	1.2330	1.2190	1.2164	1.2042	1.2042	1.2020	1.2089	1.2164	1.2217	1.2272	(40)
HLP (average)												1.2190	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4456 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
83.7764	82.5174	80.6828	77.1726	74.5822	71.6933	70.0513	71.8720	73.8679	76.9696	80.5552	83.4554	(42a)

Hot water usage for baths

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)

Hot water usage for other uses

39.6750	38.2323	36.7896	35.3468	33.9041	32.4614	32.4614	33.9041	35.3468	36.7896	38.2323	39.6750	(42c)

Average daily hot water use (litres/day) 113.3072 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	123.4514	120.7496	117.4723	112.5194	108.4862	104.1547	102.5127	105.7761	109.2147	113.7592	118.7875	123.1304	(44)
Energy conte	195.5168	171.9459	180.5506	154.0334	146.0433	128.0704	123.9802	130.9730	134.6727	154.3701	169.2345	192.7924	(45)
Energy content (annual)										Total = Sum(45)m =		1882.1833	
Distribution loss (46)m = 0.15 x (45)m	29.3275	25.7919	27.0826	23.1050	21.9065	19.2106	18.5970	19.6459	20.2009	23.1555	25.3852	28.9189	(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

242.1117	214.0316	227.1455	199.1253	192.6382	173.1622	170.5751	177.5679	179.7645	200.9650	214.3264	239.3873	(62)
WWHRS -38.2991	-33.8720	-35.4688	-29.3696	-27.3714	-23.4219	-21.9543	-23.3462	-24.2332	-28.5683	-32.3644	-37.5898	(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

203.8126	180.1596	191.6767	169.7557	165.2669	149.7403	148.6208	154.2217	155.5313	172.3967	181.9620	201.7975	(64)
									Total per year (kWh/year) = Sum(64)m =		2074.9419	(64)
12Total per year (kWh/year)											2075	(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

102.2853	90.8406	97.3090	87.2896	85.8353	78.6569	78.4993	80.8244	80.8521	88.6040	92.3440	101.3794	(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	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	109.7286	121.4853	109.7286	113.3862	109.7286	113.3862	109.7286	109.7286	113.3862	109.7286	113.3862	109.7286	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	217.5493	219.8067	214.1180	202.0072	186.7196	172.3514	162.7525	160.4951	166.1838	178.2946	193.5822	207.9504	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	(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)	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	(71)
Water heating gains (Table 5)	137.4802	135.1794	130.7916	121.2355	115.3701	109.2456	105.5099	108.6350	112.2946	119.0914	128.2555	136.2626	(72)
Total internal gains	527.4415	539.1549	517.3217	499.3125	474.5017	454.6667	437.6745	438.5421	451.5481	469.7980	497.9074	516.6251	(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	
Southeast	1.6600	36.7938	0.6300	0.7000	0.7700	18.6662	(77)
Southwest	9.2900	36.7938	0.6300	0.7000	0.7700	104.4630	(79)
Northwest	2.0200	11.2829	0.6300	0.7000	0.7700	6.9654	(81)
Horizontal	6.8100	26.0000	0.6300	0.7000	1.0000	70.2751	(82)

Solar gains	200.3697	369.8688	571.9900	802.9523	973.6110	996.0818	948.2795	818.5278	652.6845	427.5190	245.4400	167.8219	(83)
Total gains	727.8112	909.0237	1089.3117	1302.2647	1448.1127	1450.7485	1385.9539	1257.0699	1104.2326	897.3170	743.3473	684.4470	(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	28.5567	28.6269	28.6960	29.0250	29.0874	29.3814	29.3814	29.4366	29.2675	29.0874	28.9614	28.8309	
alpha	2.9038	2.9085	2.9131	2.9350	2.9392	2.9588	2.9588	2.9624	2.9512	2.9392	2.9308	2.9221	
util living area	0.9449	0.9031	0.8322	0.7036	0.5504	0.4009	0.2962	0.3378	0.5370	0.7853	0.9126	0.9525	(86)
MIT	18.9536	19.3746	19.9033	20.4567	20.7879	20.9388	20.9813	20.9723	20.8546	20.3574	19.5591	18.8819	(87)
Th 2	19.8889	19.8913	19.8937	19.9048	19.9069	19.9166	19.9166	19.9184	19.9129	19.9069	19.9027	19.8983	(88)
util rest of house	0.9356	0.8880	0.8077	0.6653	0.4994	0.3388	0.2257	0.2622	0.4681	0.7454	0.8963	0.9445	(89)
MIT 2	17.5457	18.0679	18.7115	19.3629	19.7217	19.8751	19.9080	19.9048	19.8040	19.2756	18.3149	17.4620	(90)
Living area fraction									fLA = Living area / (4) =			0.2882	(91)
MIT	17.9515	18.4446	19.0550	19.6782	20.0290	20.1817	20.2174	20.2125	20.1068	19.5875	18.6736	17.8713	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.9515	18.4446	19.0550	19.6782	20.0290	20.1817	20.2174	20.2125	20.1068	19.5875	18.6736	17.8713	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9142	0.8637	0.7862	0.6568	0.5053	0.3543	0.2456	0.2832	0.4809	0.7322	0.8733	0.9244	(94)
Useful gains	665.3609	785.1109	856.4438	855.2897	731.7327	514.0619	340.3384	355.9445	531.0733	656.9993	649.1438	632.7154	(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	1337.9060	1324.1722	1224.4756	1039.2651	801.3843	531.6728	344.5690	362.4718	574.3996	864.7390	1118.4069	1327.1019	(97)
Space heating kWh	500.3735	362.2492	273.8156	132.4623	51.8207	0.0000	0.0000	0.0000	0.0000	154.5583	337.8695	516.6235	(98a)
Space heating requirement - total per year (kWh/year)												2329.7727	
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	500.3735	362.2492	273.8156	132.4623	51.8207	0.0000	0.0000	0.0000	0.0000	154.5583	337.8695	516.6235	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2329.7727	
Space heating per m2										(98c) / (4) =		29.4535	(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	500.3735	362.2492	273.8156	132.4623	51.8207	0.0000	0.0000	0.0000	0.0000	154.5583	337.8695	516.6235	(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)	542.1165	392.4693	296.6583	143.5128	56.1438	0.0000	0.0000	0.0000	0.0000	167.4521	366.0558	559.7222	(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	203.8126	180.1596	191.6767	169.7557	165.2669	149.7403	148.6208	154.2217	155.5313	172.3967	181.9620	201.7975	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.9930	85.5936	84.8591	83.5097	81.7785	79.8000	79.8000	79.8000	79.8000	83.8157	85.4275	86.0733	(217)
Fuel for water heating, kWh/month	237.0108	210.4825	225.8764	203.2766	202.0908	187.6445	186.2416	193.2602	194.9014	205.6856	213.0017	234.4486	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	22.7994	18.2906	16.4686	12.0656	9.3198	7.6144	8.5019	11.0510	14.3542	18.8335	21.2724	23.4331	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-40.6065	-56.5468	-80.3079	-89.1910	-95.2670	-88.6010	-87.4904	-83.0185	-75.0158	-64.1189	-44.3859	-35.1884	(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	-25.1360	-52.6071	-104.0690	-155.6051	-205.0846	-205.8232	-203.4117	-172.5424	-126.8808	-75.0117	-33.4867	-19.8985	(233b)

Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2524.1308	(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	2493.9208	(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)	184.0045	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2219.2950	(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	3068.7611	(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	2524.1308	0.2100	530.0675	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2493.9208	0.2100	523.7234	(264)
Space and water heating			1053.7908	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	184.0045	0.1443	26.5575	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-839.7381	0.1348	-113.2347	
PV Unit electricity exported	-1379.5569	0.1260	-173.8629	
Total			-287.0976	(269)
Total CO2, kg/year			805.1800	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.1800	(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	2524.1308	1.1300	2852.2678	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2493.9208	1.1300	2818.1305	(278)
Space and water heating			5670.3983	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	184.0045	1.5338	282.2323	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-839.7381	1.4984	-1258.2464	
PV Unit electricity exported	-1379.5569	0.4626	-638.2049	
Total			-1896.4513	(283)
Total Primary energy kWh/year			4186.2801	(286)
Target Primary Energy Rate (TPER)			52.9200	(287)

Summary for Input Data

elmhurst energy

Property Reference	Unit 2	**Issued on Date**	04/05/2024
Assessment Reference	Unit 2 - Be Lean	**Prop Type Ref**	
Property			

SAP Rating	86 B	**DER**	11.30	**TER**	10.18
Environmental	91 B	**% DER < TER**			-11.00
CO_2 Emissions (t/year)	0.82	**DFEE**	33.57	**TFEE**	38.18
Compliance Check	See BREL	**% DFEE < TFEE**			12.09
% DPER < TPER	-21.66	**DPER**	64.38	**TPER**	52.92

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

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

Orientation	Southwest	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Suburban	
1.0 Property Type	Bungalow, End-Terrace	
Which Floor	0	
2.0 Number of Storeys	2	
3.0 Date Built	2024	
3.0 Property Age Band	L	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	N/A	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Basement:	0.00 m	0.00 m²	0.00 m
Ground floor:	13.80 m	44.90 m²	2.50 m
1st Storey:	20.00 m	34.20 m²	2.50 m
2nd Storey:	0.00 m	0.00 m²	0.00 m
3rd Storey:	0.00 m	0.00 m²	0.00 m
4th Storey:	0.00 m	0.00 m²	0.00 m
5th Storey:	0.00 m	0.00 m²	0.00 m
6th Storey:	0.00 m	0.00 m²	0.00 m
7th Storey:	0.00 m	0.00 m²	0.00 m

8.0 Living Area	22.80	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
External Wall 1	Cavity Wall	Cavity wall : dense plaster, AAC block, filled cavity, any outside structure	0.16	70.00	84.50	70.40	0.00	None	14.10	Calculate Wall Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Plasterboard on dabs mounted on cement render on both sides, AAC blocks, cavity	0.00	45.00	19.25	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	64.00

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area	Shelter Code	Shelter Factor	Calculation Type	Openings

Summary for Input Data

						(m²)				
FR	External Flat Roof	Plasterboard, insulated flat roof	0.10	9.00	44.90	37.50	None	0.00	Enter Gross Area	7.40

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Heatloss Floor 1	Ground Floor - Solid	Lowest occupied	Suspended concrete floor, carpeted	0.10	None	0.00	75.00	44.90

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Windows	Manufacturer	Window	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.20
RLs	Manufacturer	Roof Window	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
SW	Windows	External Wall 1	South West	10.10	0
SE	Windows	External Wall 1	South East	1.80	0
NW	Windows	External Wall 1	North West	2.20	0
RL	RLs	FR	Horizontal	7.40	0

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	
17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E5 Ground floor (normal)	Gov Approved Scheme	30.20	0.05	0.05	Yes
E14 Flat roof	Table K1 - Default	30.20	0.16	0.16	Yes
E16 Corner (normal)	Gov Approved Scheme	15.00	0.04	0.04	No
E18 Party wall between dwellings	Gov Approved Scheme	5.00	0.03	0.03	Yes
E1 Steel lintel with perforated steel base plate	Gov Approved Scheme	7.00	0.30	0.30	No
E3 Sill	Gov Approved Scheme	3.80	0.03	0.03	No
E4 Jamb	Gov Approved Scheme	23.20	0.02	0.02	No
E6 Intermediate floor within a dwelling	Gov Approved Scheme	20.10	0.00	0.00	No

Y-value	0.06	W/m²K
18.0 Pressure Testing	Yes	
Designed AP_{50}	3.00	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500811
Configuration	2
Manufacturer SFP	0.54
Duct Type	Rigid
MVHR Efficiency	88.00
Wet Rooms	2
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)
Duct Installation Specification	Level 1

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System	No

22.0 Lighting

No Fixed Lighting	No

Name	Efficacy	Power	Capacity	Count
Lighting 1	120.00	6	720	40

Summary for Input Data

24.0 Main Heating 1	Manufacturer	
Percentage of Heat	100.00	%
Database Ref. No.	0	
Fuel Type	Mains gas	
SAP Code	102	
In Winter	89.50	
In Summer	82.00	
Model Name	GB	
Manufacturer	GB	
Controls SAP Code	2110	
Delayed Start Stat	Yes	
Burner Control	On/Off	
HETAS approved System	No	
Oil Pump Inside	No	
Flue Type	None or Unknown	
Fan Assisted Flue	No	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators	
Flow Temperature	Unknown	
Boiler Interlock	Yes	
Combi boiler type	No Combi	
25.0 Main Heating 2	None	
26.0 Heat Networks	None	
28.0 Water Heating		
Water Heating	Main Heating 1	
SAP Code	901	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	Yes	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
Summer Immersion	No	
Cold Water Source	From mains	
Bath Count	0	
Supplementary Immersion	No	
Immersion Only Heating Hot Water	No	

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
S1	Vented hot water system + pump	12.00		Yes	Instantaneous System 1
S2	Vented hot water system + pump	12.00		Yes	Instantaneous System 1

28.3 Waste Water Heat Recovery System Instantaneous System 1		
Database ID	80194	
Brand Model	Zypho, Slim DW50	
Details	Year: 2022 + current Efficiency: 44.7 Utilisation factor: 0.987	
29.0 Hot Water Cylinder	Hot Water Cylinder	

Summary for Input Data

Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	150.00	L
Loss	1.12	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	

31.0 Thermal Store None

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Property Reference	Unit 2	Issued on Date	04/05/2024
Assessment Reference	Unit 2 - Be Lean	Prop Type Ref	
Property			

SAP Rating	86 B	DER	11.30	TER	10.18
Environmental	91 B	% DER < TER			-11.00
CO_2 Emissions (t/year)	0.82	DFEE	33.57	TFEE	38.18
Compliance Check	See BREL	% DFEE < TFEE			12.09
% DPER < TPER	-21.66	DPER	64.38	TPER	52.92

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	44.9000 (1b)	x	2.5000 (2b)	=	112.2500	(1b) - (3b)
First floor	34.2000 (1c)	x	2.5000 (2c)	=	85.5000	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.1000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	197.7500	(5)

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	79.2000	(23c)

Effective ac	0.2666	0.2634	0.2602	0.2442	0.2411	0.2251	0.2251	0.2219	0.2315	0.2411	0.2474	0.2538	(25)

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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)			14.1000	1.1450	16.1450			(27)
RL			7.4000	1.1450	8.4733			(27a)
Heatloss Floor 1			44.9000	0.1000	4.4900	75.0000	3367.5000	(28a)
External Wall 1	84.5000	14.1000	70.4000	0.1600	11.2640	70.0000	4928.0000	(29a)
FR	44.9000	7.4000	37.5000	0.1000	3.7500	9.0000	337.5000	(30)
Total net area of external elements Aum(A, m2)			174.3000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.1223			(33)
Party Wall 1			19.2500	0.0000	0.0000	45.0000	866.2500	(32)
Internal Wall 1			64.0000			9.0000	576.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 10075.2500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	127.3736	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E5 Ground floor (normal)	30.2000	0.0480	1.4496	
E14 Flat roof	30.2000	0.1600	4.8320	
E16 Corner (normal)	15.0000	0.0350	0.5250	
E18 Party wall between dwellings	5.0000	0.0330	0.1650	
E1 Steel lintel with perforated steel base plate	7.0000	0.3020	2.1140	
E3 Sill	3.8000	0.0290	0.1102	
E4 Jamb	23.2000	0.0240	0.5568	
E6 Intermediate floor within a dwelling	20.1000	0.0010	0.0201	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				9.7727 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	53.8950 (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	17.3952	17.1872	16.9792	15.9391	15.7311	14.6911	14.6911	14.4831	15.1071	15.7311	16.1472	16.5632	(38)
Heat transfer coeff	71.2902	71.0822	70.8742	69.8342	69.6262	68.5861	68.5861	68.3781	69.0021	69.6262	70.0422	70.4582	(39)
Average = Sum(39)m / 12 =												69.7822	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9013	0.8986	0.8960	0.8829	0.8802	0.8671	0.8671	0.8645	0.8723	0.8802	0.8855	0.8907	(40)
HLP (average)												0.8822	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4456	(42)
Hot water usage for mixer showers	125.6645	123.7761	121.0241	115.7589	111.8732	107.5400	105.0770	107.8081	110.8018	115.4544	120.8328	125.1831	(42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses	39.6750	38.2323	36.7896	35.3468	33.9041	32.4614	32.4614	33.9041	35.3468	36.7896	38.2323	39.6750	(42c)
Average daily hot water use (litres/day)												151.9267	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	165.3396	162.0083	157.8137	151.1057	145.7773	140.0014	137.5384	141.7122	146.1487	152.2440	159.0651	164.8581	(44)
Energy conte	261.8574	230.6977	242.5538	206.8561	196.2443	172.1480	166.3407	175.4693	180.2159	206.5936	226.6173	258.1279	(45)
Energy content (annual)										Total = Sum(45)m =		2523.7221	
Distribution loss (46)m = 0.15 x (45)m	39.2786	34.6047	36.3831	31.0284	29.4366	25.8222	24.9511	26.3204	27.0324	30.9890	33.9926	38.7192	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.1200	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.6048	(55)
Total storage loss	18.7488	16.9344	18.7488	18.1440	18.7488	18.1440	18.7488	18.7488	18.1440	18.7488	18.1440	18.7488	(56)
If cylinder contains dedicated solar storage	18.7488	16.9344	18.7488	18.1440	18.7488	18.1440	18.7488	18.7488	18.1440	18.7488	18.1440	18.7488	(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	303.8686	268.6433	284.5650	247.5121	238.2555	212.8040	208.3519	217.4805	220.8719	248.6048	267.2733	300.1391	(62)
WWHRS	-71.8415	-63.5372	-66.5325	-55.0915	-51.3433	-43.9349	-41.1819	-43.7929	-45.4567	-53.5884	-60.7092	-70.5111	(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	232.0271	205.1061	218.0325	192.4206	186.9122	168.8692	167.1700	173.6876	175.4152	195.0164	206.5641	229.6280	(64)
										Total per year (kWh/year) = Sum(64)m =		2350.8489	(64)
12Total per year (kWh/year)												2351	(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	120.6766	107.0635	114.2581	101.3045	98.8602	89.7640	88.9173	91.9525	92.4466	102.3013	107.8751	119.4365	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	109.7286	121.4853	109.7286	113.3862	109.7286	113.3862	109.7286	109.7286	113.3862	109.7286	113.3862	109.7286	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	217.5493	219.8067	214.1180	202.0072	186.7196	172.3514	162.7525	160.4951	166.1838	178.2946	193.5822	207.9504	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	(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)	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	(71)
Water heating gains (Table 5)	162.1997	159.3206	153.5727	140.7006	132.8766	124.6722	119.5124	123.5921	128.3980	137.5018	149.8265	160.5329	(72)
Total internal gains	552.1610	563.2961	540.1027	518.7776	492.0083	470.0933	451.6770	453.4992	467.6516	488.2084	519.4784	540.8954	(73)

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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	
Southeast	1.8000	36.7938	0.6300	0.7000	0.7700	20.2404	(77)
Southwest	10.1000	36.7938	0.6300	0.7000	0.7700	113.5712	(79)
Northwest	2.2000	11.2829	0.6300	0.7000	0.7700	7.5861	(81)
Horizontal	7.4000	26.0000	0.6300	0.7000	1.0000	76.3636	(82)

Solar gains	217.7612	401.9736	621.6434	872.6645	1058.1494	1082.5760	1030.6208	889.5958	709.3457	464.6289	266.7437	182.3883	(83)

Total gains	769.9222	965.2697	1161.7462	1391.4421	1550.1577	1552.6693	1482.2979	1343.0949	1176.9973	952.8373	786.2221	723.2837	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	39.2576	39.3724	39.4880	40.0761	40.1958	40.8054	40.8054	40.9295	40.5593	40.1958	39.9571	39.7212	
alpha	3.6172	3.6248	3.6325	3.6717	3.6797	3.7204	3.7204	3.7286	3.7040	3.6797	3.6638	3.6481	
util living area	0.9157	0.8450	0.7337	0.5650	0.4078	0.2809	0.2032	0.2334	0.3960	0.6681	0.8606	0.9282	(86)
MIT	19.8394	20.2135	20.5803	20.8584	20.9628	20.9931	20.9984	20.9974	20.9757	20.7893	20.2866	19.7712	(87)
Th 2	20.1664	20.1687	20.1709	20.1821	20.1843	20.1956	20.1956	20.1978	20.1911	20.1843	20.1799	20.1754	(88)
util rest of house	0.9044	0.8272	0.7081	0.5335	0.3742	0.2461	0.1662	0.1930	0.3520	0.6306	0.8412	0.9183	(89)
MIT 2	18.8327	19.2880	19.7215	20.0416	20.1515	20.1906	20.1948	20.1964	20.1725	19.9790	19.3944	18.7554	(90)
Living area fraction										fLA = Living area / (4) =		0.2882	(91)
MIT	19.1229	19.5548	19.9690	20.2770	20.3854	20.4219	20.4264	20.4273	20.4040	20.2126	19.6516	19.0482	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.9729	19.4048	19.8190	20.1270	20.2354	20.2719	20.2764	20.2773	20.2540	20.0626	19.5016	18.8982	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8849	0.8088	0.6965	0.5313	0.3764	0.2495	0.1699	0.1970	0.3555	0.6247	0.8229	0.8997	(94)
Useful gains	681.3286	780.7360	809.2091	739.3152	583.4030	387.3205	251.8637	264.6193	418.3684	595.2321	646.9780	650.7114	(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	1046.0329	1031.0300	943.9736	784.0298	594.2867	389.0148	252.1513	265.1213	424.6393	658.8453	868.6319	1035.6076	(97)
Space heating kWh	271.3400	168.1975	100.2647	32.1945	8.0974	0.0000	0.0000	0.0000	0.0000	47.3282	159.5908	286.3628	(98a)
Space heating requirement - total per year (kWh/year)												1073.3761	
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	271.3400	168.1975	100.2647	32.1945	8.0974	0.0000	0.0000	0.0000	0.0000	47.3282	159.5908	286.3628	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1073.3761	
Space heating per m2											(98c) / (4) =	13.5699	(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 %)												89.5000	(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													
	271.3400	168.1975	100.2647	32.1945	8.0974	0.0000	0.0000	0.0000	0.0000	47.3282	159.5908	286.3628	(98)
Space heating efficiency (main heating system 1)													
	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)													
	303.1732	187.9302	112.0277	35.9716	9.0474	0.0000	0.0000	0.0000	0.0000	52.8807	178.3138	319.9584	(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													
	232.0271	205.1061	218.0325	192.4206	186.9122	168.8692	167.1700	173.6876	175.4152	195.0164	206.5641	229.6280	(64)
Efficiency of water heater												82.0000	(216)
(217)m	85.8793	85.2175	84.2232	82.9969	82.2863	82.0000	82.0000	82.0000	82.0000	83.3643	85.1085	85.9995	(217)
Fuel for water heating, kWh/month													
	270.1781	240.6853	258.8745	231.8408	227.1485	205.9380	203.8658	211.8142	213.9210	233.9328	242.7068	267.0108	(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	17.3130	15.6376	17.3130	16.7546	17.3130	16.7546	17.3130	17.3130	16.7546	17.3130	16.7546	17.3130	(231)
Lighting	20.7044	16.6098	14.9553	10.9569	8.4634	6.9147	7.7206	10.0356	13.0352	17.1029	19.3177	21.2798	(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												1199.3029	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												82.0000	
Water heating fuel used												2807.9164	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6750)													
mechanical ventilation fans (SFP = 0.6750)												162.8471	(230a)
central heating pump												41.0000	(230c)

Total electricity for the above, kWh/year	203.8471	(231)
Electricity for lighting (calculated in Appendix L)	167.0964	(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	4378.1629	(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	1199.3029	0.2100	251.8536	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2807.9164	0.2100	589.6624	(264)
Space and water heating			841.5161	(265)
Pumps, fans and electric keep-hot	203.8471	0.1387	28.2761	(267)
Energy for lighting	167.0964	0.1443	24.1172	(268)
Total CO2, kg/year			893.9093	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.3000	(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	1199.3029	1.1300	1355.2123	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2807.9164	1.1300	3172.9455	(278)
Space and water heating			4528.1578	(279)
Pumps, fans and electric keep-hot	203.8471	1.5128	308.3799	(281)
Energy for lighting	167.0964	1.5338	256.2981	(282)
Total Primary energy kWh/year			5092.8358	(286)
Dwelling Primary energy Rate (DPER)			64.3800	(287)

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

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		44.9000 (1b)	x	2.5000 (2b)	=	112.2500	(1b) - (3b)
First floor		34.2000 (1c)	x	2.5000 (2c)	=	85.5000	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.1000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	197.7500	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1517	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4017	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3415	(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	0.4353	0.4268	0.4183	0.3756	0.3671	0.3244	0.3244	0.3158	0.3415	0.3671	0.3841	0.4012	(22b)
Effective ac	0.5948	0.5911	0.5875	0.5705	0.5674	0.5526	0.5526	0.5499	0.5583	0.5674	0.5738	0.5805	(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 Opening Type (Uw = 1.20)			12.9700	1.1450	14.8511			(27)
RL			6.8100	1.5918	10.8399			(27a)
Heatloss Floor 1			44.9000	0.1300	5.8370			(28a)
External Wall 1	84.5000	12.9700	71.5300	0.1800	12.8754			(29a)
FR	44.9000	6.8100	38.0900	0.1100	4.1899			(30)
Total net area of external elements Aum(A, m2)			174.3000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	48.5933			(33)
Party Wall 1			19.2500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 127.3736 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	30.2000	0.1600	4.8320
E14 Flat roof	30.2000	0.0800	2.4160
E16 Corner (normal)	15.0000	0.0900	1.3500
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E1 Steel lintel with perforated steel base plate	7.0000	0.0500	0.3500
E3 Sill	3.8000	0.0500	0.1900
E4 Jamb	23.2000	0.0500	1.1600
E6 Intermediate floor within a dwelling	20.1000	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.5980 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 59.1913 (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	38.8129	38.5727	38.3373	37.2318	37.0249	36.0620	36.0620	35.8837	36.4329	37.0249	37.4434	37.8808	(38)
Heat transfer coeff	98.0042	97.7641	97.5287	96.4231	96.2162	95.2533	95.2533	95.0750	95.6242	96.2162	96.6347	97.0722	(39)
Average = Sum(39)m / 12 =												96.4221	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2390	1.2360	1.2330	1.2190	1.2164	1.2042	1.2042	1.2020	1.2089	1.2164	1.2217	1.2272	(40)
HLP (average)												1.2190	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4456 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	83.7764	82.5174	80.6828	77.1726	74.5822	71.6933	70.0513	71.8720	73.8679	76.9696	80.5552	83.4554	(42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses	39.6750	38.2323	36.7896	35.3468	33.9041	32.4614	32.4614	33.9041	35.3468	36.7896	38.2323	39.6750	(42c)
Average daily hot water use (litres/day)												113.3072	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	123.4514	120.7496	117.4723	112.5194	108.4862	104.1547	102.5127	105.7761	109.2147	113.7592	118.7875	123.1304	(44)
Energy conte	195.5168	171.9459	180.5506	154.0334	146.0433	128.0704	123.9802	130.9730	134.6727	154.3701	169.2345	192.7924	(45)
Energy content (annual)										Total = Sum(45)m =		1882.1833	
Distribution loss (46)m = 0.15 x (45)m	29.3275	25.7919	27.0826	23.1050	21.9065	19.2106	18.5970	19.6459	20.2009	23.1555	25.3852	28.9189	(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	242.1117	214.0316	227.1455	199.1253	192.6382	173.1622	170.5751	177.5679	179.7645	200.9650	214.3264	239.3873	(62)
WWHRS	-38.2991	-33.8720	-35.4688	-29.3696	-27.3714	-23.4219	-21.9543	-23.3462	-24.2332	-28.5683	-32.3644	-37.5898	(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	203.8126	180.1596	191.6767	169.7557	165.2669	149.7403	148.6208	154.2217	155.5313	172.3967	181.9620	201.7975	(64)
										Total per year (kWh/year) = Sum(64)m =		2074.9419	(64)
12Total per year (kWh/year)												2075	(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	102.2853	90.8406	97.3090	87.2896	85.8353	78.6569	78.4993	80.8244	80.8521	88.6040	92.3440	101.3794	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	109.7286	121.4853	109.7286	113.3862	109.7286	113.3862	109.7286	109.7286	113.3862	109.7286	113.3862	109.7286	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	217.5493	219.8067	214.1180	202.0072	186.7196	172.3514	162.7525	160.4951	166.1838	178.2946	193.5822	207.9504	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	(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)	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	(71)
Water heating gains (Table 5)	137.4802	135.1794	130.7916	121.2355	115.3701	109.2456	105.5099	108.6350	112.2946	119.0914	128.2555	136.2626	(72)
Total internal gains	527.4415	539.1549	517.3217	499.3125	474.5017	454.6667	437.6745	438.5421	451.5481	469.7980	497.9074	516.6251	(73)

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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	
Southeast	1.6600	36.7938	0.6300	0.7000	0.7700	18.6662	(77)
Southwest	9.2900	36.7938	0.6300	0.7000	0.7700	104.4630	(79)
Northwest	2.0200	11.2829	0.6300	0.7000	0.7700	6.9654	(81)
Horizontal	6.8100	26.0000	0.6300	0.7000	1.0000	70.2751	(82)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	200.3697	369.8688	571.9900	802.9523	973.6110	996.0818	948.2795	818.5278	652.6845	427.5190	245.4400	167.8219	(83)
Total gains	727.8112	909.0237	1089.3117	1302.2647	1448.1127	1450.7485	1385.9539	1257.0699	1104.2326	897.3170	743.3473	684.4470	(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	28.5567	28.6269	28.6960	29.0250	29.0874	29.3814	29.3814	29.4366	29.2675	29.0874	28.9614	28.8309	
alpha	2.9038	2.9085	2.9131	2.9350	2.9392	2.9588	2.9588	2.9624	2.9512	2.9392	2.9308	2.9221	
util living area	0.9449	0.9031	0.8322	0.7036	0.5504	0.4009	0.2962	0.3378	0.5370	0.7853	0.9126	0.9525	(86)
MIT	18.9536	19.3746	19.9033	20.4567	20.7879	20.9388	20.9813	20.9723	20.8546	20.3574	19.5591	18.8819	(87)
Th 2	19.8889	19.8913	19.8937	19.9048	19.9069	19.9166	19.9166	19.9184	19.9129	19.9069	19.9027	19.8983	(88)
util rest of house	0.9356	0.8880	0.8077	0.6653	0.4994	0.3388	0.2257	0.2622	0.4681	0.7454	0.8963	0.9445	(89)
MIT 2	17.5457	18.0679	18.7115	19.3629	19.7217	19.8751	19.9080	19.9048	19.8040	19.2756	18.3149	17.4620	(90)
Living area fraction									fLA = Living area / (4) =			0.2882	(91)
MIT	17.9515	18.4446	19.0550	19.6782	20.0290	20.1817	20.2174	20.2125	20.1068	19.5875	18.6736	17.8713	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.9515	18.4446	19.0550	19.6782	20.0290	20.1817	20.2174	20.2125	20.1068	19.5875	18.6736	17.8713	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9142	0.8637	0.7862	0.6568	0.5053	0.3543	0.2456	0.2832	0.4809	0.7322	0.8733	0.9244	(94)
Useful gains	665.3609	785.1109	856.4438	855.2897	731.7327	514.0619	340.3384	355.9445	531.0733	656.9993	649.1438	632.7154	(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	1337.9060	1324.1722	1224.4756	1039.2651	801.3843	531.6728	344.5690	362.4718	574.3996	864.7390	1118.4069	1327.1019	(97)
Space heating kWh	500.3735	362.2492	273.8156	132.4623	51.8207	0.0000	0.0000	0.0000	0.0000	154.5583	337.8695	516.6235	(98a)
Space heating requirement - total per year (kWh/year)												2329.7727	
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	500.3735	362.2492	273.8156	132.4623	51.8207	0.0000	0.0000	0.0000	0.0000	154.5583	337.8695	516.6235	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2329.7727	
Space heating per m2										(98c) / (4) =		29.4535	(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	500.3735	362.2492	273.8156	132.4623	51.8207	0.0000	0.0000	0.0000	0.0000	154.5583	337.8695	516.6235	(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)	542.1165	392.4693	296.6583	143.5128	56.1438	0.0000	0.0000	0.0000	0.0000	167.4521	366.0558	559.7222	(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	203.8126	180.1596	191.6767	169.7557	165.2669	149.7403	148.6208	154.2217	155.5313	172.3967	181.9620	201.7975	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.9930	85.5936	84.8591	83.5097	81.7785	79.8000	79.8000	79.8000	79.8000	83.8157	85.4275	86.0733	(217)
Fuel for water heating, kWh/month	237.0108	210.4825	225.8764	203.2766	202.0908	187.6445	186.2416	193.2602	194.9014	205.6856	213.0017	234.4486	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	22.7994	18.2906	16.4686	12.0656	9.3198	7.6144	8.5019	11.0510	14.3542	18.8335	21.2724	23.4331	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-40.6065	-56.5468	-80.3079	-89.1910	-95.2670	-88.6010	-87.4904	-83.0185	-75.0158	-64.1189	-44.3859	-35.1884	(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	-25.1360	-52.6071	-104.0690	-155.6051	-205.0846	-205.8232	-203.4117	-172.5424	-126.8808	-75.0117	-33.4867	-19.8985	(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	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2524.1308	(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	2493.9208	(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)	184.0045	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2219.2950	(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	3068.7611	(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	2524.1308	0.2100	530.0675	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2493.9208	0.2100	523.7234	(264)
Space and water heating			1053.7908	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	184.0045	0.1443	26.5575	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-839.7381	0.1348	-113.2347	
PV Unit electricity exported	-1379.5569	0.1260	-173.8629	
Total			-287.0976	(269)
Total CO2, kg/year			805.1800	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.1800	(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	2524.1308	1.1300	2852.2678	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2493.9208	1.1300	2818.1305	(278)
Space and water heating			5670.3983	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	184.0045	1.5338	282.2323	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-839.7381	1.4984	-1258.2464	
PV Unit electricity exported	-1379.5569	0.4626	-638.2049	
Total			-1896.4513	(283)
Total Primary energy kWh/year			4186.2801	(286)
Target Primary Energy Rate (TPER)			52.9200	(287)

Full SAP Calculation Printout

Property Reference	Unit 2	**Issued on Date**	04/05/2024
Assessment Reference	Unit 2 - Be Lean	**Prop Type Ref**	
Property			

SAP Rating	86 B	**DER**	11.30	**TER**	10.18
Environmental	91 B	**% DER < TER**			-11.00
CO_2 Emissions (t/year)	0.82	**DFEE**	33.57	**TFEE**	38.18
Compliance Check	See BREL	**% DFEE < TFEE**			12.09
% DPER < TPER	-21.66	**DPER**	64.38	**TPER**	52.92

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	44.9000 (1b)	x	2.5000 (2b)	=	112.2500	(1b) - (3b)
First floor	34.2000 (1c)	x	2.5000 (2c)	=	85.5000	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.1000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	197.7500	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1517	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3017	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2565	(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	0.3270	0.3206	0.3142	0.2821	0.2757	0.2436	0.2436	0.2372	0.2565	0.2757	0.2885	0.3013	(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	0.5535	0.5514	0.5493	0.5398	0.5380	0.5297	0.5297	0.5281	0.5329	0.5380	0.5416	0.5454	(25)

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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)			14.1000	1.1450	16.1450			(27)
RL			7.4000	1.1450	8.4733			(27a)
Heatloss Floor 1			44.9000	0.1000	4.4900	75.0000	3367.5000	(28a)
External Wall 1	84.5000	14.1000	70.4000	0.1600	11.2640	70.0000	4928.0000	(29a)
FR	44.9000	7.4000	37.5000	0.1000	3.7500	9.0000	337.5000	(30)
Total net area of external elements Aum(A, m2)			174.3000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		44.1223			(33)
Party Wall 1			19.2500	0.0000	0.0000	45.0000	866.2500	(32)
Internal Wall 1			64.0000			9.0000	576.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10075.2500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		127.3736 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	30.2000	0.0480	1.4496
E14 Flat roof	30.2000	0.1600	4.8320
E16 Corner (normal)	15.0000	0.0350	0.5250

E18 Party wall between dwellings	5.0000	0.0330	0.1650	
E1 Steel lintel with perforated steel base plate	7.0000	0.3020	2.1140	
E3 Sill	3.8000	0.0290	0.1102	
E4 Jamb	23.2000	0.0240	0.5568	
E6 Intermediate floor within a dwelling	20.1000	0.0010	0.0201	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.7727 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 53.8950 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.1172	35.9817	35.8489	35.2253	35.1086	34.5654	34.5654	34.4648	34.7746	35.1086	35.3446	35.5914	(38)
Heat transfer coeff	90.0122	89.8767	89.7440	89.1203	89.0036	88.4604	88.4604	88.3599	88.6697	89.0036	89.2397	89.4864	(39)
Average = Sum(39)m / 12 =												89.1197	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1380	1.1362	1.1346	1.1267	1.1252	1.1183	1.1183	1.1171	1.1210	1.1252	1.1282	1.1313	(40)
HLP (average)												1.1267	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4456 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

28.1716	27.7532	27.1640	26.0777	25.2642	24.3623	23.8751	24.4601	25.0971	26.0623	27.1710	28.0763	(42b)

Hot water usage for other uses

39.6750	38.2323	36.7896	35.3468	33.9041	32.4614	32.4614	33.9041	35.3468	36.7896	38.2323	39.6750	(42c)

Average daily hot water use (litres/day) 62.1877 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	67.8466	65.9855	63.9536	61.4245	59.1683	56.8236	56.3364	58.3642	60.4440	62.8518	65.4033	67.7513	(44)
Energy conte	107.4524	93.9624	98.2942	84.0871	79.6519	69.8713	68.1340	72.2671	74.5334	85.2893	93.1789	106.0822	(45)
Energy content (annual)											Total = Sum(45)m =	1032.8044	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

91.3345	79.8681	83.5501	71.4740	67.7042	59.3906	57.9139	61.4270	63.3534	72.4959	79.2021	90.1699	(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

91.3345	79.8681	83.5501	71.4740	67.7042	59.3906	57.9139	61.4270	63.3534	72.4959	79.2021	90.1699	(64)
									Total per year (kWh/year) = Sum(64)m =		877.8837	(64)
12Total per year (kWh/year)											878	(64)

Electric shower(s)

52.2334	46.5403	50.8203	48.4972	49.4072	47.1297	48.7007	49.4072	48.4972	50.8203	49.8647	52.2334	(64a)
				Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							594.1513	(64a)

Heat gains from water heating, kWh/month

35.8920	31.6021	33.5926	29.9928	29.2778	26.6301	26.6536	27.7086	27.9626	30.8291	32.2667	35.6008	(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	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	109.7286	121.4853	109.7286	113.3862	109.7286	113.3862	109.7286	109.7286	113.3862	109.7286	113.3862	109.7286	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	217.5493	219.8067	214.1180	202.0072	186.7196	172.3514	162.7525	160.4951	166.1838	178.2946	193.5822	207.9504	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	(71)
Water heating gains (Table 5)	48.2419	47.0269	45.1513	41.6567	39.3519	36.9862	35.8248	37.2427	38.8370	41.4369	44.8148	47.8506	(72)
Total internal gains	435.2032	448.0024	428.6814	416.7336	395.4836	382.4073	367.9894	367.1498	378.0905	389.1435	411.4667	425.2130	(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	
Southeast	1.8000	36.7938	0.6300	0.7000	0.7700	20.2404	(77)
Southwest	10.1000	36.7938	0.6300	0.7000	0.7700	113.5712	(79)
Northwest	2.2000	11.2829	0.6300	0.7000	0.7700	7.5861	(81)
Horizontal	7.4000	26.0000	0.6300	0.7000	1.0000	76.3636	(82)

Solar gains	217.7612	401.9736	621.6434	872.6645	1058.1494	1082.5760	1030.6208	889.5958	709.3457	464.6289	266.7437	182.3883	(83)
Total gains	652.9645	849.9760	1050.3248	1289.3981	1453.6330	1464.9832	1398.6102	1256.7456	1087.4362	853.7724	678.2104	607.6013	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	31.0922	31.1391	31.1852	31.4034	31.4446	31.6377	31.6377	31.6737	31.5630	31.4446	31.3614	31.2749	
alpha	3.0728	3.0759	3.0790	3.0936	3.0963	3.1092	3.1092	3.1116	3.1042	3.0963	3.0908	3.0850	
util living area	0.9549	0.9093	0.8289	0.6846	0.5218	0.3739	0.2745	0.3168	0.5170	0.7855	0.9234	0.9627	(86)
MIT	19.0457	19.5017	20.0423	20.5638	20.8456	20.9588	20.9882	20.9815	20.8893	20.4314	19.6316	18.9556	(87)
Th 2	19.9700	19.9713	19.9727	19.9791	19.9803	19.9859	19.9859	19.9869	19.9837	19.9803	19.9779	19.9753	(88)
util rest of house	0.9473	0.8955	0.8051	0.6476	0.4745	0.3185	0.2128	0.2496	0.4529	0.7474	0.9092	0.9563	(89)
MIT 2	18.2107	18.6525	19.1645	19.6394	19.8749	19.9638	19.9815	19.9796	19.9185	19.5414	18.7913	18.1265	(90)
Living area fraction										fLA = Living area / (4) =		0.2882	(91)
MIT	18.4514	18.8972	19.4175	19.9059	20.1547	20.2506	20.2717	20.2684	20.1984	19.7979	19.0335	18.3655	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4514	18.8972	19.4175	19.9059	20.1547	20.2506	20.2717	20.2684	20.1984	19.7979	19.0335	18.3655	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9331	0.8783	0.7907	0.6447	0.4828	0.3332	0.2303	0.2685	0.4670	0.7398	0.8931	0.9433	(94)
Useful gains	609.2582	746.5106	830.5222	831.3380	701.8258	488.0813	322.1284	337.4604	507.7878	631.6000	605.6979	573.1646	(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	1273.7991	1258.0270	1159.2683	980.8456	752.4981	499.8550	324.7980	341.8106	540.7403	818.6502	1064.9409	1267.6163	(97)
Space heating kWh	494.4184	343.7390	244.5871	107.6455	37.7002	0.0000	0.0000	0.0000	0.0000	139.1654	330.6550	516.6720	(98a)
Space heating requirement - total per year (kWh/year)												2214.5825	
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	494.4184	343.7390	244.5871	107.6455	37.7002	0.0000	0.0000	0.0000	0.0000	139.1654	330.6550	516.6720	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2214.5825	
Space heating per m2											(98c) / (4) =	27.9973	(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	831.5281	654.6073	671.5349	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9297	0.9558	0.9397	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	773.1081	625.6882	631.0321	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1571.0332	1501.0461	1353.2384	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	574.5061	651.2663	537.3215	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	143.6265	162.8166	134.3304	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												440.7735	(107)
Energy for space heating												27.9973	(99)
Energy for space cooling												5.5724	(108)
Total												33.5696	(109)
Fabric Energy Efficiency (DFEE)												33.6	(109)

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

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		44.9000 (1b)	x	2.5000 (2b)	=	112.2500	(1b) - (3b)
First floor		34.2000 (1c)	x	2.5000 (2c)	=	85.5000	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.1000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		197.7500	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1517	(8)
Pressure test		Yes	

Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.4017	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.3415	(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	0.4353	0.4268	0.4183	0.3756	0.3671	0.3244	0.3244	0.3158	0.3415	0.3671	0.3841	0.4012	(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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5948	0.5911	0.5875	0.5705	0.5674	0.5526	0.5526	0.5499	0.5583	0.5674	0.5738	0.5805	(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 Opening Type (Uw = 1.20)			12.9700	1.1450	14.8511			(27)
RL			6.8100	1.5918	10.8399			(27a)
Heatloss Floor 1			44.9000	0.1300	5.8370			(28a)
External Wall 1	84.5000	12.9700	71.5300	0.1800	12.8754			(29a)
FR	44.9000	6.8100	38.0900	0.1100	4.1899			(30)
Total net area of external elements Aum(A, m2)			174.3000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		48.5933			(33)
Party Wall 1			19.2500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	127.3736	(35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E5	Ground floor (normal)	30.2000	0.1600	4.8320
E14	Flat roof	30.2000	0.0800	2.4160
E16	Corner (normal)	15.0000	0.0900	1.3500
E18	Party wall between dwellings	5.0000	0.0600	0.3000
E1	Steel lintel with perforated steel base plate	7.0000	0.0500	0.3500
E3	Sill	3.8000	0.0500	0.1900
E4	Jamb	23.2000	0.0500	1.1600
E6	Intermediate floor within a dwelling	20.1000	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	10.5980	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	59.1913	(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	38.8129	38.5727	38.3373	37.2318	37.0249	36.0620	36.0620	35.8837	36.4329	37.0249	37.4434	37.8808	(38)
Heat transfer coeff	98.0042	97.7641	97.5287	96.4231	96.2162	95.2533	95.2533	95.0750	95.6242	96.2162	96.6347	97.0722	(39)
Average = Sum(39)m / 12 =												96.4221	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2390	1.2360	1.2330	1.2190	1.2164	1.2042	1.2042	1.2020	1.2089	1.2164	1.2217	1.2272	(40)
HLP (average)												1.2190	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4456	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	28.1716	27.7532	27.1640	26.0777	25.2642	24.3623	23.8751	24.4601	25.0971	26.0623	27.1710	28.0763	(42b)
Hot water usage for other uses	39.6750	38.2323	36.7896	35.3468	33.9041	32.4614	32.4614	33.9041	35.3468	36.7896	38.2323	39.6750	(42c)
Average daily hot water use (litres/day)												62.1877	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	67.8466	65.9855	63.9536	61.4245	59.1683	56.8236	56.3364	58.3642	60.4440	62.8518	65.4033	67.7513	(44)
Energy conte	107.4524	93.9624	98.2942	84.0871	79.6519	69.8713	68.1340	72.2671	74.5334	85.2893	93.1789	106.0822	(45)
Energy content (annual)										Total = Sum(45)m =		1032.8044	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	91.3345	79.8681	83.5501	71.4740	67.7042	59.3906	57.9139	61.4270	63.3534	72.4959	79.2021	90.1699	(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	91.3345	79.8681	83.5501	71.4740	67.7042	59.3906	57.9139	61.4270	63.3534	72.4959	79.2021	90.1699	(64)
									Total per year (kWh/year) = Sum(64)m =			877.8837	(64)
12Total per year (kWh/year)												878	(64)
Electric shower(s)	52.2334	46.5403	50.8203	48.4972	49.4072	47.1297	48.7007	49.4072	48.4972	50.8203	49.8647	52.2334	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			594.1513	(64a)
Heat gains from water heating, kWh/month	35.8920	31.6021	33.5926	29.9928	29.2778	26.6301	26.6536	27.7086	27.9626	30.8291	32.2667	35.6008	(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	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	109.7286	121.4853	109.7286	113.3862	109.7286	113.3862	109.7286	109.7286	113.3862	109.7286	113.3862	109.7286	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	217.5493	219.8067	214.1180	202.0072	186.7196	172.3514	162.7525	160.4951	166.1838	178.2946	193.5822	207.9504	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	(71)
Water heating gains (Table 5)													
	48.2419	47.0269	45.1513	41.6567	39.3519	36.9862	35.8248	37.2427	38.8370	41.4369	44.8148	47.8506	(72)
Total internal gains													
	435.2032	448.0024	428.6814	416.7336	395.4836	382.4073	367.9894	367.1498	378.0905	389.1435	411.4667	425.2130	(73)

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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	
Southeast	1.6600	36.7938	0.6300	0.7000	0.7700	18.6662	(77)
Southwest	9.2900	36.7938	0.6300	0.7000	0.7700	104.4630	(79)
Northwest	2.0200	11.2829	0.6300	0.7000	0.7700	6.9654	(81)
Horizontal	6.8100	26.0000	0.6300	0.7000	1.0000	70.2751	(82)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	200.3697	369.8688	571.9900	802.9523	973.6110	996.0818	948.2795	818.5278	652.6845	427.5190	245.4400	167.8219	(83)
Total gains	635.5729	817.8712	1000.6714	1219.6859	1369.0946	1378.4891	1316.2689	1185.6776	1030.7750	816.6625	656.9067	593.0349	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	28.5567	28.6269	28.6960	29.0250	29.0874	29.3814	29.3814	29.4366	29.2675	29.0874	28.9614	28.8309	
alpha	2.9038	2.9085	2.9131	2.9350	2.9392	2.9588	2.9588	2.9624	2.9512	2.9392	2.9308	2.9221	
util living area													
	0.9598	0.9224	0.8561	0.7291	0.5738	0.4193	0.3110	0.3565	0.5656	0.8163	0.9332	0.9663	(86)
MIT	18.7860	19.2311	19.7956	20.3982	20.7628	20.9310	20.9787	20.9680	20.8329	20.2750	19.4174	18.7111	(87)
Th 2	19.8889	19.8913	19.8937	19.9048	19.9069	19.9166	19.9166	19.9184	19.9129	19.9069	19.9027	19.8983	(88)
util rest of house													
	0.9527	0.9098	0.8338	0.6919	0.5221	0.3551	0.2373	0.2773	0.4953	0.7794	0.9200	0.9603	(89)
MIT 2	17.9001	18.3340	18.8742	19.4336	19.7444	19.8799	19.9089	19.9060	19.8142	19.3448	18.5311	17.8331	(90)
Living area fraction									fLA = Living area / (4) =			0.2882	(91)
MIT	18.1555	18.5926	19.1398	19.7116	20.0379	20.1829	20.2173	20.2121	20.1079	19.6129	18.7866	18.0862	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1555	18.5926	19.1398	19.7116	20.0379	20.1829	20.2173	20.2121	20.1079	19.6129	18.7866	18.0862	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9381	0.8913	0.8162	0.6847	0.5285	0.3713	0.2581	0.2993	0.5085	0.7681	0.9030	0.9470	(94)
Useful gains	596.2475	729.0038	816.7471	835.1696	723.6336	511.8216	339.7129	354.8549	524.2000	627.2629	593.1820	561.6293	(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													
	1357.8951	1338.6407	1232.7441	1042.4893	802.2454	531.7853	344.5588	362.4393	574.4961	867.1890	1129.3315	1347.9644	(97)
Space heating kWh													
	566.6658	409.6760	309.5018	149.2702	58.4872	0.0000	0.0000	0.0000	0.0000	178.5051	386.0276	585.0334	(98a)
Space heating requirement - total per year (kWh/year)												2643.1671	
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													
	566.6658	409.6760	309.5018	149.2702	58.4872	0.0000	0.0000	0.0000	0.0000	178.5051	386.0276	585.0334	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2643.1671	
Space heating per m2											(98c) / (4) =	33.4155	(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	895.3812	704.8746	722.5700	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8962	0.9315	0.9102	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	802.4779	656.6199	657.6492	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1477.8432	1412.2751	1276.3789	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	486.2630	562.2075	460.3349	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	121.5658	140.5519	115.0837	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												377.2014	(107)
Energy for space heating												33.4155	(99)
Energy for space cooling												4.7687	(108)
Total												38.1842	(109)
Fabric Energy Efficiency (TFEE)												38.2	(109)

Full SAP Calculation Printout

Property Reference	Unit 2	Issued on Date	04/05/2024
Assessment Reference	Unit 2 - Be Lean	Prop Type Ref	
Property			

SAP Rating	86 B	DER	11.30	TER	10.18
Environmental	91 B	% DER < TER			-11.00
CO_2 Emissions (t/year)	0.82	DFEE	33.57	TFEE	38.18
Compliance Check	See BREL	% DFEE < TFEE			12.09
% DPER < TPER	-21.66	DPER	64.38	TPER	52.92

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	44.9000 (1b)	x	2.5000 (2b)	=	112.2500	(1b) - (3b)
First floor	34.2000 (1c)	x	2.5000 (2c)	=	85.5000	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.1000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	197.7500	(5)

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	79.2000	(23c)

Effective ac	0.2666	0.2634	0.2602	0.2442	0.2411	0.2251	0.2251	0.2219	0.2315	0.2411	0.2474	0.2538	(25)

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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)			14.1000	1.1450	16.1450			(27)
RL			7.4000	1.1450	8.4733			(27a)
Heatloss Floor 1			44.9000	0.1000	4.4900	75.0000	3367.5000	(28a)
External Wall 1	84.5000	14.1000	70.4000	0.1600	11.2640	70.0000	4928.0000	(29a)
FR	44.9000	7.4000	37.5000	0.1000	3.7500	9.0000	337.5000	(30)
Total net area of external elements Aum(A, m2)			174.3000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.1223			(33)
Party Wall 1			19.2500	0.0000	0.0000	45.0000	866.2500	(32)
Internal Wall 1			64.0000			9.0000	576.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 10075.2500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	127.3736	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E5 Ground floor (normal)	30.2000	0.0480	1.4496	
E14 Flat roof	30.2000	0.1600	4.8320	
E16 Corner (normal)	15.0000	0.0350	0.5250	
E18 Party wall between dwellings	5.0000	0.0330	0.1650	
E1 Steel lintel with perforated steel base plate	7.0000	0.3020	2.1140	
E3 Sill	3.8000	0.0290	0.1102	
E4 Jamb	23.2000	0.0240	0.5568	
E6 Intermediate floor within a dwelling	20.1000	0.0010	0.0201	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				9.7727 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	53.8950 (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	17.3952	17.1872	16.9792	15.9391	15.7311	14.6911	14.6911	14.4831	15.1071	15.7311	16.1472	16.5632	(38)
Heat transfer coeff	71.2902	71.0822	70.8742	69.8342	69.6262	68.5861	68.5861	68.3781	69.0021	69.6262	70.0422	70.4582	(39)
Average = Sum(39)m / 12 =												69.7822	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9013	0.8986	0.8960	0.8829	0.8802	0.8671	0.8671	0.8645	0.8723	0.8802	0.8855	0.8907	(40)
HLP (average)												0.8822	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4456	(42)
Hot water usage for mixer showers	125.6645	123.7761	121.0241	115.7589	111.8732	107.5400	105.0770	107.8081	110.8018	115.4544	120.8328	125.1831	(42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses	39.6750	38.2323	36.7896	35.3468	33.9041	32.4614	32.4614	33.9041	35.3468	36.7896	38.2323	39.6750	(42c)
Average daily hot water use (litres/day)												151.9267	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	165.3396	162.0083	157.8137	151.1057	145.7773	140.0014	137.5384	141.7122	146.1487	152.2440	159.0651	164.8581	(44)
Energy conte	261.8574	230.6977	242.5538	206.8561	196.2443	172.1480	166.3407	175.4693	180.2159	206.5936	226.6173	258.1279	(45)
Energy content (annual)										Total = Sum(45)m =		2523.7221	
Distribution loss (46)m = 0.15 x (45)m	39.2786	34.6047	36.3831	31.0284	29.4366	25.8222	24.9511	26.3204	27.0324	30.9890	33.9926	38.7192	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.1200	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.6048	(55)
Total storage loss	18.7488	16.9344	18.7488	18.1440	18.7488	18.1440	18.7488	18.7488	18.1440	18.7488	18.1440	18.7488	(56)
If cylinder contains dedicated solar storage	18.7488	16.9344	18.7488	18.1440	18.7488	18.1440	18.7488	18.7488	18.1440	18.7488	18.1440	18.7488	(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	303.8686	268.6433	284.5650	247.5121	238.2555	212.8040	208.3519	217.4805	220.8719	248.6048	267.2733	300.1391	(62)
WWHRS	-71.8415	-63.5372	-66.5325	-55.0915	-51.3433	-43.9349	-41.1819	-43.7929	-45.4567	-53.5884	-60.7092	-70.5111	(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	232.0271	205.1061	218.0325	192.4206	186.9122	168.8692	167.1700	173.6876	175.4152	195.0164	206.5641	229.6280	(64)
										Total per year (kWh/year) = Sum(64)m =		2350.8489	(64)
12Total per year (kWh/year)												2351	(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	120.6766	107.0635	114.2581	101.3045	98.8602	89.7640	88.9173	91.9525	92.4466	102.3013	107.8751	119.4365	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	109.7286	121.4853	109.7286	113.3862	109.7286	113.3862	109.7286	109.7286	113.3862	109.7286	113.3862	109.7286	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	217.5493	219.8067	214.1180	202.0072	186.7196	172.3514	162.7525	160.4951	166.1838	178.2946	193.5822	207.9504	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	(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)	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	(71)
Water heating gains (Table 5)	162.1997	159.3206	153.5727	140.7006	132.8766	124.6722	119.5124	123.5921	128.3980	137.5018	149.8265	160.5329	(72)
Total internal gains	552.1610	563.2961	540.1027	518.7776	492.0083	470.0933	451.6770	453.4992	467.6516	488.2084	519.4784	540.8954	(73)

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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	
Southeast	1.8000	36.7938	0.6300	0.7000	0.7700	20.2404	(77)
Southwest	10.1000	36.7938	0.6300	0.7000	0.7700	113.5712	(79)
Northwest	2.2000	11.2829	0.6300	0.7000	0.7700	7.5861	(81)
Horizontal	7.4000	26.0000	0.6300	0.7000	1.0000	76.3636	(82)

Solar gains	217.7612	401.9736	621.6434	872.6645	1058.1494	1082.5760	1030.6208	889.5958	709.3457	464.6289	266.7437	182.3883	(83)

Total gains	769.9222	965.2697	1161.7462	1391.4421	1550.1577	1552.6693	1482.2979	1343.0949	1176.9973	952.8373	786.2221	723.2837	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	39.2576	39.3724	39.4880	40.0761	40.1958	40.8054	40.8054	40.9295	40.5593	40.1958	39.9571	39.7212	
alpha	3.6172	3.6248	3.6325	3.6717	3.6797	3.7204	3.7204	3.7286	3.7040	3.6797	3.6638	3.6481	
util living area	0.9157	0.8450	0.7337	0.5650	0.4078	0.2809	0.2032	0.2334	0.3960	0.6681	0.8606	0.9282	(86)
MIT	19.8394	20.2135	20.5803	20.8584	20.9628	20.9931	20.9984	20.9974	20.9757	20.7893	20.2866	19.7712	(87)
Th 2	20.1664	20.1687	20.1709	20.1821	20.1843	20.1956	20.1956	20.1978	20.1911	20.1843	20.1799	20.1754	(88)
util rest of house	0.9044	0.8272	0.7081	0.5335	0.3742	0.2461	0.1662	0.1930	0.3520	0.6306	0.8412	0.9183	(89)
MIT 2	18.8327	19.2880	19.7215	20.0416	20.1515	20.1906	20.1948	20.1964	20.1725	19.9790	19.3944	18.7554	(90)
Living area fraction										fLA = Living area / (4) =		0.2882	(91)
MIT	19.1229	19.5548	19.9690	20.2770	20.3854	20.4219	20.4264	20.4273	20.4040	20.2126	19.6516	19.0482	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.9729	19.4048	19.8190	20.1270	20.2354	20.2719	20.2764	20.2773	20.2540	20.0626	19.5016	18.8982	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8849	0.8088	0.6965	0.5313	0.3764	0.2495	0.1699	0.1970	0.3555	0.6247	0.8229	0.8997	(94)
Useful gains	681.3286	780.7360	809.2091	739.3152	583.4030	387.3205	251.8637	264.6193	418.3684	595.2321	646.9780	650.7114	(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	1046.0329	1031.0300	943.9736	784.0298	594.2867	389.0148	252.1513	265.1213	424.6393	658.8453	868.6319	1035.6076	(97)
Space heating kWh	271.3400	168.1975	100.2647	32.1945	8.0974	0.0000	0.0000	0.0000	0.0000	47.3282	159.5908	286.3628	(98a)
Space heating requirement - total per year (kWh/year)												1073.3761	
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	271.3400	168.1975	100.2647	32.1945	8.0974	0.0000	0.0000	0.0000	0.0000	47.3282	159.5908	286.3628	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1073.3761	
Space heating per m2											(98c) / (4) =	13.5699	(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 %)												89.5000	(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													
	271.3400	168.1975	100.2647	32.1945	8.0974	0.0000	0.0000	0.0000	0.0000	47.3282	159.5908	286.3628	(98)
Space heating efficiency (main heating system 1)													
	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)													
	303.1732	187.9302	112.0277	35.9716	9.0474	0.0000	0.0000	0.0000	0.0000	52.8807	178.3138	319.9584	(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													
	232.0271	205.1061	218.0325	192.4206	186.9122	168.8692	167.1700	173.6876	175.4152	195.0164	206.5641	229.6280	(64)
Efficiency of water heater												82.0000	(216)
(217)m	85.8793	85.2175	84.2232	82.9969	82.2863	82.0000	82.0000	82.0000	82.0000	83.3643	85.1085	85.9995	(217)
Fuel for water heating, kWh/month													
	270.1781	240.6853	258.8745	231.8408	227.1485	205.9380	203.8658	211.8142	213.9210	233.9328	242.7068	267.0108	(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	17.3130	15.6376	17.3130	16.7546	17.3130	16.7546	17.3130	17.3130	16.7546	17.3130	16.7546	17.3130	(231)
Lighting	20.7044	16.6098	14.9553	10.9569	8.4634	6.9147	7.7206	10.0356	13.0352	17.1029	19.3177	21.2798	(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												1199.3029	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												82.0000	
Water heating fuel used												2807.9164	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6750)													
mechanical ventilation fans (SFP = 0.6750)												162.8471	(230a)
central heating pump												41.0000	(230c)

Total electricity for the above, kWh/year	203.8471	(231)
Electricity for lighting (calculated in Appendix L)	167.0964	(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	4378.1629	(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	1199.3029	0.2100	251.8536	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2807.9164	0.2100	589.6624	(264)
Space and water heating			841.5161	(265)
Pumps, fans and electric keep-hot	203.8471	0.1387	28.2761	(267)
Energy for lighting	167.0964	0.1443	24.1172	(268)
Total CO2, kg/year			893.9093	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.3000	(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	1199.3029	1.1300	1355.2123	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2807.9164	1.1300	3172.9455	(278)
Space and water heating			4528.1578	(279)
Pumps, fans and electric keep-hot	203.8471	1.5128	308.3799	(281)
Energy for lighting	167.0964	1.5338	256.2981	(282)
Total Primary energy kWh/year			5092.8358	(286)
Dwelling Primary energy Rate (DPER)			64.3800	(287)

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

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		44.9000 (1b)	x	2.5000 (2b)	=	112.2500	(1b) - (3b)
First floor		34.2000 (1c)	x	2.5000 (2c)	=	85.5000	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.1000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	197.7500	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1517	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4017	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3415	(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	0.4353	0.4268	0.4183	0.3756	0.3671	0.3244	0.3244	0.3158	0.3415	0.3671	0.3841	0.4012	(22b)
Effective ac	0.5948	0.5911	0.5875	0.5705	0.5674	0.5526	0.5526	0.5499	0.5583	0.5674	0.5738	0.5805	(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 Opening Type (Uw = 1.20)			12.9700	1.1450	14.8511			(27)
RL			6.8100	1.5918	10.8399			(27a)
Heatloss Floor 1			44.9000	0.1300	5.8370			(28a)
External Wall 1	84.5000	12.9700	71.5300	0.1800	12.8754			(29a)
FR	44.9000	6.8100	38.0900	0.1100	4.1899			(30)
Total net area of external elements Aum(A, m2)			174.3000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	48.5933			(33)
Party Wall 1			19.2500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 127.3736 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	30.2000	0.1600	4.8320
E14 Flat roof	30.2000	0.0800	2.4160
E16 Corner (normal)	15.0000	0.0900	1.3500
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E1 Steel lintel with perforated steel base plate	7.0000	0.0500	0.3500
E3 Sill	3.8000	0.0500	0.1900
E4 Jamb	23.2000	0.0500	1.1600
E6 Intermediate floor within a dwelling	20.1000	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.5980 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 59.1913 (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	38.8129	38.5727	38.3373	37.2318	37.0249	36.0620	36.0620	35.8837	36.4329	37.0249	37.4434	37.8808	(38)
Heat transfer coeff	98.0042	97.7641	97.5287	96.4231	96.2162	95.2533	95.2533	95.0750	95.6242	96.2162	96.6347	97.0722	(39)
Average = Sum(39)m / 12 =												96.4221	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2390	1.2360	1.2330	1.2190	1.2164	1.2042	1.2042	1.2020	1.2089	1.2164	1.2217	1.2272	(40)
HLP (average)												1.2190	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4456 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	83.7764	82.5174	80.6828	77.1726	74.5822	71.6933	70.0513	71.8720	73.8679	76.9696	80.5552	83.4554	(42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses	39.6750	38.2323	36.7896	35.3468	33.9041	32.4614	32.4614	33.9041	35.3468	36.7896	38.2323	39.6750	(42c)
Average daily hot water use (litres/day)												113.3072	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	123.4514	120.7496	117.4723	112.5194	108.4862	104.1547	102.5127	105.7761	109.2147	113.7592	118.7875	123.1304	(44)
Energy conte	195.5168	171.9459	180.5506	154.0334	146.0433	128.0704	123.9802	130.9730	134.6727	154.3701	169.2345	192.7924	(45)
Energy content (annual)										Total = Sum(45)m =		1882.1833	
Distribution loss (46)m = 0.15 x (45)m	29.3275	25.7919	27.0826	23.1050	21.9065	19.2106	18.5970	19.6459	20.2009	23.1555	25.3852	28.9189	(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	242.1117	214.0316	227.1455	199.1253	192.6382	173.1622	170.5751	177.5679	179.7645	200.9650	214.3264	239.3873	(62)
WWHRS	-38.2991	-33.8720	-35.4688	-29.3696	-27.3714	-23.4219	-21.9543	-23.3462	-24.2332	-28.5683	-32.3644	-37.5898	(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	203.8126	180.1596	191.6767	169.7557	165.2669	149.7403	148.6208	154.2217	155.5313	172.3967	181.9620	201.7975	(64)
										Total per year (kWh/year) = Sum(64)m =		2074.9419	(64)
12Total per year (kWh/year)												2075	(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	102.2853	90.8406	97.3090	87.2896	85.8353	78.6569	78.4993	80.8244	80.8521	88.6040	92.3440	101.3794	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	109.7286	121.4853	109.7286	113.3862	109.7286	113.3862	109.7286	109.7286	113.3862	109.7286	113.3862	109.7286	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	217.5493	219.8067	214.1180	202.0072	186.7196	172.3514	162.7525	160.4951	166.1838	178.2946	193.5822	207.9504	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	(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)	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	(71)
Water heating gains (Table 5)	137.4802	135.1794	130.7916	121.2355	115.3701	109.2456	105.5099	108.6350	112.2946	119.0914	128.2555	136.2626	(72)
Total internal gains	527.4415	539.1549	517.3217	499.3125	474.5017	454.6667	437.6745	438.5421	451.5481	469.7980	497.9074	516.6251	(73)

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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	
Southeast	1.6600	36.7938	0.6300	0.7000	0.7700	18.6662	(77)
Southwest	9.2900	36.7938	0.6300	0.7000	0.7700	104.4630	(79)
Northwest	2.0200	11.2829	0.6300	0.7000	0.7700	6.9654	(81)
Horizontal	6.8100	26.0000	0.6300	0.7000	1.0000	70.2751	(82)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	200.3697	369.8688	571.9900	802.9523	973.6110	996.0818	948.2795	818.5278	652.6845	427.5190	245.4400	167.8219	(83)
Total gains	727.8112	909.0237	1089.3117	1302.2647	1448.1127	1450.7485	1385.9539	1257.0699	1104.2326	897.3170	743.3473	684.4470	(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	28.5567	28.6269	28.6960	29.0250	29.0874	29.3814	29.3814	29.4366	29.2675	29.0874	28.9614	28.8309	
alpha	2.9038	2.9085	2.9131	2.9350	2.9392	2.9588	2.9588	2.9624	2.9512	2.9392	2.9308	2.9221	
util living area	0.9449	0.9031	0.8322	0.7036	0.5504	0.4009	0.2962	0.3378	0.5370	0.7853	0.9126	0.9525	(86)
MIT	18.9536	19.3746	19.9033	20.4567	20.7879	20.9388	20.9813	20.9723	20.8546	20.3574	19.5591	18.8819	(87)
Th 2	19.8889	19.8913	19.8937	19.9048	19.9069	19.9166	19.9166	19.9184	19.9129	19.9069	19.9027	19.8983	(88)
util rest of house	0.9356	0.8880	0.8077	0.6653	0.4994	0.3388	0.2257	0.2622	0.4681	0.7454	0.8963	0.9445	(89)
MIT 2	17.5457	18.0679	18.7115	19.3629	19.7217	19.8751	19.9080	19.9048	19.8040	19.2756	18.3149	17.4620	(90)
Living area fraction									fLA = Living area / (4) =			0.2882	(91)
MIT	17.9515	18.4446	19.0550	19.6782	20.0290	20.1817	20.2174	20.2125	20.1068	19.5875	18.6736	17.8713	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.9515	18.4446	19.0550	19.6782	20.0290	20.1817	20.2174	20.2125	20.1068	19.5875	18.6736	17.8713	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9142	0.8637	0.7862	0.6568	0.5053	0.3543	0.2456	0.2832	0.4809	0.7322	0.8733	0.9244	(94)
Useful gains	665.3609	785.1109	856.4438	855.2897	731.7327	514.0619	340.3384	355.9445	531.0733	656.9993	649.1438	632.7154	(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	1337.9060	1324.1722	1224.4756	1039.2651	801.3843	531.6728	344.5690	362.4718	574.3996	864.7390	1118.4069	1327.1019	(97)
Space heating kWh	500.3735	362.2492	273.8156	132.4623	51.8207	0.0000	0.0000	0.0000	0.0000	154.5583	337.8695	516.6235	(98a)
Space heating requirement - total per year (kWh/year)												2329.7727	
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	500.3735	362.2492	273.8156	132.4623	51.8207	0.0000	0.0000	0.0000	0.0000	154.5583	337.8695	516.6235	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2329.7727	
Space heating per m2										(98c) / (4) =		29.4535	(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	500.3735	362.2492	273.8156	132.4623	51.8207	0.0000	0.0000	0.0000	0.0000	154.5583	337.8695	516.6235	(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)	542.1165	392.4693	296.6583	143.5128	56.1438	0.0000	0.0000	0.0000	0.0000	167.4521	366.0558	559.7222	(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	203.8126	180.1596	191.6767	169.7557	165.2669	149.7403	148.6208	154.2217	155.5313	172.3967	181.9620	201.7975	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.9930	85.5936	84.8591	83.5097	81.7785	79.8000	79.8000	79.8000	79.8000	83.8157	85.4275	86.0733	(217)
Fuel for water heating, kWh/month	237.0108	210.4825	225.8764	203.2766	202.0908	187.6445	186.2416	193.2602	194.9014	205.6856	213.0017	234.4486	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	22.7994	18.2906	16.4686	12.0656	9.3198	7.6144	8.5019	11.0510	14.3542	18.8335	21.2724	23.4331	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-40.6065	-56.5468	-80.3079	-89.1910	-95.2670	-88.6010	-87.4904	-83.0185	-75.0158	-64.1189	-44.3859	-35.1884	(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	-25.1360	-52.6071	-104.0690	-155.6051	-205.0846	-205.8232	-203.4117	-172.5424	-126.8808	-75.0117	-33.4867	-19.8985	(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	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2524.1308	(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	2493.9208	(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)	184.0045	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2219.2950	(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	3068.7611	(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	2524.1308	0.2100	530.0675	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2493.9208	0.2100	523.7234	(264)
Space and water heating			1053.7908	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	184.0045	0.1443	26.5575	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-839.7381	0.1348	-113.2347	
PV Unit electricity exported	-1379.5569	0.1260	-173.8629	
Total			-287.0976	(269)
Total CO2, kg/year			805.1800	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.1800	(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	2524.1308	1.1300	2852.2678	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2493.9208	1.1300	2818.1305	(278)
Space and water heating			5670.3983	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	184.0045	1.5338	282.2323	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-839.7381	1.4984	-1258.2464	
PV Unit electricity exported	-1379.5569	0.4626	-638.2049	
Total			-1896.4513	(283)
Total Primary energy kWh/year			4186.2801	(286)
Target Primary Energy Rate (TPER)			52.9200	(287)

Summary for Input Data

elmhurst energy

Property Reference	Unit 3	**Issued on Date**	04/05/2024
Assessment Reference	Unit 3 - Be Green	**Prop Type Ref**	
Property			

SAP Rating	84 B	**DER**	3.78	**TER**	9.35
Environmental	97 A	**% DER < TER**			59.57
CO_2 Emissions (t/year)	0.28	**DFEE**	30.61	**TFEE**	34.47
Compliance Check	See BREL	**% DFEE < TFEE**			11.19
% DPER < TPER	16.73	**DPER**	40.34	**TPER**	48.44

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

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

Orientation	Southwest	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Suburban	
1.0 Property Type	Bungalow, End-Terrace	
Which Floor	0	
2.0 Number of Storeys	2	
3.0 Date Built	2024	
3.0 Property Age Band	L	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	N/A	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Basement:	0.00 m	0.00 m²	0.00 m
Ground floor:	8.60 m	44.90 m²	2.50 m
1st Storey:	16.00 m	34.20 m²	2.50 m
2nd Storey:	0.00 m	0.00 m²	0.00 m
3rd Storey:	0.00 m	0.00 m²	0.00 m
4th Storey:	0.00 m	0.00 m²	0.00 m
5th Storey:	0.00 m	0.00 m²	0.00 m
6th Storey:	0.00 m	0.00 m²	0.00 m
7th Storey:	0.00 m	0.00 m²	0.00 m

8.0 Living Area	22.80	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
External Wall 1	Cavity Wall	Cavity wall : dense plaster, AAC block, filled cavity, any outside structure	0.16	70.00	61.50	49.60	0.00	None	11.90	Calculate Wall Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Plasterboard on dabs mounted on cement render on both sides, AAC blocks, cavity	0.00	45.00	19.25	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	64.00

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area	Shelter Code	Shelter Factor	Calculation Type	Openings

Summary for Input Data

						(m²)				
FR	External Flat Roof	Plasterboard, insulated flat roof	0.10	9.00	44.90	37.50	None	0.00	Enter Gross Area	7.40

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Heatloss Floor 1	Ground Floor - Solid	Lowest occupied	Suspended concrete floor, carpeted	0.10	None	0.00	75.00	44.90

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Windows	Manufacturer	Window	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.20
RLs	Manufacturer	Roof Window	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
SW	Windows	External Wall 1	South West	10.10	0
SE	Windows	External Wall 1	South East	1.80	0
RL	RLs	FR	Horizontal	7.40	0

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	

17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E5 Ground floor (normal)	Gov Approved Scheme	8.60	0.05	0.05	No
E14 Flat roof	Table K1 - Default	30.20	0.16	0.16	Yes
E16 Corner (normal)	Gov Approved Scheme	15.00	0.04	0.04	No
E18 Party wall between dwellings	Gov Approved Scheme	20.00	0.03	0.03	No
E1 Steel lintel with perforated steel base plate	Gov Approved Scheme	7.00	0.30	0.30	No
E3 Sill	Gov Approved Scheme	3.80	0.03	0.03	No
E4 Jamb	Gov Approved Scheme	23.20	0.02	0.02	No
E6 Intermediate floor within a dwelling	Gov Approved Scheme	20.10	0.00	0.00	No

Y-value	0.06	W/m²K

18.0 Pressure Testing	Yes	
Designed AP_{50}	3.00	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	No
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500811
Configuration	2
Manufacturer SFP	0.54
Duct Type	Rigid
MVHR Efficiency	88.00
Wet Rooms	2
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)
Duct Installation Specification	Level 1

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System	No

22.0 Lighting

No Fixed Lighting	No

Name	Efficacy	Power	Capacity	Count
Lighting 1	120.00	6	720	40

Summary for Input Data

24.0 Main Heating 1	Database	
Percentage of Heat	100.00	%
Database Ref. No.	102608	
Fuel Type	Electricity	
SAP Code	0	
In Winter	323.76	
In Summer	163.58	
Model Name	aroTHERM 5kW	
Manufacturer	Vaillant Group UK Ltd	
System Type	Heat Pump	
Controls SAP Code	2207	
Delayed Start Stat	Yes	
Burner Control	On/Off	
HETAS approved System	No	
Oil Pump Inside	No	
FI Case	0.00	
Flue Type	None or Unknown	
Fan Assisted Flue	No	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators	
Flow Temperature	Enter value	
Flow Temperature Value	35.00	
Boiler Interlock	Yes	
Combi boiler type	No Combi	
25.0 Main Heating 2	None	
26.0 Heat Networks	None	
28.0 Water Heating		
Water Heating	Main Heating 1	
SAP Code	901	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	Yes	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
Summer Immersion	No	
Cold Water Source	From mains	
Bath Count	0	
Supplementary Immersion	No	
Immersion Only Heating Hot Water	No	

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
S1	Vented hot water system + pump	12.00		Yes	Instantaneous System 1
S2	Vented hot water system + pump	12.00		Yes	Instantaneous System 1

28.3 Waste Water Heat Recovery System Instantaneous System 1		
Database ID	80194	

Summary for Input Data

Brand Model	Zypho, Slim DW50	
Details	Year: 2022 + current Efficiency: 44.7 Utilisation factor: 0.987	
29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	150.00	L
Loss	1.12	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	
31.0 Thermal Store	None	

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Property Reference	Unit 3	**Issued on Date**	04/05/2024
Assessment Reference	Unit 3 - Be Green	**Prop Type Ref**	
Property			

SAP Rating	84 B	**DER**	3.78	**TER**	9.35
Environmental	97 A	**% DER < TER**			59.57
CO_2 Emissions (t/year)	0.28	**DFEE**	30.61	**TFEE**	34.47
Compliance Check	See BREL	**% DFEE < TFEE**			11.19
% DPER < TPER	16.73	**DPER**	40.34	**TPER**	48.44

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	44.9000 (1b)	x	2.5000 (2b)	=	112.2500	(1b) - (3b)
First floor	34.2000 (1c)	x	2.5000 (2c)	=	85.5000	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.1000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	197.7500	(5)

2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	79.2000 (23c)

Effective ac	0.2666	0.2634	0.2602	0.2442	0.2411	0.2251	0.2251	0.2219	0.2315	0.2411	0.2474	0.2538	(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)			11.9000	1.1450	13.6260			(27)
RL			7.4000	1.1450	8.4733			(27a)
Heatloss Floor 1			44.9000	0.1000	4.4900	75.0000	3367.5000	(28a)
External Wall 1	61.5000	11.9000	49.6000	0.1600	7.9360	70.0000	3472.0000	(29a)
FR	44.9000	7.4000	37.5000	0.1000	3.7500	9.0000	337.5000	(30)
Total net area of external elements Aum(A, m2)			151.3000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		38.2752			(33)
Party Wall 1			19.2500	0.0000	0.0000	45.0000	866.2500	(32)
Internal Wall 1			64.0000			9.0000	576.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 8619.2500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	108.9665 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E5 Ground floor (normal)	8.6000	0.0480	0.4128	
E14 Flat roof	30.2000	0.1600	4.8320	
E16 Corner (normal)	15.0000	0.0350	0.5250	
E18 Party wall between dwellings	20.0000	0.0330	0.6600	
E1 Steel lintel with perforated steel base plate	7.0000	0.3020	2.1140	
E3 Sill	3.8000	0.0290	0.1102	
E4 Jamb	23.2000	0.0240	0.5568	
E6 Intermediate floor within a dwelling	20.1000	0.0010	0.0201	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.2309 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 47.5061 (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	17.3952	17.1872	16.9792	15.9391	15.7311	14.6911	14.6911	14.4831	15.1071	15.7311	16.1472	16.5632	(38)
Heat transfer coeff	64.9013	64.6933	64.4853	63.4453	63.2373	62.1972	62.1972	61.9892	62.6132	63.2373	63.6533	64.0693	(39)
Average = Sum(39)m / 12 =												63.3933	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8205	0.8179	0.8152	0.8021	0.7995	0.7863	0.7863	0.7837	0.7916	0.7995	0.8047	0.8100	(40)
HLP (average)												0.8014	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4456 (42)
Hot water usage for mixer showers

125.6645	123.7761	121.0241	115.7589	111.8732	107.5400	105.0770	107.8081	110.8018	115.4544	120.8328	125.1831	(42a)

Hot water usage for baths

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)

Hot water usage for other uses

39.6750	38.2323	36.7896	35.3468	33.9041	32.4614	32.4614	33.9041	35.3468	36.7896	38.2323	39.6750	(42c)

Average daily hot water use (litres/day) 151.9267 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	165.3396	162.0083	157.8137	151.1057	145.7773	140.0014	137.5384	141.7122	146.1487	152.2440	159.0651	164.8581	(44)
Energy conte	261.8574	230.6977	242.5538	206.8561	196.2443	172.1480	166.3407	175.4693	180.2159	206.5936	226.6173	258.1279	(45)
Energy content (annual)										Total = Sum(45)m =		2523.7221	
Distribution loss (46)m = 0.15 x (45)m	39.2786	34.6047	36.3831	31.0284	29.4366	25.8222	24.9511	26.3204	27.0324	30.9890	33.9926	38.7192	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.1200 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.6048 (55)
Total storage loss

18.7488	16.9344	18.7488	18.1440	18.7488	18.1440	18.7488	18.7488	18.1440	18.7488	18.1440	18.7488	(56)

If cylinder contains dedicated solar storage

18.7488	16.9344	18.7488	18.1440	18.7488	18.1440	18.7488	18.7488	18.1440	18.7488	18.1440	18.7488	(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

303.8686	268.6433	284.5650	247.5121	238.2555	212.8040	208.3519	217.4805	220.8719	248.6048	267.2733	300.1391	(62)

WWHRS	-71.8415	-63.5372	-66.5325	-55.0915	-51.3433	-43.9349	-41.1819	-43.7929	-45.4567	-53.5884	-60.7092	-70.5111	(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

232.0271	205.1061	218.0325	192.4206	186.9122	168.8692	167.1700	173.6876	175.4152	195.0164	206.5641	229.6280	(64)

Total per year (kWh/year) = Sum(64)m = 2350.8489 (64)
12Total per year (kWh/year) 2351 (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

120.6766	107.0635	114.2581	101.3045	98.8602	89.7640	88.9173	91.9525	92.4466	102.3013	107.8751	119.4365	(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	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	109.7286	121.4853	109.7286	113.3862	109.7286	113.3862	109.7286	109.7286	113.3862	109.7286	113.3862	109.7286	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	217.5493	219.8067	214.1180	202.0072	186.7196	172.3514	162.7525	160.4951	166.1838	178.2946	193.5822	207.9504	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	(71)
Water heating gains (Table 5)	162.1997	159.3206	153.5727	140.7006	132.8766	124.6722	119.5124	123.5921	128.3980	137.5018	149.8265	160.5329	(72)
Total internal gains	549.1610	560.2961	537.1027	515.7776	489.0083	470.0933	451.6770	453.4992	467.6516	485.2084	516.4784	537.8954	(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	
Southeast	1.8000	36.7938	0.6300	0.7000	0.7700	20.2404	(77)
Southwest	10.1000	36.7938	0.6300	0.7000	0.7700	113.5712	(79)
Horizontal	7.4000	26.0000	0.6300	0.7000	1.0000	76.3636	(82)

Solar gains	210.1752	386.5319	593.8225	826.9745	996.7331	1017.0996	969.3691	840.7651	675.4454	445.7579	257.1985	176.1931	(83)
Total gains	759.3362	946.8280	1130.9252	1342.7520	1485.7413	1487.1930	1421.0461	1294.2643	1143.0970	930.9664	773.6768	714.0885	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	36.8904	37.0090	37.1284	37.7370	37.8612	38.4943	38.4943	38.6234	38.2385	37.8612	37.6137	37.3695	
alpha	3.4594	3.4673	3.4752	3.5158	3.5241	3.5663	3.5663	3.5749	3.5492	3.5241	3.5076	3.4913	
util living area	0.8901	0.8116	0.6978	0.5344	0.3866	0.2659	0.1921	0.2195	0.3704	0.6295	0.8272	0.9046	(86)
Living	19.8808	20.2501	20.5989	20.8617	20.9619	20.9926	20.9983	20.9972	20.9761	20.8021	20.3245	19.8146	
Non living	18.9417	19.3905	19.8040	20.1106	20.2188	20.2596	20.2642	20.2658	20.2413	20.0560	19.4983	18.8673	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.4275	20.2501	20.5989	20.8617	20.9619	20.9926	20.9983	20.9972	20.9761	20.8021	20.3245	19.9804	(87)
Th 2	20.2356	20.2379	20.2401	20.2515	20.2538	20.2652	20.2652	20.2675	20.2606	20.2538	20.2492	20.2447	(88)
util rest of house	0.8780	0.7940	0.6741	0.5068	0.3574	0.2359	0.1602	0.1849	0.3327	0.5958	0.8077	0.8937	(89)
MIT 2	19.7198	19.3905	19.8040	20.1106	20.2188	20.2596	20.2642	20.2658	20.2413	20.0560	19.4983	19.1155	(90)
Living area fraction										fLA = Living area / (4) =		0.2882	(91)
MIT	19.9238	19.6382	20.0332	20.3271	20.4330	20.4709	20.4758	20.4766	20.4531	20.2710	19.7364	19.3648	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9238	19.6382	20.0332	20.3271	20.4330	20.4709	20.4758	20.4766	20.4531	20.2710	19.7364	19.3648	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8726	0.7789	0.6674	0.5096	0.3645	0.2443	0.1694	0.1948	0.3426	0.5966	0.7930	0.8793	(94)
Useful gains	662.5697	737.4398	754.7759	684.2745	541.5198	363.3073	240.7061	252.1155	391.6157	555.4609	613.5464	627.8776	(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	1014.0024	953.4661	872.6907	724.9981	552.2496	365.1513	241.0641	252.7078	397.7874	611.5687	804.3505	971.5999	(97)
Space heating kWh	261.4659	145.1697	87.7286	29.3210	7.9829	0.0000	0.0000	0.0000	0.0000	41.7442	137.3789	255.7294	(98a)
Space heating requirement - total per year (kWh/year)												966.5206	
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	261.4659	145.1697	87.7286	29.3210	7.9829	0.0000	0.0000	0.0000	0.0000	41.7442	137.3789	255.7294	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												966.5206	
Space heating per m2											(98c) / (4) =	12.2190	(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 %) 323.7609 (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	261.4659	145.1697	87.7286	29.3210	7.9829	0.0000	0.0000	0.0000	0.0000	41.7442	137.3789	255.7294	(98)
Space heating efficiency (main heating system 1)	323.7609	323.7609	323.7609	323.7609	323.7609	0.0000	0.0000	0.0000	0.0000	323.7609	323.7609	323.7609	(210)
Space heating fuel (main heating system)	80.7589	44.8385	27.0967	9.0564	2.4657	0.0000	0.0000	0.0000	0.0000	12.8935	42.4322	78.9871	(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	232.0271	205.1061	218.0325	192.4206	186.9122	168.8692	167.1700	173.6876	175.4152	195.0164	206.5641	229.6280	(64)
Efficiency of water heater												163.5787	(216)
(217)m	163.5787	163.5787	163.5787	163.5787	163.5787	163.5787	163.5787	163.5787	163.5787	163.5787	163.5787	163.5787	(217)
Fuel for water heating, kWh/month	141.8443	125.3868	133.2890	117.6318	114.2644	103.2342	102.1954	106.1798	107.2360	119.2187	126.2781	140.3777	(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	15.4906	13.9915	15.4906	14.9909	15.4906	14.9909	15.4906	15.4906	14.9909	15.4906	14.9909	15.4906	(231)
Lighting	20.7044	16.6098	14.9553	10.9569	8.4634	6.9147	7.7206	10.0356	13.0352	17.1029	19.3177	21.2798	(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												298.5291	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												163.5787	
Water heating fuel used												1437.1363	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7560)		
mechanical ventilation fans (SFP = 0.7560)	182.3888	(230a)
Total electricity for the above, kWh/year	182.3888	(231)
Electricity for lighting (calculated in Appendix L)	167.0964	(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	2085.1506	(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	298.5291	0.1579	47.1399	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1437.1363	0.1408	202.3500	(264)
Space and water heating			249.4899	(265)
Pumps, fans and electric keep-hot	182.3888	0.1387	25.2996	(267)
Energy for lighting	167.0964	0.1443	24.1172	(268)
Total CO2, kg/year			298.9066	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.7800	(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	298.5291	1.5845	473.0106	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1437.1363	1.5206	2185.3459	(278)
Space and water heating			2658.3564	(279)
Pumps, fans and electric keep-hot	182.3888	1.5128	275.9177	(281)
Energy for lighting	167.0964	1.5338	256.2981	(282)
Total Primary energy kWh/year			3190.5723	(286)
Dwelling Primary energy Rate (DPER)			40.3400	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	44.9000 (1b)	x	2.5000 (2b)	=	112.2500	(1b) - (3b)
First floor	34.2000 (1c)	x	2.5000 (2c)	=	85.5000	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 79.1000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	197.7500	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1517	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4017	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3415	(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	0.4353	0.4268	0.4183	0.3756	0.3671	0.3244	0.3244	0.3158	0.3415	0.3671	0.3841	0.4012	(22b)
Effective ac	0.5948	0.5911	0.5875	0.5705	0.5674	0.5526	0.5526	0.5499	0.5583	0.5674	0.5738	0.5805	(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 Opening Type (Uw = 1.20)			11.9000	1.1450	13.6260			(27)
RL			7.4000	1.5918	11.7790			(27a)
Heatloss Floor 1			44.9000	0.1300	5.8370			(28a)
External Wall 1	61.5000	11.9000	49.6000	0.1800	8.9280			(29a)
FR	44.9000	7.4000	37.5000	0.1100	4.1250			(30)
Total net area of external elements Aum(A, m2)			151.3000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.2950			(33)
Party Wall 1			19.2500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 108.9665 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	8.6000	0.1600	1.3760
E14 Flat roof	30.2000	0.0800	2.4160
E16 Corner (normal)	15.0000	0.0900	1.3500
E18 Party wall between dwellings	20.0000	0.0600	1.2000
E1 Steel lintel with perforated steel base plate	7.0000	0.0500	0.3500
E3 Sill	3.8000	0.0500	0.1900
E4 Jamb	23.2000	0.0500	1.1600
E6 Intermediate floor within a dwelling	20.1000	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.0420 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 52.3370 (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	38.8129	38.5727	38.3373	37.2318	37.0249	36.0620	36.0620	35.8837	36.4329	37.0249	37.4434	37.8808	(38)
Heat transfer coeff	91.1498	90.9097	90.6743	89.5687	89.3619	88.3990	88.3990	88.2206	88.7699	89.3619	89.7803	90.2178	(39)

Average = Sum(39)m / 12 = 89.5677

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1523	1.1493	1.1463	1.1323	1.1297	1.1176	1.1176	1.1153	1.1222	1.1297	1.1350	1.1406	(40)
HLP (average)												1.1323	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4456 (42)

Hot water usage for mixer showers

83.7764	82.5174	80.6828	77.1726	74.5822	71.6933	70.0513	71.8720	73.8679	76.9696	80.5552	83.4554	(42a)

Hot water usage for baths

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)

Hot water usage for other uses

39.6750	38.2323	36.7896	35.3468	33.9041	32.4614	32.4614	33.9041	35.3468	36.7896	38.2323	39.6750	(42c)

Average daily hot water use (litres/day) 113.3072 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	123.4514	120.7496	117.4723	112.5194	108.4862	104.1547	102.5127	105.7761	109.2147	113.7592	118.7875	123.1304	(44)
Energy conte	195.5168	171.9459	180.5506	154.0334	146.0433	128.0704	123.9802	130.9730	134.6727	154.3701	169.2345	192.7924	(45)

Energy content (annual) Total = Sum(45)m = 1882.1833

Distribution loss (46)m = 0.15 x (45)m

29.3275	25.7919	27.0826	23.1050	21.9065	19.2106	18.5970	19.6459	20.2009	23.1555	25.3852	28.9189	(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

242.1117	214.0316	227.1455	199.1253	192.6382	173.1622	170.5751	177.5679	179.7645	200.9650	214.3264	239.3873	(62)
WWHRS -38.2991	-33.8720	-35.4688	-29.3696	-27.3714	-23.4219	-21.9543	-23.3462	-24.2332	-28.5683	-32.3644	-37.5898	(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												
203.8126	180.1596	191.6767	169.7557	165.2669	149.7403	148.6208	154.2217	155.5313	172.3967	181.9620	201.7975	(64)

Total per year (kWh/year) = Sum(64)m = 2074.9419 (64)

12Total per year (kWh/year) 2075 (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

102.2853	90.8406	97.3090	87.2896	85.8353	78.6569	78.4993	80.8244	80.8521	88.6040	92.3440	101.3794	(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	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	109.7286	121.4853	109.7286	113.3862	109.7286	113.3862	109.7286	109.7286	113.3862	109.7286	113.3862	109.7286	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	217.5493	219.8067	214.1180	202.0072	186.7196	172.3514	162.7525	160.4951	166.1838	178.2946	193.5822	207.9504	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	(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)	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	(71)
Water heating gains (Table 5)	137.4802	135.1794	130.7916	121.2355	115.3701	109.2456	105.5099	108.6350	112.2946	119.0914	128.2555	136.2626	(72)
Total internal gains	527.4415	539.1549	517.3217	499.3125	474.5017	454.6667	437.6745	438.5421	451.5481	469.7980	497.9074	516.6251	(73)

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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	
Southeast	1.8000	36.7938	0.6300	0.7000	0.7700	20.2404	(77)
Southwest	10.1000	36.7938	0.6300	0.7000	0.7700	113.5712	(79)
Horizontal	7.4000	26.0000	0.6300	0.7000	1.0000	76.3636	(82)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	210.1752	386.5319	593.8225	826.9745	996.7331	1017.0996	969.3691	840.7651	675.4454	445.7579	257.1985	176.1931	(83)
Total gains	737.6167	925.6868	1111.1441	1326.2869	1471.2348	1471.7664	1407.0436	1279.3072	1126.9936	915.5559	755.1058	692.8182	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	26.2670	26.3364	26.4048	26.7307	26.7926	27.0844	27.0844	27.1392	26.9713	26.7926	26.6677	26.5384	
alpha	2.7511	2.7558	2.7603	2.7820	2.7862	2.8056	2.8056	2.8093	2.7981	2.7862	2.7778	2.7692	
util living area	0.9248	0.8733	0.7924	0.6576	0.5083	0.3678	0.2710	0.3085	0.4935	0.7414	0.8849	0.9345	(86)
MIT	18.9467	19.3969	19.9364	20.4794	20.7951	20.9395	20.9810	20.9724	20.8609	20.3829	19.5749	18.8696	(87)
Th 2	19.9583	19.9608	19.9632	19.9745	19.9766	19.9865	19.9865	19.9884	19.9827	19.9766	19.9723	19.9679	(88)
util rest of house	0.9142	0.8570	0.7676	0.6219	0.4630	0.3142	0.2106	0.2438	0.4328	0.7025	0.8671	0.9251	(89)
MIT 2	17.5968	18.1528	18.8071	19.4467	19.7919	19.9428	19.9768	19.9733	19.8737	19.3612	18.3923	17.5068	(90)
Living area fraction									fLA = Living area / (4) =			0.2882	(91)
MIT	17.9859	18.5114	19.1326	19.7444	20.0811	20.2301	20.2662	20.2613	20.1583	19.6557	18.7331	17.8996	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.9859	18.5114	19.1326	19.7444	20.0811	20.2301	20.2662	20.2613	20.1583	19.6557	18.7331	17.8996	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8881	0.8295	0.7451	0.6133	0.4678	0.3273	0.2274	0.2615	0.4437	0.6890	0.8407	0.9003	(94)
Useful gains	655.0901	767.8110	827.9410	813.4164	688.1956	481.7122	320.0202	334.5336	500.0438	630.7835	634.8333	623.7317	(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	1247.4691	1237.4091	1145.4534	971.3188	748.9479	497.6962	324.0903	340.6465	537.7903	809.2356	1044.4281	1235.9481	(97)
Space heating kWh	440.7300	315.5699	236.2292	113.6897	45.1997	0.0000	0.0000	0.0000	0.0000	132.7683	294.9083	455.4890	(98a)
Space heating requirement - total per year (kWh/year)												2034.5841	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	440.7300	315.5699	236.2292	113.6897	45.1997	0.0000	0.0000	0.0000	0.0000	132.7683	294.9083	455.4890	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2034.5841	
Space heating per m2										(98c) / (4) =		25.7217	(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	440.7300	315.5699	236.2292	113.6897	45.1997	0.0000	0.0000	0.0000	0.0000	132.7683	294.9083	455.4890	(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)	477.4973	341.8959	255.9363	123.1741	48.9704	0.0000	0.0000	0.0000	0.0000	143.8443	319.5106	493.4876	(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	203.8126	180.1596	191.6767	169.7557	165.2669	149.7403	148.6208	154.2217	155.5313	172.3967	181.9620	201.7975	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.7422	85.3036	84.5296	83.1815	81.5756	79.8000	79.8000	79.8000	79.8000	83.4811	85.1362	85.8281	(217)
Fuel for water heating, kWh/month	237.7041	211.1981	226.7569	204.0787	202.5935	187.6445	186.2416	193.2602	194.9014	206.5099	213.7305	235.1182	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	22.7994	18.2906	16.4686	12.0656	9.3198	7.6144	8.5019	11.0510	14.3542	18.8335	21.2724	23.4331	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-40.6065	-56.5468	-80.3079	-89.1910	-95.2670	-88.6010	-87.4904	-83.0185	-75.0158	-64.1189	-44.3859	-35.1884	(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	-25.1360	-52.6071	-104.0690	-155.6051	-205.0846	-205.8232	-203.4117	-172.5424	-126.8808	-75.0117	-33.4867	-19.8985	(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	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2204.3164	(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	2499.7377	(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)	184.0045	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2219.2950	(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	2754.7637	(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	2204.3164	0.2100	462.9065	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2499.7377	0.2100	524.9449	(264)
Space and water heating			987.8514	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	184.0045	0.1443	26.5575	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-839.7381	0.1348	-113.2347	
PV Unit electricity exported	-1379.5569	0.1260	-173.8629	
Total			-287.0976	(269)
Total CO2, kg/year			739.2405	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.3500	(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	2204.3164	1.1300	2490.8776	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2499.7377	1.1300	2824.7036	(278)
Space and water heating			5315.5812	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	184.0045	1.5338	282.2323	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-839.7381	1.4984	-1258.2464	
PV Unit electricity exported	-1379.5569	0.4626	-638.2049	
Total			-1896.4513	(283)
Total Primary energy kWh/year			3831.4630	(286)
Target Primary Energy Rate (TPER)			48.4400	(287)

Full SAP Calculation Printout

Property Reference	Unit 3	**Issued on Date**	04/05/2024
Assessment Reference	Unit 3 - Be Green	**Prop Type Ref**	
Property			

SAP Rating	84 B	**DER**	3.78	**TER**	9.35
Environmental	97 A	**% DER < TER**			59.57
CO_2 Emissions (t/year)	0.28	**DFEE**	30.61	**TFEE**	34.47
Compliance Check	See BREL	**% DFEE < TFEE**			11.19
% DPER < TPER	16.73	**DPER**	40.34	**TPER**	48.44

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	44.9000 (1b)	x	2.5000 (2b)	=	112.2500	(1b) - (3b)
First floor	34.2000 (1c)	x	2.5000 (2c)	=	85.5000	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.1000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	197.7500	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1517	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3017	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2565	(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	0.3270	0.3206	0.3142	0.2821	0.2757	0.2436	0.2436	0.2372	0.2565	0.2757	0.2885	0.3013	(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	0.5535	0.5514	0.5493	0.5398	0.5380	0.5297	0.5297	0.5281	0.5329	0.5380	0.5416	0.5454	(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)			11.9000	1.1450	13.6260			(27)
RL			7.4000	1.1450	8.4733			(27a)
Heatloss Floor 1			44.9000	0.1000	4.4900	75.0000	3367.5000	(28a)
External Wall 1	61.5000	11.9000	49.6000	0.1600	7.9360	70.0000	3472.0000	(29a)
FR	44.9000	7.4000	37.5000	0.1000	3.7500	9.0000	337.5000	(30)
Total net area of external elements Aum(A, m2)			151.3000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		38.2752			(33)
Party Wall 1			19.2500	0.0000	0.0000	45.0000	866.2500	(32)
Internal Wall 1			64.0000			9.0000	576.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8619.2500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		108.9665 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	8.6000	0.0480	0.4128
E14 Flat roof	30.2000	0.1600	4.8320
E16 Corner (normal)	15.0000	0.0350	0.5250

E18 Party wall between dwellings	20.0000	0.0330	0.6600	
E1 Steel lintel with perforated steel base plate	7.0000	0.3020	2.1140	
E3 Sill	3.8000	0.0290	0.1102	
E4 Jamb	23.2000	0.0240	0.5568	
E6 Intermediate floor within a dwelling	20.1000	0.0010	0.0201	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.2309 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 47.5061 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.1172	35.9817	35.8489	35.2253	35.1086	34.5654	34.5654	34.4648	34.7746	35.1086	35.3446	35.5914	(38)
Heat transfer coeff	83.6233	83.4878	83.3551	82.7314	82.6147	82.0716	82.0716	81.9710	82.2808	82.6147	82.8508	83.0976	(39)
Average = Sum(39)m / 12 =												82.7309	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0572	1.0555	1.0538	1.0459	1.0444	1.0376	1.0376	1.0363	1.0402	1.0444	1.0474	1.0505	(40)
HLP (average)												1.0459	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4456 (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

28.1716	27.7532	27.1640	26.0777	25.2642	24.3623	23.8751	24.4601	25.0971	26.0623	27.1710	28.0763	(42b)

Hot water usage for other uses

39.6750	38.2323	36.7896	35.3468	33.9041	32.4614	32.4614	33.9041	35.3468	36.7896	38.2323	39.6750	(42c)

Average daily hot water use (litres/day) 62.1877 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	67.8466	65.9855	63.9536	61.4245	59.1683	56.8236	56.3364	58.3642	60.4440	62.8518	65.4033	67.7513	(44)
Energy conte	107.4524	93.9624	98.2942	84.0871	79.6519	69.8713	68.1340	72.2671	74.5334	85.2893	93.1789	106.0822	(45)
Energy content (annual)											Total = Sum(45)m =	1032.8044	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	91.3345	79.8681	83.5501	71.4740	67.7042	59.3906	57.9139	61.4270	63.3534	72.4959	79.2021	90.1699	(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													
	91.3345	79.8681	83.5501	71.4740	67.7042	59.3906	57.9139	61.4270	63.3534	72.4959	79.2021	90.1699	(64)
										Total per year (kWh/year) = Sum(64)m =		877.8837	(64)
12Total per year (kWh/year)												878	(64)
Electric shower(s)													
	52.2334	46.5403	50.8203	48.4972	49.4072	47.1297	48.7007	49.4072	48.4972	50.8203	49.8647	52.2334	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		594.1513	(64a)
Heat gains from water heating, kWh/month													
	35.8920	31.6021	33.5926	29.9928	29.2778	26.6301	26.6536	27.7086	27.9626	30.8291	32.2667	35.6008	(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	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	109.7286	121.4853	109.7286	113.3862	109.7286	113.3862	109.7286	109.7286	113.3862	109.7286	113.3862	109.7286	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	217.5493	219.8067	214.1180	202.0072	186.7196	172.3514	162.7525	160.4951	166.1838	178.2946	193.5822	207.9504	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	(71)
Water heating gains (Table 5)	48.2419	47.0269	45.1513	41.6567	39.3519	36.9862	35.8248	37.2427	38.8370	41.4369	44.8148	47.8506	(72)
Total internal gains	435.2032	448.0024	428.6814	416.7336	395.4836	382.4073	367.9894	367.1498	378.0905	389.1435	411.4667	425.2130	(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	
Southeast	1.8000	36.7938	0.6300	0.7000	0.7700	20.2404	(77)
Southwest	10.1000	36.7938	0.6300	0.7000	0.7700	113.5712	(79)
Horizontal	7.4000	26.0000	0.6300	0.7000	1.0000	76.3636	(82)

Solar gains	210.1752	386.5319	593.8225	826.9745	996.7331	1017.0996	969.3691	840.7651	675.4454	445.7579	257.1985	176.1931	(83)
Total gains	645.3784	834.5343	1022.5038	1243.7081	1392.2167	1399.5069	1337.3585	1207.9149	1053.5359	834.9015	668.6652	601.4061	(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	28.6312	28.6777	28.7233	28.9399	28.9807	29.1725	29.1725	29.2083	29.0984	28.9807	28.8982	28.8124	
alpha	2.9087	2.9118	2.9149	2.9293	2.9320	2.9448	2.9448	2.9472	2.9399	2.9320	2.9265	2.9208	
util living area	0.9401	0.8880	0.8031	0.6600	0.5040	0.3620	0.2658	0.3051	0.4947	0.7563	0.9031	0.9495	(86)
MIT	19.0073	19.4775	20.0213	20.5435	20.8310	20.9525	20.9857	20.9785	20.8817	20.4228	19.6134	18.9137	(87)
Th 2	20.0360	20.0374	20.0387	20.0453	20.0465	20.0521	20.0521	20.0532	20.0500	20.0465	20.0440	20.0414	(88)
util rest of house	0.9316	0.8736	0.7801	0.6260	0.4613	0.3121	0.2101	0.2448	0.4372	0.7200	0.8880	0.9422	(89)
MIT 2	18.2329	18.6875	19.2029	19.6817	19.9265	20.0249	20.0463	20.0438	19.9765	19.5921	18.8323	18.1455	(90)
Living area fraction										fLA = Living area / (4) =		0.2882	(91)
MIT	18.4561	18.9152	19.4388	19.9301	20.1872	20.2923	20.3171	20.3132	20.2374	19.8316	19.0575	18.3670	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4561	18.9152	19.4388	19.9301	20.1872	20.2923	20.3171	20.3132	20.2374	19.8316	19.0575	18.3670	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9141	0.8538	0.7641	0.6216	0.4678	0.3249	0.2258	0.2616	0.4489	0.7110	0.8692	0.9259	(94)
Useful gains	589.9295	712.5653	781.2613	773.1391	651.2210	454.7119	302.0235	316.0111	472.9591	593.6371	581.1906	556.8429	(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	1183.7788	1170.0975	1078.5121	912.5360	701.1694	467.1755	305.0648	320.7680	504.9921	762.6642	990.6842	1177.2397	(97)
Space heating kWh	441.8239	307.4616	221.1546	100.3658	37.1616	0.0000	0.0000	0.0000	0.0000	125.7561	294.8354	461.5753	(98a)
Space heating requirement - total per year (kWh/year)												1990.1343	
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	441.8239	307.4616	221.1546	100.3658	37.1616	0.0000	0.0000	0.0000	0.0000	125.7561	294.8354	461.5753	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1990.1343	
Space heating per m2											(98c) / (4) =	25.1597	(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	771.4726	607.3295	622.9793	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9255	0.9521	0.9365	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	713.9928	578.2520	583.4458	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1494.5024	1429.4531	1296.1636	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	561.9669	633.2936	530.2621	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	140.4917	158.3234	132.5655	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												431.3807	(107)
Energy for space heating												25.1597	(99)
Energy for space cooling												5.4536	(108)
Total												30.6133	(109)
Fabric Energy Efficiency (DFEE)												30.6	(109)

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

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		44.9000 (1b)	x	2.5000 (2b)	=	112.2500	(1b) - (3b)
First floor		34.2000 (1c)	x	2.5000 (2c)	=	85.5000	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.1000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	197.7500	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1517	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	

Measured/design AP50 5.0000 (17)
Infiltration rate 0.4017 (18)
Number of sides sheltered 2 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3415 (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	0.4353	0.4268	0.4183	0.3756	0.3671	0.3244	0.3244	0.3158	0.3415	0.3671	0.3841	0.4012	(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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5948	0.5911	0.5875	0.5705	0.5674	0.5526	0.5526	0.5499	0.5583	0.5674	0.5738	0.5805	(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 Opening Type (Uw = 1.20)			11.9000	1.1450	13.6260			(27)
RL			7.4000	1.5918	11.7790			(27a)
Heatloss Floor 1			44.9000	0.1300	5.8370			(28a)
External Wall 1	61.5000	11.9000	49.6000	0.1800	8.9280			(29a)
FR	44.9000	7.4000	37.5000	0.1100	4.1250			(30)
Total net area of external elements Aum(A, m2)			151.3000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.2950			(33)
Party Wall 1			19.2500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 108.9665 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	8.6000	0.1600	1.3760
E14 Flat roof	30.2000	0.0800	2.4160
E16 Corner (normal)	15.0000	0.0900	1.3500
E18 Party wall between dwellings	20.0000	0.0600	1.2000
E1 Steel lintel with perforated steel base plate	7.0000	0.0500	0.3500
E3 Sill	3.8000	0.0500	0.1900
E4 Jamb	23.2000	0.0500	1.1600
E6 Intermediate floor within a dwelling	20.1000	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.0420 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 52.3370 (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	38.8129	38.5727	38.3373	37.2318	37.0249	36.0620	36.0620	35.8837	36.4329	37.0249	37.4434	37.8808	(38)
Heat transfer coeff	91.1498	90.9097	90.6743	89.5687	89.3619	88.3990	88.3990	88.2206	88.7699	89.3619	89.7803	90.2178	(39)
Average = Sum(39)m / 12 =												89.5677	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1523	1.1493	1.1463	1.1323	1.1297	1.1176	1.1176	1.1153	1.1222	1.1297	1.1350	1.1406	(40)
HLP (average)												1.1323	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4456 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	28.1716	27.7532	27.1640	26.0777	25.2642	24.3623	23.8751	24.4601	25.0971	26.0623	27.1710	28.0763	(42b)
Hot water usage for other uses	39.6750	38.2323	36.7896	35.3468	33.9041	32.4614	32.4614	33.9041	35.3468	36.7896	38.2323	39.6750	(42c)
Average daily hot water use (litres/day)												62.1877	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	67.8466	65.9855	63.9536	61.4245	59.1683	56.8236	56.3364	58.3642	60.4440	62.8518	65.4033	67.7513	(44)
Energy conte	107.4524	93.9624	98.2942	84.0871	79.6519	69.8713	68.1340	72.2671	74.5334	85.2893	93.1789	106.0822	(45)
Energy content (annual)										Total = Sum(45)m =		1032.8044	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	91.3345	79.8681	83.5501	71.4740	67.7042	59.3906	57.9139	61.4270	63.3534	72.4959	79.2021	90.1699	(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	91.3345	79.8681	83.5501	71.4740	67.7042	59.3906	57.9139	61.4270	63.3534	72.4959	79.2021	90.1699	(64)
									Total per year (kWh/year) = Sum(64)m =			877.8837	(64)
12Total per year (kWh/year)												878	(64)
Electric shower(s)	52.2334	46.5403	50.8203	48.4972	49.4072	47.1297	48.7007	49.4072	48.4972	50.8203	49.8647	52.2334	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							594.1513	(64a)
Heat gains from water heating, kWh/month	35.8920	31.6021	33.5926	29.9928	29.2778	26.6301	26.6536	27.7086	27.9626	30.8291	32.2667	35.6008	(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	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	109.7286	121.4853	109.7286	113.3862	109.7286	113.3862	109.7286	109.7286	113.3862	109.7286	113.3862	109.7286	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	217.5493	219.8067	214.1180	202.0072	186.7196	172.3514	162.7525	160.4951	166.1838	178.2946	193.5822	207.9504	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	(71)
Water heating gains (Table 5)													
	48.2419	47.0269	45.1513	41.6567	39.3519	36.9862	35.8248	37.2427	38.8370	41.4369	44.8148	47.8506	(72)
Total internal gains													
	435.2032	448.0024	428.6814	416.7336	395.4836	382.4073	367.9894	367.1498	378.0905	389.1435	411.4667	425.2130	(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	
Southeast	1.8000	36.7938	0.6300	0.7000	0.7700	20.2404	(77)
Southwest	10.1000	36.7938	0.6300	0.7000	0.7700	113.5712	(79)
Horizontal	7.4000	26.0000	0.6300	0.7000	1.0000	76.3636	(82)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	210.1752	386.5319	593.8225	826.9745	996.7331	1017.0996	969.3691	840.7651	675.4454	445.7579	257.1985	176.1931	(83)
Total gains	645.3784	834.5343	1022.5038	1243.7081	1392.2167	1399.5069	1337.3585	1207.9149	1053.5359	834.9015	668.6652	601.4061	(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	26.2670	26.3364	26.4048	26.7307	26.7926	27.0844	27.0844	27.1392	26.9713	26.7926	26.6677	26.5384	
alpha	2.7511	2.7558	2.7603	2.7820	2.7862	2.8056	2.8056	2.8093	2.7981	2.7862	2.7778	2.7692	
util living area													
	0.9434	0.8960	0.8184	0.6831	0.5303	0.3847	0.2843	0.3254	0.5202	0.7740	0.9094	0.9519	(86)
MIT	18.7675	19.2484	19.8294	20.4239	20.7717	20.9322	20.9785	20.9684	20.8409	20.3027	19.4271	18.6857	(87)
Th 2	19.9583	19.9608	19.9632	19.9745	19.9766	19.9865	19.9865	19.9884	19.9827	19.9766	19.9723	19.9679	(88)
util rest of house													
	0.9350	0.8818	0.7953	0.6479	0.4842	0.3292	0.2212	0.2576	0.4580	0.7372	0.8945	0.9446	(89)
MIT 2	17.9447	18.4114	18.9650	19.5165	19.8154	19.9482	19.9779	19.9748	19.8847	19.4289	18.6017	17.8713	(90)
Living area fraction										fLA = Living area / (4) =		0.2882	(91)
MIT	18.1819	18.6526	19.2142	19.7780	20.0910	20.2318	20.2663	20.2612	20.1603	19.6808	18.8396	18.1061	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1819	18.6526	19.2142	19.7780	20.0910	20.2318	20.2663	20.2612	20.1603	19.6808	18.8396	18.1061	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9164	0.8602	0.7764	0.6407	0.4896	0.3429	0.2389	0.2762	0.4693	0.7253	0.8742	0.9275	(94)
Useful gains	591.4537	717.8870	793.8879	796.7998	681.5805	479.8418	319.4716	333.5996	494.4338	605.5728	584.5262	557.8082	(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													
	1265.3297	1250.2486	1152.8497	974.3330	749.8388	497.8453	324.0960	340.6392	537.9719	811.4745	1053.9859	1254.5740	(97)
Space heating kWh													
	501.3638	357.7470	267.0676	127.8239	50.7842	0.0000	0.0000	0.0000	0.0000	153.1909	338.0110	518.3938	(98a)
Space heating requirement - total per year (kWh/year)												2314.3820	
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													
	501.3638	357.7470	267.0676	127.8239	50.7842	0.0000	0.0000	0.0000	0.0000	153.1909	338.0110	518.3938	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2314.3820	
Space heating per m2											(98c) / (4) =	29.2589	(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	830.9503	654.1524	670.4769	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9042	0.9362	0.9175	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	751.3446	612.4413	615.1896	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1494.5024	1429.4531	1296.1636	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	535.0736	607.8568	506.6447	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	133.7684	151.9642	126.6612	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												412.3938	(107)
Energy for space heating												29.2589	(99)
Energy for space cooling												5.2136	(108)
Total												34.4725	(109)
Fabric Energy Efficiency (TFEE)												34.5	(109)

Full SAP Calculation Printout

Property Reference	Unit 3	**Issued on Date**	04/05/2024
Assessment Reference	Unit 3 - Be Green	**Prop Type Ref**	
Property			

SAP Rating	84 B	**DER**	3.78	**TER**	9.35
Environmental	97 A	**% DER < TER**			59.57
CO_2 Emissions (t/year)	0.28	**DFEE**	30.61	**TFEE**	34.47
Compliance Check	See BREL	**% DFEE < TFEE**			11.19
% DPER < TPER	16.73	**DPER**	40.34	**TPER**	48.44

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	44.9000 (1b)	x	2.5000 (2b)	=	112.2500	(1b) - (3b)
First floor	34.2000 (1c)	x	2.5000 (2c)	=	85.5000	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.1000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	197.7500	(5)

2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	79.2000 (23c)

Effective ac	0.2666	0.2634	0.2602	0.2442	0.2411	0.2251	0.2251	0.2219	0.2315	0.2411	0.2474	0.2538	(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)			11.9000	1.1450	13.6260			(27)
RL			7.4000	1.1450	8.4733			(27a)
Heatloss Floor 1			44.9000	0.1000	4.4900	75.0000	3367.5000	(28a)
External Wall 1	61.5000	11.9000	49.6000	0.1600	7.9360	70.0000	3472.0000	(29a)
FR	44.9000	7.4000	37.5000	0.1000	3.7500	9.0000	337.5000	(30)
Total net area of external elements Aum(A, m2)			151.3000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		38.2752			(33)
Party Wall 1			19.2500	0.0000	0.0000	45.0000	866.2500	(32)
Internal Wall 1			64.0000			9.0000	576.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 8619.2500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	108.9665 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E5 Ground floor (normal)	8.6000	0.0480	0.4128	
E14 Flat roof	30.2000	0.1600	4.8320	
E16 Corner (normal)	15.0000	0.0350	0.5250	
E18 Party wall between dwellings	20.0000	0.0330	0.6600	
E1 Steel lintel with perforated steel base plate	7.0000	0.3020	2.1140	
E3 Sill	3.8000	0.0290	0.1102	
E4 Jamb	23.2000	0.0240	0.5568	
E6 Intermediate floor within a dwelling	20.1000	0.0010	0.0201	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.2309 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 47.5061 (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	17.3952	17.1872	16.9792	15.9391	15.7311	14.6911	14.6911	14.4831	15.1071	15.7311	16.1472	16.5632	(38)
Heat transfer coeff	64.9013	64.6933	64.4853	63.4453	63.2373	62.1972	62.1972	61.9892	62.6132	63.2373	63.6533	64.0693	(39)
Average = Sum(39)m / 12 =												63.3933	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8205	0.8179	0.8152	0.8021	0.7995	0.7863	0.7863	0.7837	0.7916	0.7995	0.8047	0.8100	(40)
HLP (average)												0.8014	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4456 (42)
Hot water usage for mixer showers

125.6645	123.7761	121.0241	115.7589	111.8732	107.5400	105.0770	107.8081	110.8018	115.4544	120.8328	125.1831	(42a)

Hot water usage for baths

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)

Hot water usage for other uses

39.6750	38.2323	36.7896	35.3468	33.9041	32.4614	32.4614	33.9041	35.3468	36.7896	38.2323	39.6750	(42c)

Average daily hot water use (litres/day) 151.9267 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	165.3396	162.0083	157.8137	151.1057	145.7773	140.0014	137.5384	141.7122	146.1487	152.2440	159.0651	164.8581	(44)
Energy conte	261.8574	230.6977	242.5538	206.8561	196.2443	172.1480	166.3407	175.4693	180.2159	206.5936	226.6173	258.1279	(45)
Energy content (annual)										Total = Sum(45)m =		2523.7221	
Distribution loss (46)m = 0.15 x (45)m	39.2786	34.6047	36.3831	31.0284	29.4366	25.8222	24.9511	26.3204	27.0324	30.9890	33.9926	38.7192	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.1200 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.6048 (55)
Total storage loss

18.7488	16.9344	18.7488	18.1440	18.7488	18.1440	18.7488	18.7488	18.1440	18.7488	18.1440	18.7488	(56)

If cylinder contains dedicated solar storage

18.7488	16.9344	18.7488	18.1440	18.7488	18.1440	18.7488	18.7488	18.1440	18.7488	18.1440	18.7488	(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

303.8686	268.6433	284.5650	247.5121	238.2555	212.8040	208.3519	217.4805	220.8719	248.6048	267.2733	300.1391	(62)

WWHRS	-71.8415	-63.5372	-66.5325	-55.0915	-51.3433	-43.9349	-41.1819	-43.7929	-45.4567	-53.5884	-60.7092	-70.5111	(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

232.0271	205.1061	218.0325	192.4206	186.9122	168.8692	167.1700	173.6876	175.4152	195.0164	206.5641	229.6280	(64)

Total per year (kWh/year) = Sum(64)m = 2350.8489 (64)
12Total per year (kWh/year) 2351 (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

120.6766	107.0635	114.2581	101.3045	98.8602	89.7640	88.9173	91.9525	92.4466	102.3013	107.8751	119.4365	(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	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	109.7286	121.4853	109.7286	113.3862	109.7286	113.3862	109.7286	109.7286	113.3862	109.7286	113.3862	109.7286	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	217.5493	219.8067	214.1180	202.0072	186.7196	172.3514	162.7525	160.4951	166.1838	178.2946	193.5822	207.9504	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	(71)
Water heating gains (Table 5)	162.1997	159.3206	153.5727	140.7006	132.8766	124.6722	119.5124	123.5921	128.3980	137.5018	149.8265	160.5329	(72)
Total internal gains	549.1610	560.2961	537.1027	515.7776	489.0083	470.0933	451.6770	453.4992	467.6516	485.2084	516.4784	537.8954	(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	
Southeast	1.8000	36.7938	0.6300	0.7000	0.7700	20.2404	(77)
Southwest	10.1000	36.7938	0.6300	0.7000	0.7700	113.5712	(79)
Horizontal	7.4000	26.0000	0.6300	0.7000	1.0000	76.3636	(82)

Solar gains	210.1752	386.5319	593.8225	826.9745	996.7331	1017.0996	969.3691	840.7651	675.4454	445.7579	257.1985	176.1931	(83)
Total gains	759.3362	946.8280	1130.9252	1342.7520	1485.7413	1487.1930	1421.0461	1294.2643	1143.0970	930.9664	773.6768	714.0885	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	36.8904	37.0090	37.1284	37.7370	37.8612	38.4943	38.4943	38.6234	38.2385	37.8612	37.6137	37.3695	
alpha	3.4594	3.4673	3.4752	3.5158	3.5241	3.5663	3.5663	3.5749	3.5492	3.5241	3.5076	3.4913	
util living area	0.8901	0.8116	0.6978	0.5344	0.3866	0.2659	0.1921	0.2195	0.3704	0.6295	0.8272	0.9046	(86)
Living	19.8808	20.2501	20.5989	20.8617	20.9619	20.9926	20.9983	20.9972	20.9761	20.8021	20.3245	19.8146	
Non living	18.9417	19.3905	19.8040	20.1106	20.2188	20.2596	20.2642	20.2658	20.2413	20.0560	19.4983	18.8673	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.4275	20.2501	20.5989	20.8617	20.9619	20.9926	20.9983	20.9972	20.9761	20.8021	20.3245	19.9804	(87)
Th 2	20.2356	20.2379	20.2401	20.2515	20.2538	20.2652	20.2652	20.2675	20.2606	20.2538	20.2492	20.2447	(88)
util rest of house	0.8780	0.7940	0.6741	0.5068	0.3574	0.2359	0.1602	0.1849	0.3327	0.5958	0.8077	0.8937	(89)
MIT 2	19.7198	19.3905	19.8040	20.1106	20.2188	20.2596	20.2642	20.2658	20.2413	20.0560	19.4983	19.1155	(90)
Living area fraction										fLA = Living area / (4) =		0.2882	(91)
MIT	19.9238	19.6382	20.0332	20.3271	20.4330	20.4709	20.4758	20.4766	20.4531	20.2710	19.7364	19.3648	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9238	19.6382	20.0332	20.3271	20.4330	20.4709	20.4758	20.4766	20.4531	20.2710	19.7364	19.3648	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8726	0.7789	0.6674	0.5096	0.3645	0.2443	0.1694	0.1948	0.3426	0.5966	0.7930	0.8793	(94)
Useful gains	662.5697	737.4398	754.7759	684.2745	541.5198	363.3073	240.7061	252.1155	391.6157	555.4609	613.5464	627.8776	(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	1014.0024	953.4661	872.6907	724.9981	552.2496	365.1513	241.0641	252.7078	397.7874	611.5687	804.3505	971.5999	(97)
Space heating kWh	261.4659	145.1697	87.7286	29.3210	7.9829	0.0000	0.0000	0.0000	0.0000	41.7442	137.3789	255.7294	(98a)
Space heating requirement - total per year (kWh/year)												966.5206	
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	261.4659	145.1697	87.7286	29.3210	7.9829	0.0000	0.0000	0.0000	0.0000	41.7442	137.3789	255.7294	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												966.5206	
Space heating per m2											(98c) / (4) =	12.2190	(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 %) 323.7609 (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	261.4659	145.1697	87.7286	29.3210	7.9829	0.0000	0.0000	0.0000	0.0000	41.7442	137.3789	255.7294	(98)
Space heating efficiency (main heating system 1)	323.7609	323.7609	323.7609	323.7609	323.7609	0.0000	0.0000	0.0000	0.0000	323.7609	323.7609	323.7609	(210)
Space heating fuel (main heating system)	80.7589	44.8385	27.0967	9.0564	2.4657	0.0000	0.0000	0.0000	0.0000	12.8935	42.4322	78.9871	(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	232.0271	205.1061	218.0325	192.4206	186.9122	168.8692	167.1700	173.6876	175.4152	195.0164	206.5641	229.6280	(64)
Efficiency of water heater												163.5787	(216)
(217)m	163.5787	163.5787	163.5787	163.5787	163.5787	163.5787	163.5787	163.5787	163.5787	163.5787	163.5787	163.5787	(217)
Fuel for water heating, kWh/month	141.8443	125.3868	133.2890	117.6318	114.2644	103.2342	102.1954	106.1798	107.2360	119.2187	126.2781	140.3777	(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	15.4906	13.9915	15.4906	14.9909	15.4906	14.9909	15.4906	15.4906	14.9909	15.4906	14.9909	15.4906	(231)
Lighting	20.7044	16.6098	14.9553	10.9569	8.4634	6.9147	7.7206	10.0356	13.0352	17.1029	19.3177	21.2798	(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												298.5291	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												163.5787	
Water heating fuel used												1437.1363	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7560)		
mechanical ventilation fans (SFP = 0.7560)	182.3888	(230a)
Total electricity for the above, kWh/year	182.3888	(231)
Electricity for lighting (calculated in Appendix L)	167.0964	(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	2085.1506	(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	298.5291	0.1579	47.1399	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1437.1363	0.1408	202.3500	(264)
Space and water heating			249.4899	(265)
Pumps, fans and electric keep-hot	182.3888	0.1387	25.2996	(267)
Energy for lighting	167.0964	0.1443	24.1172	(268)
Total CO2, kg/year			298.9066	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.7800	(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	298.5291	1.5845	473.0106	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1437.1363	1.5206	2185.3459	(278)
Space and water heating			2658.3564	(279)
Pumps, fans and electric keep-hot	182.3888	1.5128	275.9177	(281)
Energy for lighting	167.0964	1.5338	256.2981	(282)
Total Primary energy kWh/year			3190.5723	(286)
Dwelling Primary energy Rate (DPER)			40.3400	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	44.9000 (1b)	x	2.5000 (2b)	=	112.2500	(1b) - (3b)
First floor	34.2000 (1c)	x	2.5000 (2c)	=	85.5000	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 79.1000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	197.7500	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1517	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4017	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3415	(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	0.4353	0.4268	0.4183	0.3756	0.3671	0.3244	0.3244	0.3158	0.3415	0.3671	0.3841	0.4012	(22b)
Effective ac	0.5948	0.5911	0.5875	0.5705	0.5674	0.5526	0.5526	0.5499	0.5583	0.5674	0.5738	0.5805	(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 Opening Type (Uw = 1.20)			11.9000	1.1450	13.6260			(27)
RL			7.4000	1.5918	11.7790			(27a)
Heatloss Floor 1			44.9000	0.1300	5.8370			(28a)
External Wall 1	61.5000	11.9000	49.6000	0.1800	8.9280			(29a)
FR	44.9000	7.4000	37.5000	0.1100	4.1250			(30)
Total net area of external elements Aum(A, m2)			151.3000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.2950			(33)
Party Wall 1			19.2500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 108.9665 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	8.6000	0.1600	1.3760
E14 Flat roof	30.2000	0.0800	2.4160
E16 Corner (normal)	15.0000	0.0900	1.3500
E18 Party wall between dwellings	20.0000	0.0600	1.2000
E1 Steel lintel with perforated steel base plate	7.0000	0.0500	0.3500
E3 Sill	3.8000	0.0500	0.1900
E4 Jamb	23.2000	0.0500	1.1600
E6 Intermediate floor within a dwelling	20.1000	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.0420 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 52.3370 (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	38.8129	38.5727	38.3373	37.2318	37.0249	36.0620	36.0620	35.8837	36.4329	37.0249	37.4434	37.8808	(38)
Heat transfer coeff	91.1498	90.9097	90.6743	89.5687	89.3619	88.3990	88.3990	88.2206	88.7699	89.3619	89.7803	90.2178	(39)

Average = Sum(39)m / 12 = 89.5677

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1523	1.1493	1.1463	1.1323	1.1297	1.1176	1.1176	1.1153	1.1222	1.1297	1.1350	1.1406	(40)
HLP (average)												1.1323	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4456 (42)

Hot water usage for mixer showers

83.7764	82.5174	80.6828	77.1726	74.5822	71.6933	70.0513	71.8720	73.8679	76.9696	80.5552	83.4554	(42a)

Hot water usage for baths

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)

Hot water usage for other uses

39.6750	38.2323	36.7896	35.3468	33.9041	32.4614	32.4614	33.9041	35.3468	36.7896	38.2323	39.6750	(42c)

Average daily hot water use (litres/day) 113.3072 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	123.4514	120.7496	117.4723	112.5194	108.4862	104.1547	102.5127	105.7761	109.2147	113.7592	118.7875	123.1304	(44)
Energy conte	195.5168	171.9459	180.5506	154.0334	146.0433	128.0704	123.9802	130.9730	134.6727	154.3701	169.2345	192.7924	(45)

Energy content (annual) Total = Sum(45)m = 1882.1833

Distribution loss (46)m = 0.15 x (45)m

29.3275	25.7919	27.0826	23.1050	21.9065	19.2106	18.5970	19.6459	20.2009	23.1555	25.3852	28.9189	(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

242.1117	214.0316	227.1455	199.1253	192.6382	173.1622	170.5751	177.5679	179.7645	200.9650	214.3264	239.3873	(62)
WWHRS -38.2991	-33.8720	-35.4688	-29.3696	-27.3714	-23.4219	-21.9543	-23.3462	-24.2332	-28.5683	-32.3644	-37.5898	(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												
203.8126	180.1596	191.6767	169.7557	165.2669	149.7403	148.6208	154.2217	155.5313	172.3967	181.9620	201.7975	(64)

Total per year (kWh/year) = Sum(64)m = 2074.9419 (64)

12Total per year (kWh/year) 2075 (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

102.2853	90.8406	97.3090	87.2896	85.8353	78.6569	78.4993	80.8244	80.8521	88.6040	92.3440	101.3794	(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	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	109.7286	121.4853	109.7286	113.3862	109.7286	113.3862	109.7286	109.7286	113.3862	109.7286	113.3862	109.7286	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	217.5493	219.8067	214.1180	202.0072	186.7196	172.3514	162.7525	160.4951	166.1838	178.2946	193.5822	207.9504	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	(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)	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	(71)
Water heating gains (Table 5)	137.4802	135.1794	130.7916	121.2355	115.3701	109.2456	105.5099	108.6350	112.2946	119.0914	128.2555	136.2626	(72)
Total internal gains	527.4415	539.1549	517.3217	499.3125	474.5017	454.6667	437.6745	438.5421	451.5481	469.7980	497.9074	516.6251	(73)

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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	
Southeast	1.8000	36.7938	0.6300	0.7000	0.7700	20.2404	(77)
Southwest	10.1000	36.7938	0.6300	0.7000	0.7700	113.5712	(79)
Horizontal	7.4000	26.0000	0.6300	0.7000	1.0000	76.3636	(82)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	210.1752	386.5319	593.8225	826.9745	996.7331	1017.0996	969.3691	840.7651	675.4454	445.7579	257.1985	176.1931	(83)
Total gains	737.6167	925.6868	1111.1441	1326.2869	1471.2348	1471.7664	1407.0436	1279.3072	1126.9936	915.5559	755.1058	692.8182	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	26.2670	26.3364	26.4048	26.7307	26.7926	27.0844	27.0844	27.1392	26.9713	26.7926	26.6677	26.5384	
alpha	2.7511	2.7558	2.7603	2.7820	2.7862	2.8056	2.8056	2.8093	2.7981	2.7862	2.7778	2.7692	
util living area	0.9248	0.8733	0.7924	0.6576	0.5083	0.3678	0.2710	0.3085	0.4935	0.7414	0.8849	0.9345	(86)
MIT	18.9467	19.3969	19.9364	20.4794	20.7951	20.9395	20.9810	20.9724	20.8609	20.3829	19.5749	18.8696	(87)
Th 2	19.9583	19.9608	19.9632	19.9745	19.9766	19.9865	19.9865	19.9884	19.9827	19.9766	19.9723	19.9679	(88)
util rest of house	0.9142	0.8570	0.7676	0.6219	0.4630	0.3142	0.2106	0.2438	0.4328	0.7025	0.8671	0.9251	(89)
MIT 2	17.5968	18.1528	18.8071	19.4467	19.7919	19.9428	19.9768	19.9733	19.8737	19.3612	18.3923	17.5068	(90)
Living area fraction									fLA = Living area / (4) =			0.2882	(91)
MIT	17.9859	18.5114	19.1326	19.7444	20.0811	20.2301	20.2662	20.2613	20.1583	19.6557	18.7331	17.8996	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.9859	18.5114	19.1326	19.7444	20.0811	20.2301	20.2662	20.2613	20.1583	19.6557	18.7331	17.8996	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8881	0.8295	0.7451	0.6133	0.4678	0.3273	0.2274	0.2615	0.4437	0.6890	0.8407	0.9003	(94)
Useful gains	655.0901	767.8110	827.9410	813.4164	688.1956	481.7122	320.0202	334.5336	500.0438	630.7835	634.8333	623.7317	(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	1247.4691	1237.4091	1145.4534	971.3188	748.9479	497.6962	324.0903	340.6465	537.7903	809.2356	1044.4281	1235.9481	(97)
Space heating kWh	440.7300	315.5699	236.2292	113.6897	45.1997	0.0000	0.0000	0.0000	0.0000	132.7683	294.9083	455.4890	(98a)
Space heating requirement - total per year (kWh/year)												2034.5841	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	440.7300	315.5699	236.2292	113.6897	45.1997	0.0000	0.0000	0.0000	0.0000	132.7683	294.9083	455.4890	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2034.5841	
Space heating per m2										(98c) / (4) =		25.7217	(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	440.7300	315.5699	236.2292	113.6897	45.1997	0.0000	0.0000	0.0000	0.0000	132.7683	294.9083	455.4890	(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)	477.4973	341.8959	255.9363	123.1741	48.9704	0.0000	0.0000	0.0000	0.0000	143.8443	319.5106	493.4876	(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	203.8126	180.1596	191.6767	169.7557	165.2669	149.7403	148.6208	154.2217	155.5313	172.3967	181.9620	201.7975	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.7422	85.3036	84.5296	83.1815	81.5756	79.8000	79.8000	79.8000	79.8000	83.4811	85.1362	85.8281	(217)
Fuel for water heating, kWh/month	237.7041	211.1981	226.7569	204.0787	202.5935	187.6445	186.2416	193.2602	194.9014	206.5099	213.7305	235.1182	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	22.7994	18.2906	16.4686	12.0656	9.3198	7.6144	8.5019	11.0510	14.3542	18.8335	21.2724	23.4331	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-40.6065	-56.5468	-80.3079	-89.1910	-95.2670	-88.6010	-87.4904	-83.0185	-75.0158	-64.1189	-44.3859	-35.1884	(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	-25.1360	-52.6071	-104.0690	-155.6051	-205.0846	-205.8232	-203.4117	-172.5424	-126.8808	-75.0117	-33.4867	-19.8985	(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	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2204.3164	(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	2499.7377	(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)	184.0045	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2219.2950	(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	2754.7637	(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	2204.3164	0.2100	462.9065	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2499.7377	0.2100	524.9449	(264)
Space and water heating			987.8514	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	184.0045	0.1443	26.5575	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-839.7381	0.1348	-113.2347	
PV Unit electricity exported	-1379.5569	0.1260	-173.8629	
Total			-287.0976	(269)
Total CO2, kg/year			739.2405	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.3500	(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	2204.3164	1.1300	2490.8776	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2499.7377	1.1300	2824.7036	(278)
Space and water heating			5315.5812	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	184.0045	1.5338	282.2323	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-839.7381	1.4984	-1258.2464	
PV Unit electricity exported	-1379.5569	0.4626	-638.2049	
Total			-1896.4513	(283)
Total Primary energy kWh/year			3831.4630	(286)
Target Primary Energy Rate (TPER)			48.4400	(287)

Summary for Input Data

elmhurst energy

Property Reference	Unit 3	**Issued on Date**	04/05/2024
Assessment Reference	Unit 3 - Be Lean	**Prop Type Ref**	
Property			

SAP Rating	86 B	**DER**	10.84	**TER**	9.35
Environmental	91 B	**% DER < TER**			-15.94
CO_2 Emissions (t/year)	0.79	**DFEE**	30.61	**TFEE**	34.47
Compliance Check	See BREL	**% DFEE < TFEE**			11.19
% DPER < TPER	-28.15	**DPER**	62.07	**TPER**	48.44

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

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

Orientation	Southwest	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Suburban	
1.0 Property Type	Bungalow, End-Terrace	
Which Floor	0	
2.0 Number of Storeys	2	
3.0 Date Built	2024	
3.0 Property Age Band	L	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	N/A	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Basement:	0.00 m	0.00 m²	0.00 m
Ground floor:	8.60 m	44.90 m²	2.50 m
1st Storey:	16.00 m	34.20 m²	2.50 m
2nd Storey:	0.00 m	0.00 m²	0.00 m
3rd Storey:	0.00 m	0.00 m²	0.00 m
4th Storey:	0.00 m	0.00 m²	0.00 m
5th Storey:	0.00 m	0.00 m²	0.00 m
6th Storey:	0.00 m	0.00 m²	0.00 m
7th Storey:	0.00 m	0.00 m²	0.00 m

8.0 Living Area	22.80	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
External Wall 1	Cavity Wall	Cavity wall : dense plaster, AAC block, filled cavity, any outside structure	0.16	70.00	61.50	49.60	0.00	None	11.90	Calculate Wall Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Plasterboard on dabs mounted on cement render on both sides, AAC blocks, cavity	0.00	45.00	19.25	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	64.00

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area	Shelter Code	Shelter Factor	Calculation Type	Openings

Summary for Input Data

						(m²)				
FR	External Flat Roof	Plasterboard, insulated flat roof	0.10	9.00	44.90	37.50	None	0.00	Enter Gross Area	7.40

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Heatloss Floor 1	Ground Floor - Solid	Lowest occupied	Suspended concrete floor, carpeted	0.10	None	0.00	75.00	44.90

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Windows	Manufacturer	Window	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.20
RLs	Manufacturer	Roof Window	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
SW	Windows	External Wall 1	South West	10.10	0
SE	Windows	External Wall 1	South East	1.80	0
RL	RLs	FR	Horizontal	7.40	0

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	

17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E5 Ground floor (normal)	Gov Approved Scheme	8.60	0.05	0.05	No
E14 Flat roof	Table K1 - Default	30.20	0.16	0.16	Yes
E16 Corner (normal)	Gov Approved Scheme	15.00	0.04	0.04	No
E18 Party wall between dwellings	Gov Approved Scheme	20.00	0.03	0.03	No
E1 Steel lintel with perforated steel base plate	Gov Approved Scheme	7.00	0.30	0.30	No
E3 Sill	Gov Approved Scheme	3.80	0.03	0.03	No
E4 Jamb	Gov Approved Scheme	23.20	0.02	0.02	No
E6 Intermediate floor within a dwelling	Gov Approved Scheme	20.10	0.00	0.00	No

Y-value	0.06	W/m²K

18.0 Pressure Testing	Yes	
Designed AP_{50}	3.00	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	No
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500811
Configuration	2
Manufacturer SFP	0.54
Duct Type	Rigid
MVHR Efficiency	88.00
Wet Rooms	2
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)
Duct Installation Specification	Level 1

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System	No

22.0 Lighting

No Fixed Lighting	No

Name	Efficacy	Power	Capacity	Count
Lighting 1	120.00	6	720	40

Summary for Input Data

24.0 Main Heating 1	Manufacturer	
Percentage of Heat	100.00	%
Database Ref. No.	0	
Fuel Type	Mains gas	
SAP Code	102	
In Winter	89.50	
In Summer	82.00	
Model Name	GB	
Manufacturer	GB	
Controls SAP Code	2110	
Delayed Start Stat	Yes	
Burner Control	On/Off	
HETAS approved System	No	
Oil Pump Inside	No	
Flue Type	None or Unknown	
Fan Assisted Flue	No	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators	
Flow Temperature	Unknown	
Boiler Interlock	Yes	
Combi boiler type	No Combi	
25.0 Main Heating 2	None	
26.0 Heat Networks	None	
28.0 Water Heating		
Water Heating	Main Heating 1	
SAP Code	901	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	Yes	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
Summer Immersion	No	
Cold Water Source	From mains	
Bath Count	0	
Supplementary Immersion	No	
Immersion Only Heating Hot Water	No	

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
S1	Vented hot water system + pump	12.00		Yes	Instantaneous System 1
S2	Vented hot water system + pump	12.00		Yes	Instantaneous System 1

28.3 Waste Water Heat Recovery System Instantaneous System 1		
Database ID	80194	
Brand Model	Zypho, Slim DW50	
Details	Year: 2022 + current Efficiency: 44.7 Utilisation factor: 0.987	
29.0 Hot Water Cylinder	Hot Water Cylinder	

Summary for Input Data

Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	150.00	L
Loss	1.12	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	

31.0 Thermal Store None

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Property Reference	Unit 3	Issued on Date	04/05/2024
Assessment Reference	Unit 3 - Be Lean	Prop Type Ref	
Property			

SAP Rating	86 B	DER	10.84	TER	9.35
Environmental	91 B	% DER < TER			-15.94
CO_2 Emissions (t/year)	0.79	DFEE	30.61	TFEE	34.47
Compliance Check	See BREL	% DFEE < TFEE			11.19
% DPER < TPER	-28.15	DPER	62.07	TPER	48.44

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	44.9000 (1b)	x	2.5000 (2b)	=	112.2500	(1b) - (3b)
First floor	34.2000 (1c)	x	2.5000 (2c)	=	85.5000	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.1000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	197.7500	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	79.2000	(23c)

Effective ac	0.2666	0.2634	0.2602	0.2442	0.2411	0.2251	0.2251	0.2219	0.2315	0.2411	0.2474	0.2538	(25)

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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)			11.9000	1.1450	13.6260			(27)
RL			7.4000	1.1450	8.4733			(27a)
Heatloss Floor 1			44.9000	0.1000	4.4900	75.0000	3367.5000	(28a)
External Wall 1	61.5000	11.9000	49.6000	0.1600	7.9360	70.0000	3472.0000	(29a)
FR	44.9000	7.4000	37.5000	0.1000	3.7500	9.0000	337.5000	(30)
Total net area of external elements Aum(A, m2)			151.3000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	38.2752			(33)
Party Wall 1			19.2500	0.0000	0.0000	45.0000	866.2500	(32)
Internal Wall 1			64.0000			9.0000	576.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 8619.2500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	108.9665	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E5 Ground floor (normal)	8.6000	0.0480	0.4128	
E14 Flat roof	30.2000	0.1600	4.8320	
E16 Corner (normal)	15.0000	0.0350	0.5250	
E18 Party wall between dwellings	20.0000	0.0330	0.6600	
E1 Steel lintel with perforated steel base plate	7.0000	0.3020	2.1140	
E3 Sill	3.8000	0.0290	0.1102	
E4 Jamb	23.2000	0.0240	0.5568	
E6 Intermediate floor within a dwelling	20.1000	0.0010	0.0201	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.2309 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 47.5061 (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	17.3952	17.1872	16.9792	15.9391	15.7311	14.6911	14.6911	14.4831	15.1071	15.7311	16.1472	16.5632	(38)
Heat transfer coeff	64.9013	64.6933	64.4853	63.4453	63.2373	62.1972	62.1972	61.9892	62.6132	63.2373	63.6533	64.0693	(39)
Average = Sum(39)m / 12 =												63.3933	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8205	0.8179	0.8152	0.8021	0.7995	0.7863	0.7863	0.7837	0.7916	0.7995	0.8047	0.8100	(40)
HLP (average)												0.8014	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4456 (42)
Hot water usage for mixer showers

125.6645	123.7761	121.0241	115.7589	111.8732	107.5400	105.0770	107.8081	110.8018	115.4544	120.8328	125.1831	(42a)

Hot water usage for baths

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)

Hot water usage for other uses

39.6750	38.2323	36.7896	35.3468	33.9041	32.4614	32.4614	33.9041	35.3468	36.7896	38.2323	39.6750	(42c)

Average daily hot water use (litres/day) 151.9267 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	165.3396	162.0083	157.8137	151.1057	145.7773	140.0014	137.5384	141.7122	146.1487	152.2440	159.0651	164.8581	(44)
Energy conte	261.8574	230.6977	242.5538	206.8561	196.2443	172.1480	166.3407	175.4693	180.2159	206.5936	226.6173	258.1279	(45)
Energy content (annual)										Total = Sum(45)m =		2523.7221	
Distribution loss (46)m = 0.15 x (45)m	39.2786	34.6047	36.3831	31.0284	29.4366	25.8222	24.9511	26.3204	27.0324	30.9890	33.9926	38.7192	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.1200	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.6048	(55)
Total storage loss	18.7488	16.9344	18.7488	18.1440	18.7488	18.1440	18.7488	18.7488	18.1440	18.7488	18.1440	18.7488	(56)
If cylinder contains dedicated solar storage	18.7488	16.9344	18.7488	18.1440	18.7488	18.1440	18.7488	18.7488	18.1440	18.7488	18.1440	18.7488	(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	303.8686	268.6433	284.5650	247.5121	238.2555	212.8040	208.3519	217.4805	220.8719	248.6048	267.2733	300.1391	(62)
WWHRS	-71.8415	-63.5372	-66.5325	-55.0915	-51.3433	-43.9349	-41.1819	-43.7929	-45.4567	-53.5884	-60.7092	-70.5111	(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	232.0271	205.1061	218.0325	192.4206	186.9122	168.8692	167.1700	173.6876	175.4152	195.0164	206.5641	229.6280	(64)
										Total per year (kWh/year) = Sum(64)m =		2350.8489	(64)
12Total per year (kWh/year)												2351	(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	120.6766	107.0635	114.2581	101.3045	98.8602	89.7640	88.9173	91.9525	92.4466	102.3013	107.8751	119.4365	(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	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	109.7286	121.4853	109.7286	113.3862	109.7286	113.3862	109.7286	109.7286	113.3862	109.7286	113.3862	109.7286	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	217.5493	219.8067	214.1180	202.0072	186.7196	172.3514	162.7525	160.4951	166.1838	178.2946	193.5822	207.9504	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	(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)	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	(71)
Water heating gains (Table 5)	162.1997	159.3206	153.5727	140.7006	132.8766	124.6722	119.5124	123.5921	128.3980	137.5018	149.8265	160.5329	(72)
Total internal gains	552.1610	563.2961	540.1027	518.7776	492.0083	470.0933	451.6770	453.4992	467.6516	488.2084	519.4784	540.8954	(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	
Southeast	1.8000	36.7938	0.6300	0.7000	0.7700	20.2404	(77)
Southwest	10.1000	36.7938	0.6300	0.7000	0.7700	113.5712	(79)
Horizontal	7.4000	26.0000	0.6300	0.7000	1.0000	76.3636	(82)

Solar gains	210.1752	386.5319	593.8225	826.9745	996.7331	1017.0996	969.3691	840.7651	675.4454	445.7579	257.1985	176.1931	(83)
Total gains	762.3362	949.8280	1133.9252	1345.7520	1488.7413	1487.1930	1421.0461	1294.2643	1143.0970	933.9664	776.6768	717.0885	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	36.8904	37.0090	37.1284	37.7370	37.8612	38.4943	38.4943	38.6234	38.2385	37.8612	37.6137	37.3695	
alpha	3.4594	3.4673	3.4752	3.5158	3.5241	3.5663	3.5663	3.5749	3.5492	3.5241	3.5076	3.4913	
util living area	0.8891	0.8105	0.6966	0.5335	0.3858	0.2659	0.1921	0.2195	0.3704	0.6281	0.8259	0.9036	(86)
MIT	19.8861	20.2538	20.6011	20.8625	20.9622	20.9926	20.9983	20.9972	20.9761	20.8035	20.3285	19.8202	(87)
Th 2	20.2356	20.2379	20.2401	20.2515	20.2538	20.2652	20.2652	20.2675	20.2606	20.2538	20.2492	20.2447	(88)
util rest of house	0.8769	0.7928	0.6730	0.5058	0.3567	0.2359	0.1602	0.1849	0.3327	0.5944	0.8063	0.8927	(89)
MIT 2	18.9481	19.3949	19.8065	20.1115	20.2190	20.2596	20.2642	20.2658	20.2413	20.0575	19.5030	18.8742	(90)
Living area fraction										fLA = Living area / (4) =		0.2882	(91)
MIT	19.2185	19.6425	20.0355	20.3280	20.4332	20.4709	20.4758	20.4766	20.4531	20.2725	19.7410	19.1469	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.0685	19.4925	19.8855	20.1780	20.2832	20.3209	20.3258	20.3266	20.3031	20.1225	19.5910	18.9969	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8551	0.7738	0.6613	0.5030	0.3579	0.2381	0.1629	0.1877	0.3349	0.5882	0.7872	0.8714	(94)
Useful gains	651.8995	734.9486	749.9060	676.9448	532.8239	354.1699	231.4332	242.9061	382.7944	549.3721	611.3824	624.8593	(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	958.4930	944.0367	863.1701	715.5333	542.7776	355.8218	231.7345	243.4094	388.3954	602.1785	795.0902	948.0254	(97)
Space heating kWh	228.1056	140.5072	84.2685	27.7837	7.4055	0.0000	0.0000	0.0000	0.0000	39.2880	132.2697	240.4356	(98a)
Space heating requirement - total per year (kWh/year)												900.0637	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	228.1056	140.5072	84.2685	27.7837	7.4055	0.0000	0.0000	0.0000	0.0000	39.2880	132.2697	240.4356	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												900.0637	
Space heating per m2											(98c) / (4) =	11.3788	(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 %) 89.5000 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	228.1056	140.5072	84.2685	27.7837	7.4055	0.0000	0.0000	0.0000	0.0000	39.2880	132.2697	240.4356	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	254.8666	156.9913	94.1547	31.0432	8.2743	0.0000	0.0000	0.0000	0.0000	43.8972	147.7873	268.6431	(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	232.0271	205.1061	218.0325	192.4206	186.9122	168.8692	167.1700	173.6876	175.4152	195.0164	206.5641	229.6280	(64)
Efficiency of water heater												82.0000	(216)
(217)m	85.5541	84.8921	83.9613	82.8763	82.2627	82.0000	82.0000	82.0000	82.0000	83.1686	84.7731	85.6721	(217)
Fuel for water heating, kWh/month	271.2051	241.6080	259.6821	232.1782	227.2137	205.9380	203.8658	211.8142	213.9210	234.4831	243.6670	268.0311	(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	18.9727	17.1367	18.9727	18.3607	18.9727	18.3607	18.9727	18.9727	18.3607	18.9727	18.3607	18.9727	(231)
Lighting	20.7044	16.6098	14.9553	10.9569	8.4634	6.9147	7.7206	10.0356	13.0352	17.1029	19.3177	21.2798	(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 1005.6578 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 82.0000

Water heating fuel used 2813.6072 (219)

Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7560)

mechanical ventilation fans (SFP = 0.7560) 182.3888 (230a)

central heating pump 41.0000 (230c)

Total electricity for the above, kWh/year 223.3888 (231)

Electricity for lighting (calculated in Appendix L)	167.0964	(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	4209.7503	(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	1005.6578	0.2100	211.1881	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2813.6072	0.2100	590.8575	(264)
Space and water heating			802.0457	(265)
Pumps, fans and electric keep-hot	223.3888	0.1387	30.9868	(267)
Energy for lighting	167.0964	0.1443	24.1172	(268)
Total CO2, kg/year			857.1496	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.8400	(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	1005.6578	1.1300	1136.3933	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2813.6072	1.1300	3179.3762	(278)
Space and water heating			4315.7695	(279)
Pumps, fans and electric keep-hot	223.3888	1.5128	337.9425	(281)
Energy for lighting	167.0964	1.5338	256.2981	(282)
Total Primary energy kWh/year			4910.0102	(286)
Dwelling Primary energy Rate (DPER)			62.0700	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	44.9000 (1b)	x	2.5000 (2b)	=	112.2500	(1b) - (3b)
First floor	34.2000 (1c)	x	2.5000 (2c)	=	85.5000	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.1000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	197.7500	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1517	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4017	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3415	(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	0.4353	0.4268	0.4183	0.3756	0.3671	0.3244	0.3244	0.3158	0.3415	0.3671	0.3841	0.4012	(22b)
Effective ac	0.5948	0.5911	0.5875	0.5705	0.5674	0.5526	0.5526	0.5499	0.5583	0.5674	0.5738	0.5805	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K

	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opening Type (Uw = 1.20)			11.9000	1.1450	13.6260			(27)
RL			7.4000	1.5918	11.7790			(27a)
Heatloss Floor 1			44.9000	0.1300	5.8370			(28a)
External Wall 1	61.5000	11.9000	49.6000	0.1800	8.9280			(29a)
FR	44.9000	7.4000	37.5000	0.1100	4.1250			(30)
Total net area of external elements Aum(A, m2)			151.3000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		44.2950			(33)
Party Wall 1			19.2500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 108.9665 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	8.6000	0.1600	1.3760
E14 Flat roof	30.2000	0.0800	2.4160
E16 Corner (normal)	15.0000	0.0900	1.3500
E18 Party wall between dwellings	20.0000	0.0600	1.2000
E1 Steel lintel with perforated steel base plate	7.0000	0.0500	0.3500
E3 Sill	3.8000	0.0500	0.1900
E4 Jamb	23.2000	0.0500	1.1600
E6 Intermediate floor within a dwelling	20.1000	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.0420 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 52.3370 (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	38.8129	38.5727	38.3373	37.2318	37.0249	36.0620	36.0620	35.8837	36.4329	37.0249	37.4434	37.8808	(38)
Heat transfer coeff	91.1498	90.9097	90.6743	89.5687	89.3619	88.3990	88.3990	88.2206	88.7699	89.3619	89.7803	90.2178	(39)
Average = Sum(39)m / 12 =												89.5677	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1523	1.1493	1.1463	1.1323	1.1297	1.1176	1.1176	1.1153	1.1222	1.1297	1.1350	1.1406	(40)
HLP (average)												1.1323	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4456 (42)

Hot water usage for mixer showers												
83.7764	82.5174	80.6828	77.1726	74.5822	71.6933	70.0513	71.8720	73.8679	76.9696	80.5552	83.4554	(42a)
Hot water usage for baths												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses												
39.6750	38.2323	36.7896	35.3468	33.9041	32.4614	32.4614	33.9041	35.3468	36.7896	38.2323	39.6750	(42c)
Average daily hot water use (litres/day)												113.3072	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	123.4514	120.7496	117.4723	112.5194	108.4862	104.1547	102.5127	105.7761	109.2147	113.7592	118.7875	123.1304	(44)
Energy conte	195.5168	171.9459	180.5506	154.0334	146.0433	128.0704	123.9802	130.9730	134.6727	154.3701	169.2345	192.7924	(45)
Energy content (annual)										Total = Sum(45)m =		1882.1833	
Distribution loss (46)m = 0.15 x (45)m													
	29.3275	25.7919	27.0826	23.1050	21.9065	19.2106	18.5970	19.6459	20.2009	23.1555	25.3852	28.9189	(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													
	242.1117	214.0316	227.1455	199.1253	192.6382	173.1622	170.5751	177.5679	179.7645	200.9650	214.3264	239.3873	(62)
WWHRS	-38.2991	-33.8720	-35.4688	-29.3696	-27.3714	-23.4219	-21.9543	-23.3462	-24.2332	-28.5683	-32.3644	-37.5898	(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													
	203.8126	180.1596	191.6767	169.7557	165.2669	149.7403	148.6208	154.2217	155.5313	172.3967	181.9620	201.7975	(64)
										Total per year (kWh/year) = Sum(64)m =		2074.9419	(64)
12Total per year (kWh/year)												2075	(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													
	102.2853	90.8406	97.3090	87.2896	85.8353	78.6569	78.4993	80.8244	80.8521	88.6040	92.3440	101.3794	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	109.7286	121.4853	109.7286	113.3862	109.7286	113.3862	109.7286	109.7286	113.3862	109.7286	113.3862	109.7286	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	217.5493	219.8067	214.1180	202.0072	186.7196	172.3514	162.7525	160.4951	166.1838	178.2946	193.5822	207.9504	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	(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)													
	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	(71)
Water heating gains (Table 5)													
	137.4802	135.1794	130.7916	121.2355	115.3701	109.2456	105.5099	108.6350	112.2946	119.0914	128.2555	136.2626	(72)
Total internal gains													
	527.4415	539.1549	517.3217	499.3125	474.5017	454.6667	437.6745	438.5421	451.5481	469.7980	497.9074	516.6251	(73)

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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	
Southeast	1.8000	36.7938	0.6300	0.7000	0.7700	20.2404	(77)
Southwest	10.1000	36.7938	0.6300	0.7000	0.7700	113.5712	(79)
Horizontal	7.4000	26.0000	0.6300	0.7000	1.0000	76.3636	(82)

Solar gains	210.1752	386.5319	593.8225	826.9745	996.7331	1017.0996	969.3691	840.7651	675.4454	445.7579	257.1985	176.1931	(83)
Total gains	737.6167	925.6868	1111.1441	1326.2869	1471.2348	1471.7664	1407.0436	1279.3072	1126.9936	915.5559	755.1058	692.8182	(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	26.2670	26.3364	26.4048	26.7307	26.7926	27.0844	27.0844	27.1392	26.9713	26.7926	26.6677	26.5384	
alpha	2.7511	2.7558	2.7603	2.7820	2.7862	2.8056	2.8056	2.8093	2.7981	2.7862	2.7778	2.7692	
util living area	0.9248	0.8733	0.7924	0.6576	0.5083	0.3678	0.2710	0.3085	0.4935	0.7414	0.8849	0.9345	(86)
MIT	18.9467	19.3969	19.9364	20.4794	20.7951	20.9395	20.9810	20.9724	20.8609	20.3829	19.5749	18.8696	(87)
Th 2	19.9583	19.9608	19.9632	19.9745	19.9766	19.9865	19.9865	19.9884	19.9827	19.9766	19.9723	19.9679	(88)
util rest of house	0.9142	0.8570	0.7676	0.6219	0.4630	0.3142	0.2106	0.2438	0.4328	0.7025	0.8671	0.9251	(89)
MIT 2	17.5968	18.1528	18.8071	19.4467	19.7919	19.9428	19.9768	19.9733	19.8737	19.3612	18.3923	17.5068	(90)
Living area fraction									fLA = Living area / (4) =			0.2882	(91)
MIT	17.9859	18.5114	19.1326	19.7444	20.0811	20.2301	20.2662	20.2613	20.1583	19.6557	18.7331	17.8996	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.9859	18.5114	19.1326	19.7444	20.0811	20.2301	20.2662	20.2613	20.1583	19.6557	18.7331	17.8996	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8881	0.8295	0.7451	0.6133	0.4678	0.3273	0.2274	0.2615	0.4437	0.6890	0.8407	0.9003	(94)
Useful gains	655.0901	767.8110	827.9410	813.4164	688.1956	481.7122	320.0202	334.5336	500.0438	630.7835	634.8333	623.7317	(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	1247.4691	1237.4091	1145.4534	971.3188	748.9479	497.6962	324.0903	340.6465	537.7903	809.2356	1044.4281	1235.9481	(97)
Space heating kWh	440.7300	315.5699	236.2292	113.6897	45.1997	0.0000	0.0000	0.0000	0.0000	132.7683	294.9083	455.4890	(98a)
Space heating requirement - total per year (kWh/year)												2034.5841	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	440.7300	315.5699	236.2292	113.6897	45.1997	0.0000	0.0000	0.0000	0.0000	132.7683	294.9083	455.4890	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2034.5841	
Space heating per m2											(98c) / (4) =	25.7217	(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	440.7300	315.5699	236.2292	113.6897	45.1997	0.0000	0.0000	0.0000	0.0000	132.7683	294.9083	455.4890	(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)	477.4973	341.8959	255.9363	123.1741	48.9704	0.0000	0.0000	0.0000	0.0000	143.8443	319.5106	493.4876	(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	203.8126	180.1596	191.6767	169.7557	165.2669	149.7403	148.6208	154.2217	155.5313	172.3967	181.9620	201.7975	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.7422	85.3036	84.5296	83.1815	81.5756	79.8000	79.8000	79.8000	79.8000	83.4811	85.1362	85.8281	(217)
Fuel for water heating, kWh/month	237.7041	211.1981	226.7569	204.0787	202.5935	187.6445	186.2416	193.2602	194.9014	206.5099	213.7305	235.1182	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	22.7994	18.2906	16.4686	12.0656	9.3198	7.6144	8.5019	11.0510	14.3542	18.8335	21.2724	23.4331	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-40.6065	-56.5468	-80.3079	-89.1910	-95.2670	-88.6010	-87.4904	-83.0185	-75.0158	-64.1189	-44.3859	-35.1884	(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	-25.1360	-52.6071	-104.0690	-155.6051	-205.0846	-205.8232	-203.4117	-172.5424	-126.8808	-75.0117	-33.4867	-19.8985	(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	2204.3164	(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	2499.7377	(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)	184.0045	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2219.2950	(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	2754.7637	(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	2204.3164	0.2100	462.9065	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2499.7377	0.2100	524.9449	(264)
Space and water heating			987.8514	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	184.0045	0.1443	26.5575	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-839.7381	0.1348	-113.2347	
PV Unit electricity exported	-1379.5569	0.1260	-173.8629	
Total			-287.0976	(269)
Total CO2, kg/year			739.2405	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.3500	(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	2204.3164	1.1300	2490.8776	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2499.7377	1.1300	2824.7036	(278)
Space and water heating			5315.5812	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	184.0045	1.5338	282.2323	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-839.7381	1.4984	-1258.2464	
PV Unit electricity exported	-1379.5569	0.4626	-638.2049	
Total			-1896.4513	(283)
Total Primary energy kWh/year			3831.4630	(286)
Target Primary Energy Rate (TPER)			48.4400	(287)

Full SAP Calculation Printout

Property Reference	Unit 3	**Issued on Date**	04/05/2024
Assessment Reference	Unit 3 - Be Lean	**Prop Type Ref**	
Property			

SAP Rating	86 B	**DER**	10.84	**TER**	9.35
Environmental	91 B	**% DER < TER**			-15.94
CO_2 Emissions (t/year)	0.79	**DFEE**	30.61	**TFEE**	34.47
Compliance Check	See BREL	**% DFEE < TFEE**			11.19
% DPER < TPER	-28.15	**DPER**	62.07	**TPER**	48.44

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	44.9000 (1b)	x	2.5000 (2b)	=	112.2500	(1b) - (3b)
First floor	34.2000 (1c)	x	2.5000 (2c)	=	85.5000	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.1000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	197.7500	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1517	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3017	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2565	(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	0.3270	0.3206	0.3142	0.2821	0.2757	0.2436	0.2436	0.2372	0.2565	0.2757	0.2885	0.3013	(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	0.5535	0.5514	0.5493	0.5398	0.5380	0.5297	0.5297	0.5281	0.5329	0.5380	0.5416	0.5454	(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)			11.9000	1.1450	13.6260			(27)
RL			7.4000	1.1450	8.4733			(27a)
Heatloss Floor 1			44.9000	0.1000	4.4900	75.0000	3367.5000	(28a)
External Wall 1	61.5000	11.9000	49.6000	0.1600	7.9360	70.0000	3472.0000	(29a)
FR	44.9000	7.4000	37.5000	0.1000	3.7500	9.0000	337.5000	(30)
Total net area of external elements Aum(A, m2)			151.3000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		38.2752			(33)
Party Wall 1			19.2500	0.0000	0.0000	45.0000	866.2500	(32)
Internal Wall 1			64.0000			9.0000	576.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	8619.2500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		108.9665 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	8.6000	0.0480	0.4128
E14 Flat roof	30.2000	0.1600	4.8320
E16 Corner (normal)	15.0000	0.0350	0.5250

E18 Party wall between dwellings	20.0000	0.0330	0.6600	
E1 Steel lintel with perforated steel base plate	7.0000	0.3020	2.1140	
E3 Sill	3.8000	0.0290	0.1102	
E4 Jamb	23.2000	0.0240	0.5568	
E6 Intermediate floor within a dwelling	20.1000	0.0010	0.0201	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.2309 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 47.5061 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.1172	35.9817	35.8489	35.2253	35.1086	34.5654	34.5654	34.4648	34.7746	35.1086	35.3446	35.5914	(38)
Heat transfer coeff	83.6233	83.4878	83.3551	82.7314	82.6147	82.0716	82.0716	81.9710	82.2808	82.6147	82.8508	83.0976	(39)
Average = Sum(39)m / 12 =												82.7309	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0572	1.0555	1.0538	1.0459	1.0444	1.0376	1.0376	1.0363	1.0402	1.0444	1.0474	1.0505	(40)
HLP (average)												1.0459	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4456 (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

28.1716	27.7532	27.1640	26.0777	25.2642	24.3623	23.8751	24.4601	25.0971	26.0623	27.1710	28.0763	(42b)

Hot water usage for other uses

39.6750	38.2323	36.7896	35.3468	33.9041	32.4614	32.4614	33.9041	35.3468	36.7896	38.2323	39.6750	(42c)

Average daily hot water use (litres/day) 62.1877 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	67.8466	65.9855	63.9536	61.4245	59.1683	56.8236	56.3364	58.3642	60.4440	62.8518	65.4033	67.7513	(44)
Energy conte	107.4524	93.9624	98.2942	84.0871	79.6519	69.8713	68.1340	72.2671	74.5334	85.2893	93.1789	106.0822	(45)
Energy content (annual)											Total = Sum(45)m =	1032.8044	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	91.3345	79.8681	83.5501	71.4740	67.7042	59.3906	57.9139	61.4270	63.3534	72.4959	79.2021	90.1699	(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													
	91.3345	79.8681	83.5501	71.4740	67.7042	59.3906	57.9139	61.4270	63.3534	72.4959	79.2021	90.1699	(64)
										Total per year (kWh/year) = Sum(64)m =		877.8837	(64)
12Total per year (kWh/year)												878	(64)
Electric shower(s)													
	52.2334	46.5403	50.8203	48.4972	49.4072	47.1297	48.7007	49.4072	48.4972	50.8203	49.8647	52.2334	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		594.1513	(64a)
Heat gains from water heating, kWh/month													
	35.8920	31.6021	33.5926	29.9928	29.2778	26.6301	26.6536	27.7086	27.9626	30.8291	32.2667	35.6008	(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	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	109.7286	121.4853	109.7286	113.3862	109.7286	113.3862	109.7286	109.7286	113.3862	109.7286	113.3862	109.7286	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	217.5493	219.8067	214.1180	202.0072	186.7196	172.3514	162.7525	160.4951	166.1838	178.2946	193.5822	207.9504	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	(71)
Water heating gains (Table 5)	48.2419	47.0269	45.1513	41.6567	39.3519	36.9862	35.8248	37.2427	38.8370	41.4369	44.8148	47.8506	(72)
Total internal gains	435.2032	448.0024	428.6814	416.7336	395.4836	382.4073	367.9894	367.1498	378.0905	389.1435	411.4667	425.2130	(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	
Southeast	1.8000	36.7938	0.6300	0.7000	0.7700	20.2404	(77)
Southwest	10.1000	36.7938	0.6300	0.7000	0.7700	113.5712	(79)
Horizontal	7.4000	26.0000	0.6300	0.7000	1.0000	76.3636	(82)

Solar gains	210.1752	386.5319	593.8225	826.9745	996.7331	1017.0996	969.3691	840.7651	675.4454	445.7579	257.1985	176.1931	(83)
Total gains	645.3784	834.5343	1022.5038	1243.7081	1392.2167	1399.5069	1337.3585	1207.9149	1053.5359	834.9015	668.6652	601.4061	(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	28.6312	28.6777	28.7233	28.9399	28.9807	29.1725	29.1725	29.2083	29.0984	28.9807	28.8982	28.8124	
alpha	2.9087	2.9118	2.9149	2.9293	2.9320	2.9448	2.9448	2.9472	2.9399	2.9320	2.9265	2.9208	
util living area	0.9401	0.8880	0.8031	0.6600	0.5040	0.3620	0.2658	0.3051	0.4947	0.7563	0.9031	0.9495	(86)
MIT	19.0073	19.4775	20.0213	20.5435	20.8310	20.9525	20.9857	20.9785	20.8817	20.4228	19.6134	18.9137	(87)
Th 2	20.0360	20.0374	20.0387	20.0453	20.0465	20.0521	20.0521	20.0532	20.0500	20.0465	20.0440	20.0414	(88)
util rest of house	0.9316	0.8736	0.7801	0.6260	0.4613	0.3121	0.2101	0.2448	0.4372	0.7200	0.8880	0.9422	(89)
MIT 2	18.2329	18.6875	19.2029	19.6817	19.9265	20.0249	20.0463	20.0438	19.9765	19.5921	18.8323	18.1455	(90)
Living area fraction										fLA = Living area / (4) =		0.2882	(91)
MIT	18.4561	18.9152	19.4388	19.9301	20.1872	20.2923	20.3171	20.3132	20.2374	19.8316	19.0575	18.3670	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4561	18.9152	19.4388	19.9301	20.1872	20.2923	20.3171	20.3132	20.2374	19.8316	19.0575	18.3670	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9141	0.8538	0.7641	0.6216	0.4678	0.3249	0.2258	0.2616	0.4489	0.7110	0.8692	0.9259	(94)
Useful gains	589.9295	712.5653	781.2613	773.1391	651.2210	454.7119	302.0235	316.0111	472.9591	593.6371	581.1906	556.8429	(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	1183.7788	1170.0975	1078.5121	912.5360	701.1694	467.1755	305.0648	320.7680	504.9921	762.6642	990.6842	1177.2397	(97)
Space heating kWh	441.8239	307.4616	221.1546	100.3658	37.1616	0.0000	0.0000	0.0000	0.0000	125.7561	294.8354	461.5753	(98a)
Space heating requirement - total per year (kWh/year)												1990.1343	
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	441.8239	307.4616	221.1546	100.3658	37.1616	0.0000	0.0000	0.0000	0.0000	125.7561	294.8354	461.5753	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1990.1343	
Space heating per m2											(98c) / (4) =	25.1597	(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	771.4726	607.3295	622.9793	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9255	0.9521	0.9365	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	713.9928	578.2520	583.4458	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1494.5024	1429.4531	1296.1636	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	561.9669	633.2936	530.2621	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	140.4917	158.3234	132.5655	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												431.3807	(107)
Energy for space heating												25.1597	(99)
Energy for space cooling												5.4536	(108)
Total												30.6133	(109)
Fabric Energy Efficiency (DFEE)												30.6	(109)

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

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		44.9000 (1b)	x	2.5000 (2b)	=	112.2500	(1b) - (3b)
First floor		34.2000 (1c)	x	2.5000 (2c)	=	85.5000	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.1000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	197.7500	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1517	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	

Measured/design AP50 5.0000 (17)
Infiltration rate 0.4017 (18)
Number of sides sheltered 2 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3415 (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	0.4353	0.4268	0.4183	0.3756	0.3671	0.3244	0.3244	0.3158	0.3415	0.3671	0.3841	0.4012	(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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5948	0.5911	0.5875	0.5705	0.5674	0.5526	0.5526	0.5499	0.5583	0.5674	0.5738	0.5805	(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 Opening Type (Uw = 1.20)			11.9000	1.1450	13.6260			(27)
RL			7.4000	1.5918	11.7790			(27a)
Heatloss Floor 1			44.9000	0.1300	5.8370			(28a)
External Wall 1	61.5000	11.9000	49.6000	0.1800	8.9280			(29a)
FR	44.9000	7.4000	37.5000	0.1100	4.1250			(30)
Total net area of external elements Aum(A, m2)			151.3000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.2950			(33)
Party Wall 1			19.2500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 108.9665 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	8.6000	0.1600	1.3760
E14 Flat roof	30.2000	0.0800	2.4160
E16 Corner (normal)	15.0000	0.0900	1.3500
E18 Party wall between dwellings	20.0000	0.0600	1.2000
E1 Steel lintel with perforated steel base plate	7.0000	0.0500	0.3500
E3 Sill	3.8000	0.0500	0.1900
E4 Jamb	23.2000	0.0500	1.1600
E6 Intermediate floor within a dwelling	20.1000	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.0420 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 52.3370 (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	38.8129	38.5727	38.3373	37.2318	37.0249	36.0620	36.0620	35.8837	36.4329	37.0249	37.4434	37.8808	(38)
Heat transfer coeff	91.1498	90.9097	90.6743	89.5687	89.3619	88.3990	88.3990	88.2206	88.7699	89.3619	89.7803	90.2178	(39)
Average = Sum(39)m / 12 =												89.5677	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1523	1.1493	1.1463	1.1323	1.1297	1.1176	1.1176	1.1153	1.1222	1.1297	1.1350	1.1406	(40)
HLP (average)												1.1323	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4456 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	28.1716	27.7532	27.1640	26.0777	25.2642	24.3623	23.8751	24.4601	25.0971	26.0623	27.1710	28.0763	(42b)
Hot water usage for other uses	39.6750	38.2323	36.7896	35.3468	33.9041	32.4614	32.4614	33.9041	35.3468	36.7896	38.2323	39.6750	(42c)
Average daily hot water use (litres/day)												62.1877	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	67.8466	65.9855	63.9536	61.4245	59.1683	56.8236	56.3364	58.3642	60.4440	62.8518	65.4033	67.7513	(44)
Energy conte	107.4524	93.9624	98.2942	84.0871	79.6519	69.8713	68.1340	72.2671	74.5334	85.2893	93.1789	106.0822	(45)
Energy content (annual)										Total = Sum(45)m =		1032.8044	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	91.3345	79.8681	83.5501	71.4740	67.7042	59.3906	57.9139	61.4270	63.3534	72.4959	79.2021	90.1699	(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	91.3345	79.8681	83.5501	71.4740	67.7042	59.3906	57.9139	61.4270	63.3534	72.4959	79.2021	90.1699	(64)
									Total per year (kWh/year) = Sum(64)m =			877.8837	(64)
12Total per year (kWh/year)												878	(64)
Electric shower(s)	52.2334	46.5403	50.8203	48.4972	49.4072	47.1297	48.7007	49.4072	48.4972	50.8203	49.8647	52.2334	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							594.1513	(64a)
Heat gains from water heating, kWh/month	35.8920	31.6021	33.5926	29.9928	29.2778	26.6301	26.6536	27.7086	27.9626	30.8291	32.2667	35.6008	(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	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	109.7286	121.4853	109.7286	113.3862	109.7286	113.3862	109.7286	109.7286	113.3862	109.7286	113.3862	109.7286	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	217.5493	219.8067	214.1180	202.0072	186.7196	172.3514	162.7525	160.4951	166.1838	178.2946	193.5822	207.9504	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	(71)
Water heating gains (Table 5)													
	48.2419	47.0269	45.1513	41.6567	39.3519	36.9862	35.8248	37.2427	38.8370	41.4369	44.8148	47.8506	(72)
Total internal gains													
	435.2032	448.0024	428.6814	416.7336	395.4836	382.4073	367.9894	367.1498	378.0905	389.1435	411.4667	425.2130	(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	
Southeast	1.8000	36.7938	0.6300	0.7000	0.7700	20.2404	(77)
Southwest	10.1000	36.7938	0.6300	0.7000	0.7700	113.5712	(79)
Horizontal	7.4000	26.0000	0.6300	0.7000	1.0000	76.3636	(82)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	210.1752	386.5319	593.8225	826.9745	996.7331	1017.0996	969.3691	840.7651	675.4454	445.7579	257.1985	176.1931	(83)
Total gains	645.3784	834.5343	1022.5038	1243.7081	1392.2167	1399.5069	1337.3585	1207.9149	1053.5359	834.9015	668.6652	601.4061	(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	26.2670	26.3364	26.4048	26.7307	26.7926	27.0844	27.0844	27.1392	26.9713	26.7926	26.6677	26.5384	
alpha	2.7511	2.7558	2.7603	2.7820	2.7862	2.8056	2.8056	2.8093	2.7981	2.7862	2.7778	2.7692	
util living area													
	0.9434	0.8960	0.8184	0.6831	0.5303	0.3847	0.2843	0.3254	0.5202	0.7740	0.9094	0.9519	(86)
MIT	18.7675	19.2484	19.8294	20.4239	20.7717	20.9322	20.9785	20.9684	20.8409	20.3027	19.4271	18.6857	(87)
Th 2	19.9583	19.9608	19.9632	19.9745	19.9766	19.9865	19.9865	19.9884	19.9827	19.9766	19.9723	19.9679	(88)
util rest of house													
	0.9350	0.8818	0.7953	0.6479	0.4842	0.3292	0.2212	0.2576	0.4580	0.7372	0.8945	0.9446	(89)
MIT 2	17.9447	18.4114	18.9650	19.5165	19.8154	19.9482	19.9779	19.9748	19.8847	19.4289	18.6017	17.8713	(90)
Living area fraction										fLA = Living area / (4) =		0.2882	(91)
MIT	18.1819	18.6526	19.2142	19.7780	20.0910	20.2318	20.2663	20.2612	20.1603	19.6808	18.8396	18.1061	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1819	18.6526	19.2142	19.7780	20.0910	20.2318	20.2663	20.2612	20.1603	19.6808	18.8396	18.1061	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9164	0.8602	0.7764	0.6407	0.4896	0.3429	0.2389	0.2762	0.4693	0.7253	0.8742	0.9275	(94)
Useful gains	591.4537	717.8870	793.8879	796.7998	681.5805	479.8418	319.4716	333.5996	494.4338	605.5728	584.5262	557.8082	(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													
	1265.3297	1250.2486	1152.8497	974.3330	749.8388	497.8453	324.0960	340.6392	537.9719	811.4745	1053.9859	1254.5740	(97)
Space heating kWh													
	501.3638	357.7470	267.0676	127.8239	50.7842	0.0000	0.0000	0.0000	0.0000	153.1909	338.0110	518.3938	(98a)
Space heating requirement - total per year (kWh/year)												2314.3820	
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													
	501.3638	357.7470	267.0676	127.8239	50.7842	0.0000	0.0000	0.0000	0.0000	153.1909	338.0110	518.3938	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2314.3820	
Space heating per m2											(98c) / (4) =	29.2589	(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	830.9503	654.1524	670.4769	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9042	0.9362	0.9175	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	751.3446	612.4413	615.1896	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1494.5024	1429.4531	1296.1636	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	535.0736	607.8568	506.6447	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	133.7684	151.9642	126.6612	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												412.3938	(107)
Energy for space heating												29.2589	(99)
Energy for space cooling												5.2136	(108)
Total												34.4725	(109)
Fabric Energy Efficiency (TFEE)												34.5	(109)

Full SAP Calculation Printout

Property Reference	Unit 3	Issued on Date	04/05/2024
Assessment Reference	Unit 3 - Be Lean	Prop Type Ref	
Property			

SAP Rating	86 B	DER	10.84	TER	9.35
Environmental	91 B	% DER < TER			-15.94
CO_2 Emissions (t/year)	0.79	DFEE	30.61	TFEE	34.47
Compliance Check	See BREL	% DFEE < TFEE			11.19
% DPER < TPER	-28.15	DPER	62.07	TPER	48.44

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	44.9000 (1b)	x	2.5000 (2b)	=	112.2500	(1b) - (3b)
First floor	34.2000 (1c)	x	2.5000 (2c)	=	85.5000	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.1000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	197.7500	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	79.2000	(23c)

Effective ac	0.2666	0.2634	0.2602	0.2442	0.2411	0.2251	0.2251	0.2219	0.2315	0.2411	0.2474	0.2538	(25)

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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)			11.9000	1.1450	13.6260			(27)
RL			7.4000	1.1450	8.4733			(27a)
Heatloss Floor 1			44.9000	0.1000	4.4900	75.0000	3367.5000	(28a)
External Wall 1	61.5000	11.9000	49.6000	0.1600	7.9360	70.0000	3472.0000	(29a)
FR	44.9000	7.4000	37.5000	0.1000	3.7500	9.0000	337.5000	(30)
Total net area of external elements Aum(A, m2)			151.3000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	38.2752			(33)
Party Wall 1			19.2500	0.0000	0.0000	45.0000	866.2500	(32)
Internal Wall 1			64.0000			9.0000	576.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 8619.2500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	108.9665	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E5 Ground floor (normal)	8.6000	0.0480	0.4128	
E14 Flat roof	30.2000	0.1600	4.8320	
E16 Corner (normal)	15.0000	0.0350	0.5250	
E18 Party wall between dwellings	20.0000	0.0330	0.6600	
E1 Steel lintel with perforated steel base plate	7.0000	0.3020	2.1140	
E3 Sill	3.8000	0.0290	0.1102	
E4 Jamb	23.2000	0.0240	0.5568	
E6 Intermediate floor within a dwelling	20.1000	0.0010	0.0201	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.2309 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 47.5061 (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	17.3952	17.1872	16.9792	15.9391	15.7311	14.6911	14.6911	14.4831	15.1071	15.7311	16.1472	16.5632	(38)
Heat transfer coeff	64.9013	64.6933	64.4853	63.4453	63.2373	62.1972	62.1972	61.9892	62.6132	63.2373	63.6533	64.0693	(39)
Average = Sum(39)m / 12 =												63.3933	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8205	0.8179	0.8152	0.8021	0.7995	0.7863	0.7863	0.7837	0.7916	0.7995	0.8047	0.8100	(40)
HLP (average)												0.8014	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4456 (42)
Hot water usage for mixer showers

125.6645	123.7761	121.0241	115.7589	111.8732	107.5400	105.0770	107.8081	110.8018	115.4544	120.8328	125.1831	(42a)

Hot water usage for baths

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)

Hot water usage for other uses

39.6750	38.2323	36.7896	35.3468	33.9041	32.4614	32.4614	33.9041	35.3468	36.7896	38.2323	39.6750	(42c)

Average daily hot water use (litres/day) 151.9267 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	165.3396	162.0083	157.8137	151.1057	145.7773	140.0014	137.5384	141.7122	146.1487	152.2440	159.0651	164.8581	(44)
Energy conte	261.8574	230.6977	242.5538	206.8561	196.2443	172.1480	166.3407	175.4693	180.2159	206.5936	226.6173	258.1279	(45)
Energy content (annual)										Total = Sum(45)m =		2523.7221	
Distribution loss (46)m = 0.15 x (45)m	39.2786	34.6047	36.3831	31.0284	29.4366	25.8222	24.9511	26.3204	27.0324	30.9890	33.9926	38.7192	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.1200	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.6048	(55)
Total storage loss	18.7488	16.9344	18.7488	18.1440	18.7488	18.1440	18.7488	18.7488	18.1440	18.7488	18.1440	18.7488	(56)
If cylinder contains dedicated solar storage	18.7488	16.9344	18.7488	18.1440	18.7488	18.1440	18.7488	18.7488	18.1440	18.7488	18.1440	18.7488	(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	303.8686	268.6433	284.5650	247.5121	238.2555	212.8040	208.3519	217.4805	220.8719	248.6048	267.2733	300.1391	(62)
WWHRS	-71.8415	-63.5372	-66.5325	-55.0915	-51.3433	-43.9349	-41.1819	-43.7929	-45.4567	-53.5884	-60.7092	-70.5111	(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	232.0271	205.1061	218.0325	192.4206	186.9122	168.8692	167.1700	173.6876	175.4152	195.0164	206.5641	229.6280	(64)
										Total per year (kWh/year) = Sum(64)m =		2350.8489	(64)
12Total per year (kWh/year)												2351	(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	120.6766	107.0635	114.2581	101.3045	98.8602	89.7640	88.9173	91.9525	92.4466	102.3013	107.8751	119.4365	(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	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	109.7286	121.4853	109.7286	113.3862	109.7286	113.3862	109.7286	109.7286	113.3862	109.7286	113.3862	109.7286	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	217.5493	219.8067	214.1180	202.0072	186.7196	172.3514	162.7525	160.4951	166.1838	178.2946	193.5822	207.9504	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	(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)	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	(71)
Water heating gains (Table 5)	162.1997	159.3206	153.5727	140.7006	132.8766	124.6722	119.5124	123.5921	128.3980	137.5018	149.8265	160.5329	(72)
Total internal gains	552.1610	563.2961	540.1027	518.7776	492.0083	470.0933	451.6770	453.4992	467.6516	488.2084	519.4784	540.8954	(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	
Southeast	1.8000	36.7938	0.6300	0.7000	0.7700	20.2404	(77)
Southwest	10.1000	36.7938	0.6300	0.7000	0.7700	113.5712	(79)
Horizontal	7.4000	26.0000	0.6300	0.7000	1.0000	76.3636	(82)

Solar gains	210.1752	386.5319	593.8225	826.9745	996.7331	1017.0996	969.3691	840.7651	675.4454	445.7579	257.1985	176.1931	(83)
Total gains	762.3362	949.8280	1133.9252	1345.7520	1488.7413	1487.1930	1421.0461	1294.2643	1143.0970	933.9664	776.6768	717.0885	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	36.8904	37.0090	37.1284	37.7370	37.8612	38.4943	38.4943	38.6234	38.2385	37.8612	37.6137	37.3695	
alpha	3.4594	3.4673	3.4752	3.5158	3.5241	3.5663	3.5663	3.5749	3.5492	3.5241	3.5076	3.4913	
util living area	0.8891	0.8105	0.6966	0.5335	0.3858	0.2659	0.1921	0.2195	0.3704	0.6281	0.8259	0.9036	(86)
MIT	19.8861	20.2538	20.6011	20.8625	20.9622	20.9926	20.9983	20.9972	20.9761	20.8035	20.3285	19.8202	(87)
Th 2	20.2356	20.2379	20.2401	20.2515	20.2538	20.2652	20.2652	20.2675	20.2606	20.2538	20.2492	20.2447	(88)
util rest of house	0.8769	0.7928	0.6730	0.5058	0.3567	0.2359	0.1602	0.1849	0.3327	0.5944	0.8063	0.8927	(89)
MIT 2	18.9481	19.3949	19.8065	20.1115	20.2190	20.2596	20.2642	20.2658	20.2413	20.0575	19.5030	18.8742	(90)
Living area fraction										fLA = Living area / (4) =		0.2882	(91)
MIT	19.2185	19.6425	20.0355	20.3280	20.4332	20.4709	20.4758	20.4766	20.4531	20.2725	19.7410	19.1469	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.0685	19.4925	19.8855	20.1780	20.2832	20.3209	20.3258	20.3266	20.3031	20.1225	19.5910	18.9969	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8551	0.7738	0.6613	0.5030	0.3579	0.2381	0.1629	0.1877	0.3349	0.5882	0.7872	0.8714	(94)
Useful gains	651.8995	734.9486	749.9060	676.9448	532.8239	354.1699	231.4332	242.9061	382.7944	549.3721	611.3824	624.8593	(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	958.4930	944.0367	863.1701	715.5333	542.7776	355.8218	231.7345	243.4094	388.3954	602.1785	795.0902	948.0254	(97)
Space heating kWh	228.1056	140.5072	84.2685	27.7837	7.4055	0.0000	0.0000	0.0000	0.0000	39.2880	132.2697	240.4356	(98a)
Space heating requirement - total per year (kWh/year)												900.0637	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	228.1056	140.5072	84.2685	27.7837	7.4055	0.0000	0.0000	0.0000	0.0000	39.2880	132.2697	240.4356	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												900.0637	
Space heating per m2											(98c) / (4) =	11.3788	(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 %) 89.5000 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	228.1056	140.5072	84.2685	27.7837	7.4055	0.0000	0.0000	0.0000	0.0000	39.2880	132.2697	240.4356	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	254.8666	156.9913	94.1547	31.0432	8.2743	0.0000	0.0000	0.0000	0.0000	43.8972	147.7873	268.6431	(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	232.0271	205.1061	218.0325	192.4206	186.9122	168.8692	167.1700	173.6876	175.4152	195.0164	206.5641	229.6280	(64)
Efficiency of water heater												82.0000	(216)
(217)m	85.5541	84.8921	83.9613	82.8763	82.2627	82.0000	82.0000	82.0000	82.0000	83.1686	84.7731	85.6721	(217)
Fuel for water heating, kWh/month	271.2051	241.6080	259.6821	232.1782	227.2137	205.9380	203.8658	211.8142	213.9210	234.4831	243.6670	268.0311	(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	18.9727	17.1367	18.9727	18.3607	18.9727	18.3607	18.9727	18.9727	18.3607	18.9727	18.3607	18.9727	(231)
Lighting	20.7044	16.6098	14.9553	10.9569	8.4634	6.9147	7.7206	10.0356	13.0352	17.1029	19.3177	21.2798	(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 1005.6578 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 82.0000

Water heating fuel used 2813.6072 (219)

Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7560)

mechanical ventilation fans (SFP = 0.7560) 182.3888 (230a)

central heating pump 41.0000 (230c)

Total electricity for the above, kWh/year 223.3888 (231)

Electricity for lighting (calculated in Appendix L)	167.0964	(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	4209.7503	(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	1005.6578	0.2100	211.1881	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2813.6072	0.2100	590.8575	(264)
Space and water heating			802.0457	(265)
Pumps, fans and electric keep-hot	223.3888	0.1387	30.9868	(267)
Energy for lighting	167.0964	0.1443	24.1172	(268)
Total CO2, kg/year			857.1496	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.8400	(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	1005.6578	1.1300	1136.3933	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2813.6072	1.1300	3179.3762	(278)
Space and water heating			4315.7695	(279)
Pumps, fans and electric keep-hot	223.3888	1.5128	337.9425	(281)
Energy for lighting	167.0964	1.5338	256.2981	(282)
Total Primary energy kWh/year			4910.0102	(286)
Dwelling Primary energy Rate (DPER)			62.0700	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	44.9000 (1b)	x	2.5000 (2b)	=	112.2500	(1b) - (3b)
First floor	34.2000 (1c)	x	2.5000 (2c)	=	85.5000	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.1000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	197.7500	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1517	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4017	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3415	(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	0.4353	0.4268	0.4183	0.3756	0.3671	0.3244	0.3244	0.3158	0.3415	0.3671	0.3841	0.4012	(22b)
Effective ac	0.5948	0.5911	0.5875	0.5705	0.5674	0.5526	0.5526	0.5499	0.5583	0.5674	0.5738	0.5805	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K

	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opening Type (Uw = 1.20)			11.9000	1.1450	13.6260			(27)
RL			7.4000	1.5918	11.7790			(27a)
Heatloss Floor 1			44.9000	0.1300	5.8370			(28a)
External Wall 1	61.5000	11.9000	49.6000	0.1800	8.9280			(29a)
FR	44.9000	7.4000	37.5000	0.1100	4.1250			(30)
Total net area of external elements Aum(A, m2)			151.3000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		44.2950			(33)
Party Wall 1			19.2500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 108.9665 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	8.6000	0.1600	1.3760
E14 Flat roof	30.2000	0.0800	2.4160
E16 Corner (normal)	15.0000	0.0900	1.3500
E18 Party wall between dwellings	20.0000	0.0600	1.2000
E1 Steel lintel with perforated steel base plate	7.0000	0.0500	0.3500
E3 Sill	3.8000	0.0500	0.1900
E4 Jamb	23.2000	0.0500	1.1600
E6 Intermediate floor within a dwelling	20.1000	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.0420 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 52.3370 (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	38.8129	38.5727	38.3373	37.2318	37.0249	36.0620	36.0620	35.8837	36.4329	37.0249	37.4434	37.8808	(38)
Heat transfer coeff	91.1498	90.9097	90.6743	89.5687	89.3619	88.3990	88.3990	88.2206	88.7699	89.3619	89.7803	90.2178	(39)
Average = Sum(39)m / 12 =												89.5677	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1523	1.1493	1.1463	1.1323	1.1297	1.1176	1.1176	1.1153	1.1222	1.1297	1.1350	1.1406	(40)
HLP (average)												1.1323	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4456 (42)

Hot water usage for mixer showers												
83.7764	82.5174	80.6828	77.1726	74.5822	71.6933	70.0513	71.8720	73.8679	76.9696	80.5552	83.4554	(42a)
Hot water usage for baths												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses												
39.6750	38.2323	36.7896	35.3468	33.9041	32.4614	32.4614	33.9041	35.3468	36.7896	38.2323	39.6750	(42c)
Average daily hot water use (litres/day)												113.3072	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	123.4514	120.7496	117.4723	112.5194	108.4862	104.1547	102.5127	105.7761	109.2147	113.7592	118.7875	123.1304	(44)
Energy conte	195.5168	171.9459	180.5506	154.0334	146.0433	128.0704	123.9802	130.9730	134.6727	154.3701	169.2345	192.7924	(45)
Energy content (annual)										Total = Sum(45)m =		1882.1833	
Distribution loss (46)m = 0.15 x (45)m													
	29.3275	25.7919	27.0826	23.1050	21.9065	19.2106	18.5970	19.6459	20.2009	23.1555	25.3852	28.9189	(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													
	242.1117	214.0316	227.1455	199.1253	192.6382	173.1622	170.5751	177.5679	179.7645	200.9650	214.3264	239.3873	(62)
WWHRS	-38.2991	-33.8720	-35.4688	-29.3696	-27.3714	-23.4219	-21.9543	-23.3462	-24.2332	-28.5683	-32.3644	-37.5898	(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													
	203.8126	180.1596	191.6767	169.7557	165.2669	149.7403	148.6208	154.2217	155.5313	172.3967	181.9620	201.7975	(64)
										Total per year (kWh/year) = Sum(64)m =		2074.9419	(64)
12Total per year (kWh/year)												2075	(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													
	102.2853	90.8406	97.3090	87.2896	85.8353	78.6569	78.4993	80.8244	80.8521	88.6040	92.3440	101.3794	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	122.2781	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	109.7286	121.4853	109.7286	113.3862	109.7286	113.3862	109.7286	109.7286	113.3862	109.7286	113.3862	109.7286	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	217.5493	219.8067	214.1180	202.0072	186.7196	172.3514	162.7525	160.4951	166.1838	178.2946	193.5822	207.9504	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	35.2278	(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)													
	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	-97.8225	(71)
Water heating gains (Table 5)													
	137.4802	135.1794	130.7916	121.2355	115.3701	109.2456	105.5099	108.6350	112.2946	119.0914	128.2555	136.2626	(72)
Total internal gains													
	527.4415	539.1549	517.3217	499.3125	474.5017	454.6667	437.6745	438.5421	451.5481	469.7980	497.9074	516.6251	(73)

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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	
Southeast	1.8000	36.7938	0.6300	0.7000	0.7700	20.2404	(77)
Southwest	10.1000	36.7938	0.6300	0.7000	0.7700	113.5712	(79)
Horizontal	7.4000	26.0000	0.6300	0.7000	1.0000	76.3636	(82)

Solar gains	210.1752	386.5319	593.8225	826.9745	996.7331	1017.0996	969.3691	840.7651	675.4454	445.7579	257.1985	176.1931	(83)
Total gains	737.6167	925.6868	1111.1441	1326.2869	1471.2348	1471.7664	1407.0436	1279.3072	1126.9936	915.5559	755.1058	692.8182	(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	26.2670	26.3364	26.4048	26.7307	26.7926	27.0844	27.0844	27.1392	26.9713	26.7926	26.6677	26.5384	
alpha	2.7511	2.7558	2.7603	2.7820	2.7862	2.8056	2.8056	2.8093	2.7981	2.7862	2.7778	2.7692	
util living area	0.9248	0.8733	0.7924	0.6576	0.5083	0.3678	0.2710	0.3085	0.4935	0.7414	0.8849	0.9345	(86)
MIT	18.9467	19.3969	19.9364	20.4794	20.7951	20.9395	20.9810	20.9724	20.8609	20.3829	19.5749	18.8696	(87)
Th 2	19.9583	19.9608	19.9632	19.9745	19.9766	19.9865	19.9865	19.9884	19.9827	19.9766	19.9723	19.9679	(88)
util rest of house	0.9142	0.8570	0.7676	0.6219	0.4630	0.3142	0.2106	0.2438	0.4328	0.7025	0.8671	0.9251	(89)
MIT 2	17.5968	18.1528	18.8071	19.4467	19.7919	19.9428	19.9768	19.9733	19.8737	19.3612	18.3923	17.5068	(90)
Living area fraction									fLA = Living area / (4) =			0.2882	(91)
MIT	17.9859	18.5114	19.1326	19.7444	20.0811	20.2301	20.2662	20.2613	20.1583	19.6557	18.7331	17.8996	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.9859	18.5114	19.1326	19.7444	20.0811	20.2301	20.2662	20.2613	20.1583	19.6557	18.7331	17.8996	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8881	0.8295	0.7451	0.6133	0.4678	0.3273	0.2274	0.2615	0.4437	0.6890	0.8407	0.9003	(94)
Useful gains	655.0901	767.8110	827.9410	813.4164	688.1956	481.7122	320.0202	334.5336	500.0438	630.7835	634.8333	623.7317	(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	1247.4691	1237.4091	1145.4534	971.3188	748.9479	497.6962	324.0903	340.6465	537.7903	809.2356	1044.4281	1235.9481	(97)
Space heating kWh	440.7300	315.5699	236.2292	113.6897	45.1997	0.0000	0.0000	0.0000	0.0000	132.7683	294.9083	455.4890	(98a)
Space heating requirement - total per year (kWh/year)												2034.5841	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	440.7300	315.5699	236.2292	113.6897	45.1997	0.0000	0.0000	0.0000	0.0000	132.7683	294.9083	455.4890	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2034.5841	
Space heating per m2											(98c) / (4) =	25.7217	(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	440.7300	315.5699	236.2292	113.6897	45.1997	0.0000	0.0000	0.0000	0.0000	132.7683	294.9083	455.4890	(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)	477.4973	341.8959	255.9363	123.1741	48.9704	0.0000	0.0000	0.0000	0.0000	143.8443	319.5106	493.4876	(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	203.8126	180.1596	191.6767	169.7557	165.2669	149.7403	148.6208	154.2217	155.5313	172.3967	181.9620	201.7975	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.7422	85.3036	84.5296	83.1815	81.5756	79.8000	79.8000	79.8000	79.8000	83.4811	85.1362	85.8281	(217)
Fuel for water heating, kWh/month	237.7041	211.1981	226.7569	204.0787	202.5935	187.6445	186.2416	193.2602	194.9014	206.5099	213.7305	235.1182	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	22.7994	18.2906	16.4686	12.0656	9.3198	7.6144	8.5019	11.0510	14.3542	18.8335	21.2724	23.4331	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-40.6065	-56.5468	-80.3079	-89.1910	-95.2670	-88.6010	-87.4904	-83.0185	-75.0158	-64.1189	-44.3859	-35.1884	(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	-25.1360	-52.6071	-104.0690	-155.6051	-205.0846	-205.8232	-203.4117	-172.5424	-126.8808	-75.0117	-33.4867	-19.8985	(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	2204.3164	(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	2499.7377	(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)	184.0045	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2219.2950	(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	2754.7637	(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	2204.3164	0.2100	462.9065	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2499.7377	0.2100	524.9449	(264)
Space and water heating			987.8514	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	184.0045	0.1443	26.5575	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-839.7381	0.1348	-113.2347	
PV Unit electricity exported	-1379.5569	0.1260	-173.8629	
Total			-287.0976	(269)
Total CO2, kg/year			739.2405	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.3500	(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	2204.3164	1.1300	2490.8776	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2499.7377	1.1300	2824.7036	(278)
Space and water heating			5315.5812	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	184.0045	1.5338	282.2323	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-839.7381	1.4984	-1258.2464	
PV Unit electricity exported	-1379.5569	0.4626	-638.2049	
Total			-1896.4513	(283)
Total Primary energy kWh/year			3831.4630	(286)
Target Primary Energy Rate (TPER)			48.4400	(287)

Summary for Input Data

elmhurst energy

Property Reference	Unit 4	**Issued on Date**	04/05/2024
Assessment Reference	Unit 4 - Be Green	**Prop Type Ref**	
Property			

SAP Rating	84 B	**DER**	4.03	**TER**	10.04
Environmental	97 A	**% DER < TER**			59.86
CO_2 Emissions (t/year)	0.27	**DFEE**	33.99	**TFEE**	38.41
Compliance Check	See BREL	**% DFEE < TFEE**			11.52
% DPER < TPER	17.84	**DPER**	42.98	**TPER**	52.31

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

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

Orientation	Southwest	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Suburban	
1.0 Property Type	Bungalow, End-Terrace	
Which Floor	0	
2.0 Number of Storeys	2	
3.0 Date Built	2024	
3.0 Property Age Band	L	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	N/A	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Basement:	0.00 m	0.00 m²	0.00 m
Ground floor:	13.10 m	47.50 m²	2.50 m
1st Storey:	18.70 m	24.40 m²	2.50 m
2nd Storey:	0.00 m	0.00 m²	0.00 m
3rd Storey:	0.00 m	0.00 m²	0.00 m
4th Storey:	0.00 m	0.00 m²	0.00 m
5th Storey:	0.00 m	0.00 m²	0.00 m
6th Storey:	0.00 m	0.00 m²	0.00 m
7th Storey:	0.00 m	0.00 m²	0.00 m

8.0 Living Area	22.80	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
External Wall 1	Cavity Wall	Cavity wall : dense plaster, AAC block, filled cavity, any outside structure	0.16	70.00	79.50	67.60	0.00	None	11.90	Calculate Wall Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Plasterboard on dabs mounted on cement render on both sides, AAC blocks, cavity	0.00	45.00	19.25	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	64.00

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area	Shelter Code	Shelter Factor	Calculation Type	Openings

Summary for Input Data

						(m²)				
FR	External Flat Roof	Plasterboard, insulated flat roof	0.10	9.00	47.50	40.10	None	0.00	Enter Gross Area	7.40

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Heatloss Floor 1	Ground Floor - Solid	Lowest occupied	Suspended concrete floor, carpeted	0.10	None	0.00	75.00	47.50

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Windows	Manufacturer	Window	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.20
RLs	Manufacturer	Roof Window	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
SW	Windows	External Wall 1	South West	10.10	0
SE	Windows	External Wall 1	South East	1.80	0
RL	RLs	FR	Horizontal	7.40	0

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	

17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E5 Ground floor (normal)	Gov Approved Scheme	13.10	0.05	0.05	No
E14 Flat roof	Table K1 - Default	28.50	0.16	0.16	No
E16 Corner (normal)	Gov Approved Scheme	15.00	0.04	0.04	No
E18 Party wall between dwellings	Gov Approved Scheme	20.00	0.03	0.03	No
E1 Steel lintel with perforated steel base plate	Gov Approved Scheme	7.00	0.30	0.30	No
E3 Sill	Gov Approved Scheme	3.80	0.03	0.03	No
E4 Jamb	Gov Approved Scheme	23.20	0.02	0.02	No
E6 Intermediate floor within a dwelling	Gov Approved Scheme	20.10	0.00	0.00	No

Y-value	0.05	W/m²K

18.0 Pressure Testing	Yes	
Designed AP_{50}	3.00	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500811
Configuration	2
Manufacturer SFP	0.54
Duct Type	Rigid
MVHR Efficiency	88.00
Wet Rooms	2
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)
Duct Installation Specification	Level 1

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System	No

22.0 Lighting

No Fixed Lighting	No

Name	Efficacy	Power	Capacity	Count
Lighting 1	120.00	6	720	40

Summary for Input Data

24.0 Main Heating 1	Database	
Percentage of Heat	100.00	%
Database Ref. No.	102608	
Fuel Type	Electricity	
SAP Code	0	
In Winter	324.38	
In Summer	163.59	
Model Name	aroTHERM 5kW	
Manufacturer	Vaillant Group UK Ltd	
System Type	Heat Pump	
Controls SAP Code	2207	
Delayed Start Stat	Yes	
Burner Control	On/Off	
HETAS approved System	No	
Oil Pump Inside	No	
FI Case	0.00	
Flue Type	None or Unknown	
Fan Assisted Flue	No	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators	
Flow Temperature	Enter value	
Flow Temperature Value	35.00	
Boiler Interlock	Yes	
Combi boiler type	No Combi	
25.0 Main Heating 2	None	
26.0 Heat Networks	None	
28.0 Water Heating		
Water Heating	Main Heating 1	
SAP Code	901	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	Yes	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
Summer Immersion	No	
Cold Water Source	From mains	
Bath Count	0	
Supplementary Immersion	No	
Immersion Only Heating Hot Water	No	

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
S1	Vented hot water system + pump	12.00		Yes	Instantaneous System 1
S2	Vented hot water system + pump	12.00		Yes	Instantaneous System 1

28.3 Waste Water Heat Recovery System Instantaneous System 1		
Database ID	80194	

Summary for Input Data

Brand Model	Zypho, Slim DW50	
Details	Year: 2022 + current Efficiency: 44.7 Utilisation factor: 0.987	
29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	150.00	L
Loss	1.12	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	
31.0 Thermal Store	None	

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Property Reference	Unit 4	**Issued on Date**	04/05/2024
Assessment Reference	Unit 4 - Be Green	**Prop Type Ref**	
Property			

SAP Rating	84 B	**DER**	4.03	**TER**	10.04
Environmental	97 A	**% DER < TER**			59.86
CO_2 Emissions (t/year)	0.27	**DFEE**	33.99	**TFEE**	38.41
Compliance Check	See BREL	**% DFEE < TFEE**			11.52
% DPER < TPER	17.84	**DPER**	42.98	**TPER**	52.31

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	47.5000 (1b)	x	2.5000 (2b)	=	118.7500	(1b) - (3b)
First floor	24.4000 (1c)	x	2.5000 (2c)	=	61.0000	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.9000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	179.7500	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		79.2000 (23c)

Effective ac	0.2666	0.2634	0.2602	0.2442	0.2411	0.2251	0.2251	0.2219	0.2315	0.2411	0.2474	0.2538	(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)			11.9000	1.1450	13.6260			(27)
RL			7.4000	1.1450	8.4733			(27a)
Heatloss Floor 1			47.5000	0.1000	4.7500	75.0000	3562.5000	(28a)
External Wall 1	79.5000	11.9000	67.6000	0.1600	10.8160	70.0000	4732.0000	(29a)
FR	47.5000	7.4000	40.1000	0.1000	4.0100	9.0000	360.9000	(30)
Total net area of external elements Aum(A, m2)			174.5000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		41.6752			(33)
Party Wall 1			19.2500	0.0000	0.0000	45.0000	866.2500	(32)
Internal Wall 1			64.0000			9.0000	576.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10097.6500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		140.4402 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E5 Ground floor (normal)	13.1000	0.0480	0.6288	
E14 Flat roof	28.5000	0.1600	4.5600	
E16 Corner (normal)	15.0000	0.0350	0.5250	
E18 Party wall between dwellings	20.0000	0.0330	0.6600	
E1 Steel lintel with perforated steel base plate	7.0000	0.3020	2.1140	
E3 Sill	3.8000	0.0290	0.1102	
E4 Jamb	23.2000	0.0240	0.5568	
E6 Intermediate floor within a dwelling	20.1000	0.0010	0.0201	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.1749 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 50.8501 (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	15.8118	15.6227	15.4337	14.4883	14.2992	13.3539	13.3539	13.1648	13.7320	14.2992	14.6774	15.0555	(38)
Heat transfer coeff	66.6620	66.4729	66.2838	65.3384	65.1494	64.2040	64.2040	64.0149	64.5821	65.1494	65.5275	65.9057	(39)

Average = Sum(39)m / 12 = 65.2912

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9271	0.9245	0.9219	0.9087	0.9061	0.8930	0.8930	0.8903	0.8982	0.9061	0.9114	0.9166	(40)
HLP (average)												0.9081	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2914 (42)

Hot water usage for mixer showers

120.6657	118.8523	116.2099	111.1541	107.4230	103.2621	100.8971	103.5195	106.3942	110.8617	116.0261	120.2034	(42a)

Hot water usage for baths

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)

Hot water usage for other uses

38.0958	36.7105	35.3252	33.9399	32.5546	31.1693	31.1693	32.5546	33.9399	35.3252	36.7105	38.0958	(42c)

Average daily hot water use (litres/day) 145.8822 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	158.7615	155.5628	151.5350	145.0939	139.9776	134.4314	132.0664	136.0741	140.3341	146.1869	152.7366	158.2991	(44)
Energy conte	251.4393	221.5193	232.9037	198.6263	188.4367	165.2991	159.7228	168.4882	173.0460	198.3742	217.6013	247.8582	(45)
Energy content (annual)										Total = Sum(45)m =		2423.3152	
Distribution loss (46)m = 0.15 x (45)m	37.7159	33.2279	34.9356	29.7939	28.2655	24.7949	23.9584	25.2732	25.9569	29.7561	32.6402	37.1787	(46)

Water storage loss:

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.1200 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.6048 (55)

Total storage loss

18.7488	16.9344	18.7488	18.1440	18.7488	18.1440	18.7488	18.7488	18.1440	18.7488	18.1440	18.7488	(56)

If cylinder contains dedicated solar storage

18.7488	16.9344	18.7488	18.1440	18.7488	18.1440	18.7488	18.7488	18.1440	18.7488	18.1440	18.7488	(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

293.4505	259.4649	274.9149	239.2823	230.4479	205.9551	201.7340	210.4994	213.7020	240.3854	258.2573	289.8694	(62)
WWHRS -68.9837	-61.0098	-63.8859	-52.9000	-49.3009	-42.1872	-39.5437	-42.0508	-43.6485	-51.4567	-58.2942	-67.7062	(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

224.4668	198.4552	211.0290	186.3823	181.1469	163.7679	162.1903	168.4486	170.0535	188.9287	199.9631	222.1632	(64)

Total per year (kWh/year) = Sum(64)m = 2276.9955 (64)

12Total per year (kWh/year) 2277 (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

117.2125	104.0117	111.0495	98.5681	96.2642	87.4867	86.7168	89.6313	90.0626	99.5684	104.8772	116.0218	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	101.7296	112.6292	101.7296	105.1206	101.7296	105.1206	101.7296	101.7296	105.1206	101.7296	105.1206	101.7296	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.6903	203.7832	198.5091	187.2812	173.1080	159.7873	150.8881	148.7952	154.0693	165.2972	179.4704	192.7912	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	(71)
Water heating gains (Table 5)	157.5437	154.7793	149.2600	136.9001	129.3873	121.5094	116.5548	120.4721	125.0869	133.8285	145.6628	155.9433	(72)
Total internal gains	518.3339	528.5619	506.8690	486.6722	461.5953	443.7875	426.5429	428.3673	441.6471	458.2256	487.6241	507.8344	(73)

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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	
Southeast	1.8000	36.7938	0.6300	0.7000	0.7700	20.2404	(77)
Southwest	10.1000	36.7938	0.6300	0.7000	0.7700	113.5712	(79)
Horizontal	7.4000	26.0000	0.6300	0.7000	1.0000	76.3636	(82)

Solar gains	210.1752	386.5319	593.8225	826.9745	996.7331	1017.0996	969.3691	840.7651	675.4454	445.7579	257.1985	176.1931	(83)
Total gains	728.5091	915.0939	1100.6915	1313.6467	1458.3283	1460.8872	1395.9120	1269.1324	1117.0925	903.9835	744.8225	684.0275	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	42.0765	42.1962	42.3166	42.9288	43.0534	43.6874	43.6874	43.8164	43.4316	43.0534	42.8050	42.5594	
alpha	3.8051	3.8131	3.8211	3.8619	3.8702	3.9125	3.9125	3.9211	3.8954	3.8702	3.8537	3.8373	
util living area	0.9208	0.8493	0.7358	0.5650	0.4072	0.2799	0.2021	0.2314	0.3921	0.6680	0.8654	0.9333	(86)
Living	19.9239	20.2867	20.6315	20.8816	20.9706	20.9949	20.9989	20.9982	20.9815	20.8196	20.3493	19.8561	
Non living	18.9154	19.3552	19.7596	20.0449	20.1371	20.1700	20.1730	20.1748	20.1554	19.9903	19.4485	18.8388	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.4495	20.2867	20.6315	20.8816	20.9706	20.9949	20.9989	20.9982	20.9815	20.8196	20.3493	20.0161	(87)
Th 2	20.1445	20.1467	20.1489	20.1601	20.1623	20.1735	20.1735	20.1757	20.1690	20.1623	20.1578	20.1534	(88)
util rest of house	0.9093	0.8306	0.7088	0.5321	0.3725	0.2442	0.1642	0.1902	0.3470	0.6286	0.8451	0.9233	(89)
MIT 2	19.6545	19.3552	19.7596	20.0449	20.1371	20.1700	20.1730	20.1748	20.1554	19.9903	19.4485	19.0757	(90)
Living area fraction										fLA = Living area / (4) =		0.3171	(91)
MIT	19.9066	19.6506	20.0361	20.3103	20.4014	20.4316	20.4349	20.4359	20.4173	20.2533	19.7342	19.3739	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9066	19.6506	20.0361	20.3103	20.4014	20.4316	20.4349	20.4359	20.4173	20.2533	19.7342	19.3739	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9057	0.8187	0.7050	0.5381	0.3825	0.2554	0.1762	0.2033	0.3606	0.6330	0.8337	0.9125	(94)
Useful gains	659.8346	749.1517	776.0278	706.9005	557.8581	373.0566	245.9866	257.9571	402.8308	572.2297	620.9557	624.1649	(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	1040.3663	980.5157	897.2247	745.5287	566.8936	374.4117	246.2151	258.3579	407.9877	628.9035	827.8856	1000.0472	(97)
Space heating kWh	283.1156	155.4766	90.1704	27.8124	6.7224	0.0000	0.0000	0.0000	0.0000	42.1653	148.9895	279.6565	(98a)
Space heating requirement - total per year (kWh/year)												1034.1087	
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	283.1156	155.4766	90.1704	27.8124	6.7224	0.0000	0.0000	0.0000	0.0000	42.1653	148.9895	279.6565	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1034.1087	
Space heating per m2											(98c) / (4) =	14.3826	(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 %) 324.3752 (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	283.1156	155.4766	90.1704	27.8124	6.7224	0.0000	0.0000	0.0000	0.0000	42.1653	148.9895	279.6565	(98)
Space heating efficiency (main heating system 1)	324.3752	324.3752	324.3752	324.3752	324.3752	0.0000	0.0000	0.0000	0.0000	324.3752	324.3752	324.3752	(210)
Space heating fuel (main heating system)	87.2803	47.9311	27.7982	8.5741	2.0724	0.0000	0.0000	0.0000	0.0000	12.9989	45.9312	86.2139	(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	224.4668	198.4552	211.0290	186.3823	181.1469	163.7679	162.1903	168.4486	170.0535	188.9287	199.9631	222.1632	(64)
Efficiency of water heater												163.5904	(216)
(217)m	163.5904	163.5904	163.5904	163.5904	163.5904	163.5904	163.5904	163.5904	163.5904	163.5904	163.5904	163.5904	(217)
Fuel for water heating, kWh/month	137.2127	121.3123	128.9984	113.9323	110.7320	100.1085	99.1441	102.9697	103.9508	115.4889	122.2340	135.8046	(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	12.5719	11.3553	12.5719	12.1664	12.5719	12.1664	12.5719	12.5719	12.1664	12.5719	12.1664	12.5719	(231)
Lighting	19.7361	15.8330	14.2559	10.4445	8.0676	6.5913	7.3595	9.5662	12.4256	16.3030	18.4142	20.2846	(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 1 318.8002 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 163.5904

Water heating fuel used 1391.8884 (219)

Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6750)		
mechanical ventilation fans (SFP = 0.6750)	148.0241	(230a)
Total electricity for the above, kWh/year	148.0241	(231)
Electricity for lighting (calculated in Appendix L)	159.2814	(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	2017.9941	(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	318.8002	0.1581	50.4048	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1391.8884	0.1408	195.9539	(264)
Space and water heating			246.3587	(265)
Pumps, fans and electric keep-hot	148.0241	0.1387	20.5328	(267)
Energy for lighting	159.2814	0.1443	22.9892	(268)
Total CO2, kg/year			289.8807	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.0300	(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	318.8002	1.5852	505.3633	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1391.8884	1.5206	2116.4467	(278)
Space and water heating			2621.8099	(279)
Pumps, fans and electric keep-hot	148.0241	1.5128	223.9309	(281)
Energy for lighting	159.2814	1.5338	244.3112	(282)
Total Primary energy kWh/year			3090.0520	(286)
Dwelling Primary energy Rate (DPER)			42.9800	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	47.5000 (1b)	x	2.5000 (2b)	=	118.7500 (1b) - (3b)	
First floor	24.4000 (1c)	x	2.5000 (2c)	=	61.0000 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 71.9000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	179.7500	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1669	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4169	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3544	(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	0.4518	0.4430	0.4341	0.3898	0.3809	0.3366	0.3366	0.3278	0.3544	0.3809	0.3987	0.4164	(22b)
Effective ac	0.6021	0.5981	0.5942	0.5760	0.5726	0.5567	0.5567	0.5537	0.5628	0.5726	0.5795	0.5867	(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 Opening Type (Uw = 1.20)			11.0900	1.1450	12.6985			(27)
RL			6.8900	1.5918	10.9672			(27a)
Heatloss Floor 1			47.5000	0.1300	6.1750			(28a)
External Wall 1	79.5000	11.0900	68.4100	0.1800	12.3138			(29a)
FR	47.5000	6.8900	40.6100	0.1100	4.4671			(30)
Total net area of external elements Aum(A, m2)			174.5000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.6216			(33)
Party Wall 1			19.2500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 140.4402 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	13.1000	0.1600	2.0960
E14 Flat roof	28.5000	0.0800	2.2800
E16 Corner (normal)	15.0000	0.0900	1.3500
E18 Party wall between dwellings	20.0000	0.0600	1.2000
E1 Steel lintel with perforated steel base plate	7.0000	0.0500	0.3500
E3 Sill	3.8000	0.0500	0.1900
E4 Jamb	23.2000	0.0500	1.1600
E6 Intermediate floor within a dwelling	20.1000	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.6260 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 55.2476 (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	35.7132	35.4781	35.2476	34.1652	33.9627	33.0200	33.0200	32.8454	33.3831	33.9627	34.3724	34.8007	(38)
Heat transfer coeff	90.9608	90.7257	90.4952	89.4128	89.2103	88.2676	88.2676	88.0930	88.6307	89.2103	89.6200	90.0483	(39)
Average = Sum(39)m / 12 =												89.4119	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2651	1.2618	1.2586	1.2436	1.2408	1.2276	1.2276	1.2252	1.2327	1.2408	1.2465	1.2524	(40)
HLP (average)												1.2436	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2914 (42)

Hot water usage for mixer showers

	80.4438	79.2349	77.4733	74.1027	71.6153	68.8414	67.2647	69.0130	70.9295	73.9078	77.3508	80.1356	(42a)

Hot water usage for baths

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)

Hot water usage for other uses

	38.0958	36.7105	35.3252	33.9399	32.5546	31.1693	31.1693	32.5546	33.9399	35.3252	36.7105	38.0958	(42c)

Average daily hot water use (litres/day) 108.7990 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	118.5396	115.9453	112.7984	108.0426	104.1699	100.0107	98.4340	101.5676	104.8693	109.2330	114.0612	118.2313	(44)
Energy conte	187.7377	165.1046	173.3670	147.9049	140.2327	122.9748	119.0474	125.7619	129.3144	148.2281	162.5011	185.1217	(45)
Energy content (annual)										Total = Sum(45)m =		1807.2963	
Distribution loss (46)m = 0.15 x (45)m	28.1607	24.7657	26.0050	22.1857	21.0349	18.4462	17.8571	18.8643	19.3972	22.2342	24.3752	27.7683	(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

	234.3326	207.1903	219.9619	192.9967	186.8276	168.0666	165.6423	172.3568	174.4062	194.8230	207.5930	231.7166	(62)
WWHRS	-36.7755	-32.5246	-34.0579	-28.2013	-26.2826	-22.4902	-21.0810	-22.4175	-23.2692	-27.4318	-31.0769	-36.0945	(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

	197.5570	174.6658	185.9040	164.7954	160.5450	145.5765	144.5613	149.9393	151.1370	167.3912	176.5160	195.6221	(64)

Total per year (kWh/year) = Sum(64)m = 2014.2107 (64)
12Total per year (kWh/year) 2014 (64)
Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month

	99.6987	88.5659	94.9204	85.2518	83.9033	76.9626	76.8592	79.0917	79.0705	86.5618	90.1051	98.8289	(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	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	101.7296	112.6292	101.7296	105.1206	101.7296	105.1206	101.7296	101.7296	105.1206	101.7296	105.1206	101.7296	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.6903	203.7832	198.5091	187.2812	173.1080	159.7873	150.8881	148.7952	154.0693	165.2972	179.4704	192.7912	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	(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)	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	(71)
Water heating gains (Table 5)	134.0036	131.7944	127.5812	118.4053	112.7732	106.8925	103.3053	106.3061	109.8201	116.3465	125.1460	132.8345	(72)
Total internal gains	497.7938	508.5771	488.1903	471.1775	447.9812	429.1706	413.2934	414.2012	426.3803	443.7436	470.1072	487.7256	(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	
Southeast	1.6800	36.7938	0.6300	0.7000	0.7700	18.8911	(77)
Southwest	9.4100	36.7938	0.6300	0.7000	0.7700	105.8124	(79)
Horizontal	6.8900	26.0000	0.6300	0.7000	1.0000	71.1007	(82)

Solar gains	195.8041	360.0867	553.1625	770.3094	928.4079	947.3682	902.9140	783.1439	629.1821	415.2513	239.6091	164.1476	(83)
Total gains	693.5979	868.6638	1041.3527	1241.4869	1376.3891	1376.5388	1316.2074	1197.3451	1055.5624	858.9949	709.7163	651.8732	(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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	30.8364	30.9163	30.9950	31.3703	31.4415	31.7773	31.7773	31.8402	31.6471	31.4415	31.2977	31.1489	
alpha	3.0558	3.0611	3.0663	3.0914	3.0961	3.1185	3.1185	3.1227	3.1098	3.0961	3.0865	3.0766	
util living area	0.9483	0.9060	0.8333	0.7014	0.5456	0.3949	0.2904	0.3308	0.5294	0.7842	0.9158	0.9559	(86)
MIT	19.0963	19.5097	20.0159	20.5306	20.8250	20.9525	20.9863	20.9794	20.8825	20.4344	19.6764	19.0267	(87)
Th 2	19.8683	19.8709	19.8734	19.8853	19.8875	19.8979	19.8979	19.8999	19.8939	19.8875	19.8830	19.8783	(88)
util rest of house	0.9390	0.8904	0.8075	0.6613	0.4928	0.3319	0.2196	0.2547	0.4585	0.7421	0.8989	0.9478	(89)
MIT 2	17.6991	18.2108	18.8241	19.4252	19.7388	19.8671	19.8921	19.8904	19.8093	19.3419	18.4359	17.6187	(90)
Living area fraction										fLA = Living area / (4) =		0.3171	(91)
MIT	18.1421	18.6227	19.2020	19.7757	20.0833	20.2113	20.2391	20.2357	20.1496	19.6883	18.8293	18.0652	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1421	18.6227	19.2020	19.7757	20.0833	20.2113	20.2391	20.2357	20.1496	19.6883	18.8293	18.0652	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9203	0.8692	0.7900	0.6570	0.5025	0.3502	0.2418	0.2783	0.4755	0.7336	0.8791	0.9304	(94)
Useful gains	638.3000	755.0837	822.6358	815.6903	691.5796	482.0107	318.2157	333.2063	501.9667	630.1660	623.8965	606.4786	(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	1259.0915	1245.0002	1149.4708	972.4271	747.8732	495.2936	321.2108	337.8993	536.1803	810.7723	1051.1804	1248.5372	(97)
Space heating kWh	461.8689	329.2239	243.1652	112.8505	41.8825	0.0000	0.0000	0.0000	0.0000	134.3711	307.6444	477.6916	(98a)
Space heating requirement - total per year (kWh/year)												2108.6980	
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	461.8689	329.2239	243.1652	112.8505	41.8825	0.0000	0.0000	0.0000	0.0000	134.3711	307.6444	477.6916	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2108.6980	
Space heating per m2											(98c) / (4) =	29.3282	(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	461.8689	329.2239	243.1652	112.8505	41.8825	0.0000	0.0000	0.0000	0.0000	134.3711	307.6444	477.6916	(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)	500.3997	356.6889	263.4509	122.2649	45.3764	0.0000	0.0000	0.0000	0.0000	145.5808	333.3092	517.5424	(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	197.5570	174.6658	185.9040	164.7954	160.5450	145.5765	144.5613	149.9393	151.1370	167.3912	176.5160	195.6221	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.8977	85.4590	84.6629	83.2286	81.5092	79.8000	79.8000	79.8000	79.8000	83.5716	85.2929	85.9826	(217)
Fuel for water heating, kWh/month	229.9912	204.3853	219.5814	198.0034	196.9655	182.4266	181.1545	187.8939	189.3948	200.2967	206.9528	227.5136	(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	21.1374	16.9572	15.2681	11.1861	8.6404	7.0593	7.8821	10.2454	13.3078	17.4606	19.7217	21.7249	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-41.5965	-57.2485	-80.3746	-88.2259	-93.3998	-86.5904	-85.5198	-81.5612	-74.3404	-64.4376	-45.2324	-36.1291	(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	-27.9529	-58.2261	-114.6789	-170.7455	-224.3441	-224.8829	-222.2274	-188.7984	-139.2473	-82.7495	-37.1495	-22.1477	(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	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2284.6133	(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	2424.5596	(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)	170.5909	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2347.8065	(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	2617.9573	(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	2284.6133	0.2100	479.7688	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2424.5596	0.2100	509.1575	(264)
Space and water heating			988.9263	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	170.5909	0.1443	24.6215	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-834.6562	0.1351	-112.7530	
PV Unit electricity exported	-1513.1504	0.1262	-190.8938	
Total			-303.6467	(269)
Total CO2, kg/year			721.8304	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.0400	(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	2284.6133	1.1300	2581.6130	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2424.5596	1.1300	2739.7524	(278)
Space and water heating			5321.3653	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	170.5909	1.5338	261.6580	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-834.6562	1.4993	-1251.3951	
PV Unit electricity exported	-1513.1504	0.4631	-700.7297	
Total			-1952.1247	(283)
Total Primary energy kWh/year			3760.9994	(286)
Target Primary Energy Rate (TPER)			52.3100	(287)

Full SAP Calculation Printout

Property Reference	Unit 4	**Issued on Date**	04/05/2024
Assessment Reference	Unit 4 - Be Green	**Prop Type Ref**	
Property			

SAP Rating	84 B	**DER**	4.03	**TER**	10.04
Environmental	97 A	**% DER < TER**			59.86
CO_2 Emissions (t/year)	0.27	**DFEE**	33.99	**TFEE**	38.41
Compliance Check	See BREL	**% DFEE < TFEE**			11.52
% DPER < TPER	17.84	**DPER**	42.98	**TPER**	52.31

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	47.5000 (1b)	x	2.5000 (2b)	=	118.7500	(1b) - (3b)
First floor	24.4000 (1c)	x	2.5000 (2c)	=	61.0000	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.9000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	179.7500	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1669	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3169	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2694	(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	0.3434	0.3367	0.3300	0.2963	0.2896	0.2559	0.2559	0.2492	0.2694	0.2896	0.3030	0.3165	(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	0.5590	0.5567	0.5544	0.5439	0.5419	0.5327	0.5327	0.5310	0.5363	0.5419	0.5459	0.5501	(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)			11.9000	1.1450	13.6260			(27)
RL			7.4000	1.1450	8.4733			(27a)
Heatloss Floor 1			47.5000	0.1000	4.7500	75.0000	3562.5000	(28a)
External Wall 1	79.5000	11.9000	67.6000	0.1600	10.8160	70.0000	4732.0000	(29a)
FR	47.5000	7.4000	40.1000	0.1000	4.0100	9.0000	360.9000	(30)
Total net area of external elements Aum(A, m2)			174.5000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		41.6752			(33)
Party Wall 1			19.2500	0.0000	0.0000	45.0000	866.2500	(32)
Internal Wall 1			64.0000			9.0000	576.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10097.6500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		140.4402 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	13.1000	0.0480	0.6288
E14 Flat roof	28.5000	0.1600	4.5600
E16 Corner (normal)	15.0000	0.0350	0.5250

E18 Party wall between dwellings	20.0000	0.0330	0.6600	
E1 Steel lintel with perforated steel base plate	7.0000	0.3020	2.1140	
E3 Sill	3.8000	0.0290	0.1102	
E4 Jamb	23.2000	0.0240	0.5568	
E6 Intermediate floor within a dwelling	20.1000	0.0010	0.0201	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.1749 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 50.8501 (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	33.1570	33.0212	32.8880	32.2626	32.1456	31.6009	31.6009	31.5000	31.8107	32.1456	32.3823	32.6298	(38)
Heat transfer coeff	84.0071	83.8713	83.7381	83.1127	82.9957	82.4510	82.4510	82.3501	82.6608	82.9957	83.2324	83.4799	(39)

Average = Sum(39)m / 12 = 83.1122

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1684	1.1665	1.1646	1.1559	1.1543	1.1467	1.1467	1.1453	1.1497	1.1543	1.1576	1.1611	(40)
HLP (average)												1.1559	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2914 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

27.0597	26.6578	26.0919	25.0484	24.2671	23.4007	22.9327	23.4947	24.1066	25.0336	26.0986	26.9682	(42b)

Hot water usage for other uses

38.0958	36.7105	35.3252	33.9399	32.5546	31.1693	31.1693	32.5546	33.9399	35.3252	36.7105	38.0958	(42c)

Average daily hot water use (litres/day) 59.7211 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	65.1554	63.3683	61.4170	58.9883	56.8216	54.5700	54.1020	56.0493	58.0464	60.3588	62.8090	65.0640	(44)
Energy conte	103.1903	90.2356	94.3957	80.7520	76.4929	67.1001	65.4317	69.4007	71.5771	81.9063	89.4830	101.8744	(45)

Energy content (annual) Total = Sum(45)m = 991.8397

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

87.7117	76.7002	80.2363	68.6392	65.0189	57.0351	55.6169	58.9906	60.8405	69.6204	76.0605	86.5933	(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

87.7117	76.7002	80.2363	68.6392	65.0189	57.0351	55.6169	58.9906	60.8405	69.6204	76.0605	86.5933	(64)

Total per year (kWh/year) = Sum(64)m = 843.0638 (64)

12Total per year (kWh/year) 843 (64)

Electric shower(s)

50.1627	44.6954	48.8057	46.5746	47.4486	45.2614	46.7701	47.4486	46.5746	48.8057	47.8879	50.1627	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 570.5979 (64a)

Heat gains from water heating, kWh/month

34.4686	30.3489	32.2605	28.8035	28.1169	25.5741	25.5967	26.6098	26.8538	29.6065	30.9871	34.1890	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	101.7296	112.6292	101.7296	105.1206	101.7296	105.1206	101.7296	101.7296	105.1206	101.7296	105.1206	101.7296	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.6903	203.7832	198.5091	187.2812	173.1080	159.7873	150.8881	148.7952	154.0693	165.2972	179.4704	192.7912	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	(71)
Water heating gains (Table 5)	46.3288	45.1621	43.3609	40.0048	37.7915	35.5196	34.4042	35.7659	37.2969	39.7937	43.0377	45.9529	(72)
Total internal gains	407.1190	418.9447	400.9699	389.7769	369.9995	357.7977	344.3923	343.6610	353.8571	364.1908	384.9989	397.8440	(73)

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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	
Southeast	1.8000	36.7938	0.6300	0.7000	0.7700	20.2404	(77)
Southwest	10.1000	36.7938	0.6300	0.7000	0.7700	113.5712	(79)
Horizontal	7.4000	26.0000	0.6300	0.7000	1.0000	76.3636	(82)

Solar gains	210.1752	386.5319	593.8225	826.9745	996.7331	1017.0996	969.3691	840.7651	675.4454	445.7579	257.1985	176.1931	(83)
Total gains	617.2941	805.4767	994.7924	1216.7514	1366.7325	1374.8974	1313.7614	1184.4261	1029.3025	809.9487	642.1974	574.0371	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	33.3889	33.4429	33.4961	33.7482	33.7957	34.0190	34.0190	34.0607	33.9327	33.7957	33.6996	33.5997	
alpha	3.2259	3.2295	3.2331	3.2499	3.2530	3.2679	3.2679	3.2707	3.2622	3.2530	3.2466	3.2400	
util living area	0.9591	0.9143	0.8335	0.6874	0.5227	0.3733	0.2731	0.3146	0.5149	0.7886	0.9283	0.9666	(86)
MIT	19.1596	19.6060	20.1253	20.6146	20.8692	20.9670	20.9910	20.9857	20.9080	20.4886	19.7234	19.0723	(87)
Th 2	19.9454	19.9469	19.9484	19.9554	19.9567	19.9628	19.9628	19.9640	19.9605	19.9567	19.9541	19.9513	(88)
util rest of house	0.9517	0.9002	0.8088	0.6486	0.4735	0.3162	0.2100	0.2458	0.4484	0.7485	0.9139	0.9604	(89)
MIT 2	18.2957	18.7277	19.2177	19.6602	19.8697	19.9459	19.9597	19.9587	19.9083	19.5687	18.8546	18.2146	(90)
Living area fraction										fLA = Living area / (4) =		0.3171	(91)
MIT	18.5697	19.0062	19.5055	19.9629	20.1866	20.2697	20.2868	20.2844	20.2253	19.8604	19.1301	18.4866	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5697	19.0062	19.5055	19.9629	20.1866	20.2697	20.2868	20.2844	20.2253	19.8604	19.1301	18.4866	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9393	0.8852	0.7971	0.6489	0.4846	0.3333	0.2299	0.2673	0.4659	0.7444	0.9000	0.9492	(94)
Useful gains	579.8346	713.0118	792.9509	789.5905	662.3404	458.2967	302.0186	316.6407	479.6016	602.9607	578.0046	544.8676	(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	1198.7540	1183.1068	1089.0579	919.4643	704.3545	467.4713	303.9776	319.8797	506.3250	768.5751	1001.2982	1192.6454	(97)
Space heating kWh	460.4761	315.9039	220.3037	93.5092	31.2584	0.0000	0.0000	0.0000	0.0000	123.2171	304.7714	481.9467	(98a)
Space heating requirement - total per year (kWh/year)												2031.3864	
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	460.4761	315.9039	220.3037	93.5092	31.2584	0.0000	0.0000	0.0000	0.0000	123.2171	304.7714	481.9467	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2031.3864	
Space heating per m2											(98c) / (4) =	28.2529	(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	775.0396	610.1375	625.8611	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9375	0.9619	0.9475	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	726.6051	586.8865	593.0234	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1469.4199	1405.4046	1272.0778	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	534.8266	608.9775	505.2164	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	133.7067	152.2444	126.3041	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												412.2551	(107)
Energy for space heating												28.2529	(99)
Energy for space cooling												5.7337	(108)
Total												33.9867	(109)
Fabric Energy Efficiency (DFEE)												34.0	(109)

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

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		47.5000 (1b)	x	2.5000 (2b)	=	118.7500 (1b) - (3b)	
First floor		24.4000 (1c)	x	2.5000 (2c)	=	61.0000 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.9000					(4)	
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	179.7500	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1669	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	

Measured/design AP50												5.0000	(17)
Infiltration rate												0.4169	(18)
Number of sides sheltered												2	(19)
Shelter factor								(20) = 1 - [0.075 x (19)] =				0.8500	(20)
Infiltration rate adjusted to include shelter factor								(21) = (18) x (20) =				0.3544	(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	0.4518	0.4430	0.4341	0.3898	0.3809	0.3366	0.3366	0.3278	0.3544	0.3809	0.3987	0.4164	(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	0.6021	0.5981	0.5942	0.5760	0.5726	0.5567	0.5567	0.5537	0.5628	0.5726	0.5795	0.5867	(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 Opening Type (Uw = 1.20)			11.0900	1.1450	12.6985			(27)
RL			6.8900	1.5918	10.9672			(27a)
Heatloss Floor 1			47.5000	0.1300	6.1750			(28a)
External Wall 1	79.5000	11.0900	68.4100	0.1800	12.3138			(29a)
FR	47.5000	6.8900	40.6100	0.1100	4.4671			(30)
Total net area of external elements Aum(A, m2)			174.5000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.6216			(33)
Party Wall 1			19.2500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	140.4402	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	13.1000	0.1600	2.0960
E14 Flat roof	28.5000	0.0800	2.2800
E16 Corner (normal)	15.0000	0.0900	1.3500
E18 Party wall between dwellings	20.0000	0.0600	1.2000
E1 Steel lintel with perforated steel base plate	7.0000	0.0500	0.3500
E3 Sill	3.8000	0.0500	0.1900
E4 Jamb	23.2000	0.0500	1.1600
E6 Intermediate floor within a dwelling	20.1000	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	8.6260	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	55.2476	(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	35.7132	35.4781	35.2476	34.1652	33.9627	33.0200	33.0200	32.8454	33.3831	33.9627	34.3724	34.8007	(38)
Heat transfer coeff	90.9608	90.7257	90.4952	89.4128	89.2103	88.2676	88.2676	88.0930	88.6307	89.2103	89.6200	90.0483	(39)
Average = Sum(39)m / 12 =												89.4119	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2651	1.2618	1.2586	1.2436	1.2408	1.2276	1.2276	1.2252	1.2327	1.2408	1.2465	1.2524	(40)
HLP (average)												1.2436	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2914	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	27.0597	26.6578	26.0919	25.0484	24.2671	23.4007	22.9327	23.4947	24.1066	25.0336	26.0986	26.9682	(42b)
Hot water usage for other uses	38.0958	36.7105	35.3252	33.9399	32.5546	31.1693	31.1693	32.5546	33.9399	35.3252	36.7105	38.0958	(42c)
Average daily hot water use (litres/day)												59.7211	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	65.1554	63.3683	61.4170	58.9883	56.8216	54.5700	54.1020	56.0493	58.0464	60.3588	62.8090	65.0640	(44)
Energy conte	103.1903	90.2356	94.3957	80.7520	76.4929	67.1001	65.4317	69.4007	71.5771	81.9063	89.4830	101.8744	(45)
Energy content (annual)										Total = Sum(45)m =		991.8397	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	87.7117	76.7002	80.2363	68.6392	65.0189	57.0351	55.6169	58.9906	60.8405	69.6204	76.0605	86.5933	(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	87.7117	76.7002	80.2363	68.6392	65.0189	57.0351	55.6169	58.9906	60.8405	69.6204	76.0605	86.5933	(64)
										Total per year (kWh/year) = Sum(64)m =		843.0638	(64)
12Total per year (kWh/year)												843	(64)
Electric shower(s)	50.1627	44.6954	48.8057	46.5746	47.4486	45.2614	46.7701	47.4486	46.5746	48.8057	47.8879	50.1627	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		570.5979	(64a)
Heat gains from water heating, kWh/month	34.4686	30.3489	32.2605	28.8035	28.1169	25.5741	25.5967	26.6098	26.8538	29.6065	30.9871	34.1890	(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	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	101.7296	112.6292	101.7296	105.1206	101.7296	105.1206	101.7296	101.7296	105.1206	101.7296	105.1206	101.7296	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	201.6903	203.7832	198.5091	187.2812	173.1080	159.7873	150.8881	148.7952	154.0693	165.2972	179.4704	192.7912	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	(71)
Water heating gains (Table 5)													
	46.3288	45.1621	43.3609	40.0048	37.7915	35.5196	34.4042	35.7659	37.2969	39.7937	43.0377	45.9529	(72)
Total internal gains													
	407.1190	418.9447	400.9699	389.7769	369.9995	357.7977	344.3923	343.6610	353.8571	364.1908	384.9989	397.8440	(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	
Southeast	1.6800	36.7938	0.6300	0.7000	0.7700	18.8911	(77)
Southwest	9.4100	36.7938	0.6300	0.7000	0.7700	105.8124	(79)
Horizontal	6.8900	26.0000	0.6300	0.7000	1.0000	71.1007	(82)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	195.8041	360.0867	553.1625	770.3094	928.4079	947.3682	902.9140	783.1439	629.1821	415.2513	239.6091	164.1476	(83)
Total gains	602.9231	779.0314	954.1324	1160.0863	1298.4074	1305.1659	1247.3063	1126.8048	983.0392	779.4421	624.6080	561.9916	(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	30.8364	30.9163	30.9950	31.3703	31.4415	31.7773	31.7773	31.8402	31.6471	31.4415	31.2977	31.1489	
alpha	3.0558	3.0611	3.0663	3.0914	3.0961	3.1185	3.1185	3.1227	3.1098	3.0961	3.0865	3.0766	
util living area													
	0.9633	0.9261	0.8586	0.7286	0.5704	0.4142	0.3057	0.3500	0.5595	0.8172	0.9370	0.9696	(86)
MIT	18.9262	19.3647	19.9084	20.4739	20.8018	20.9457	20.9842	20.9759	20.8627	20.3530	19.5328	18.8532	(87)
Th 2	19.8683	19.8709	19.8734	19.8853	19.8875	19.8979	19.8979	19.8999	19.8939	19.8875	19.8830	19.8783	(88)
util rest of house													
	0.9564	0.9131	0.8353	0.6895	0.5168	0.3488	0.2315	0.2701	0.4868	0.7784	0.9237	0.9638	(89)
MIT 2	18.0127	18.4398	18.9584	19.4800	19.7552	19.8703	19.8926	19.8911	19.8159	19.3940	18.6197	17.9483	(90)
Living area fraction									fLA = Living area / (4) =			0.3171	(91)
MIT	18.3024	18.7331	19.2596	19.7952	20.0871	20.2113	20.2387	20.2351	20.1479	19.6981	18.9092	18.2353	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3024	18.7331	19.2596	19.7952	20.0871	20.2113	20.2387	20.2351	20.1479	19.6981	18.9092	18.2353	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9437	0.8970	0.8207	0.6861	0.5268	0.3678	0.2547	0.2949	0.5043	0.7709	0.9090	0.9524	(94)
Useful gains	568.9835	698.8275	783.0536	795.9847	683.9560	480.0392	317.7032	332.3053	495.7226	600.9063	567.7441	535.2193	(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													
	1273.6680	1255.0132	1154.6861	974.1686	748.2175	495.2958	321.1834	337.8437	536.0271	811.6476	1058.3433	1263.8518	(97)
Space heating kWh													
	524.2853	373.7568	276.4946	128.2924	47.8106	0.0000	0.0000	0.0000	0.0000	156.7915	353.2314	542.1025	(98a)
Space heating requirement - total per year (kWh/year)												2402.7652	
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													
	524.2853	373.7568	276.4946	128.2924	47.8106	0.0000	0.0000	0.0000	0.0000	156.7915	353.2314	542.1025	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2402.7652	
Space heating per m2										(98c) / (4) =		33.4182	(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	829.7153	653.1801	669.5068	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9091	0.9419	0.9229	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	754.2941	615.2299	617.9048	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1394.7505	1334.1889	1210.0936	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	461.1286	534.9055	440.5885	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	115.2822	133.7264	110.1471	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												359.1557	(107)
Energy for space heating												33.4182	(99)
Energy for space cooling												4.9952	(108)
Total												38.4134	(109)
Fabric Energy Efficiency (TFEE)												38.4	(109)

Full SAP Calculation Printout

Property Reference	Unit 4	**Issued on Date**	04/05/2024
Assessment Reference	Unit 4 - Be Green	**Prop Type Ref**	
Property			

SAP Rating	84 B	**DER**	4.03	**TER**	10.04
Environmental	97 A	**% DER < TER**			59.86
CO_2 Emissions (t/year)	0.27	**DFEE**	33.99	**TFEE**	38.41
Compliance Check	See BREL	**% DFEE < TFEE**			11.52
% DPER < TPER	17.84	**DPER**	42.98	**TPER**	52.31

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	47.5000 (1b)	x	2.5000 (2b)	=	118.7500	(1b) - (3b)
First floor	24.4000 (1c)	x	2.5000 (2c)	=	61.0000	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.9000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	179.7500	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		79.2000 (23c)

Effective ac	0.2666	0.2634	0.2602	0.2442	0.2411	0.2251	0.2251	0.2219	0.2315	0.2411	0.2474	0.2538	(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)			11.9000	1.1450	13.6260			(27)
RL			7.4000	1.1450	8.4733			(27a)
Heatloss Floor 1			47.5000	0.1000	4.7500	75.0000	3562.5000	(28a)
External Wall 1	79.5000	11.9000	67.6000	0.1600	10.8160	70.0000	4732.0000	(29a)
FR	47.5000	7.4000	40.1000	0.1000	4.0100	9.0000	360.9000	(30)
Total net area of external elements Aum(A, m2)			174.5000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		41.6752			(33)
Party Wall 1			19.2500	0.0000	0.0000	45.0000	866.2500	(32)
Internal Wall 1			64.0000			9.0000	576.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10097.6500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		140.4402 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E5 Ground floor (normal)	13.1000	0.0480	0.6288	
E14 Flat roof	28.5000	0.1600	4.5600	
E16 Corner (normal)	15.0000	0.0350	0.5250	
E18 Party wall between dwellings	20.0000	0.0330	0.6600	
E1 Steel lintel with perforated steel base plate	7.0000	0.3020	2.1140	
E3 Sill	3.8000	0.0290	0.1102	
E4 Jamb	23.2000	0.0240	0.5568	
E6 Intermediate floor within a dwelling	20.1000	0.0010	0.0201	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.1749 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 50.8501 (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	15.8118	15.6227	15.4337	14.4883	14.2992	13.3539	13.3539	13.1648	13.7320	14.2992	14.6774	15.0555	(38)
Heat transfer coeff	66.6620	66.4729	66.2838	65.3384	65.1494	64.2040	64.2040	64.0149	64.5821	65.1494	65.5275	65.9057	(39)

Average = Sum(39)m / 12 = 65.2912

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9271	0.9245	0.9219	0.9087	0.9061	0.8930	0.8930	0.8903	0.8982	0.9061	0.9114	0.9166	(40)
HLP (average)												0.9081	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2914 (42)

Hot water usage for mixer showers

120.6657	118.8523	116.2099	111.1541	107.4230	103.2621	100.8971	103.5195	106.3942	110.8617	116.0261	120.2034	(42a)

Hot water usage for baths

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)

Hot water usage for other uses

38.0958	36.7105	35.3252	33.9399	32.5546	31.1693	31.1693	32.5546	33.9399	35.3252	36.7105	38.0958	(42c)

Average daily hot water use (litres/day) 145.8822 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	158.7615	155.5628	151.5350	145.0939	139.9776	134.4314	132.0664	136.0741	140.3341	146.1869	152.7366	158.2991	(44)
Energy conte	251.4393	221.5193	232.9037	198.6263	188.4367	165.2991	159.7228	168.4882	173.0460	198.3742	217.6013	247.8582	(45)
Energy content (annual)										Total = Sum(45)m =		2423.3152	
Distribution loss (46)m = 0.15 x (45)m	37.7159	33.2279	34.9356	29.7939	28.2655	24.7949	23.9584	25.2732	25.9569	29.7561	32.6402	37.1787	(46)

Water storage loss:

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.1200 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.6048 (55)

Total storage loss

18.7488	16.9344	18.7488	18.1440	18.7488	18.1440	18.7488	18.7488	18.1440	18.7488	18.1440	18.7488	(56)

If cylinder contains dedicated solar storage

18.7488	16.9344	18.7488	18.1440	18.7488	18.1440	18.7488	18.7488	18.1440	18.7488	18.1440	18.7488	(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

293.4505	259.4649	274.9149	239.2823	230.4479	205.9551	201.7340	210.4994	213.7020	240.3854	258.2573	289.8694	(62)
WWHRS -68.9837	-61.0098	-63.8859	-52.9000	-49.3009	-42.1872	-39.5437	-42.0508	-43.6485	-51.4567	-58.2942	-67.7062	(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

224.4668	198.4552	211.0290	186.3823	181.1469	163.7679	162.1903	168.4486	170.0535	188.9287	199.9631	222.1632	(64)

Total per year (kWh/year) = Sum(64)m = 2276.9955 (64)

12Total per year (kWh/year) 2277 (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

117.2125	104.0117	111.0495	98.5681	96.2642	87.4867	86.7168	89.6313	90.0626	99.5684	104.8772	116.0218	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	101.7296	112.6292	101.7296	105.1206	101.7296	105.1206	101.7296	101.7296	105.1206	101.7296	105.1206	101.7296	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.6903	203.7832	198.5091	187.2812	173.1080	159.7873	150.8881	148.7952	154.0693	165.2972	179.4704	192.7912	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	(71)
Water heating gains (Table 5)	157.5437	154.7793	149.2600	136.9001	129.3873	121.5094	116.5548	120.4721	125.0869	133.8285	145.6628	155.9433	(72)
Total internal gains	518.3339	528.5619	506.8690	486.6722	461.5953	443.7875	426.5429	428.3673	441.6471	458.2256	487.6241	507.8344	(73)

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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	
Southeast	1.8000	36.7938	0.6300	0.7000	0.7700	20.2404	(77)
Southwest	10.1000	36.7938	0.6300	0.7000	0.7700	113.5712	(79)
Horizontal	7.4000	26.0000	0.6300	0.7000	1.0000	76.3636	(82)

Solar gains	210.1752	386.5319	593.8225	826.9745	996.7331	1017.0996	969.3691	840.7651	675.4454	445.7579	257.1985	176.1931	(83)
Total gains	728.5091	915.0939	1100.6915	1313.6467	1458.3283	1460.8872	1395.9120	1269.1324	1117.0925	903.9835	744.8225	684.0275	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	42.0765	42.1962	42.3166	42.9288	43.0534	43.6874	43.6874	43.8164	43.4316	43.0534	42.8050	42.5594	
alpha	3.8051	3.8131	3.8211	3.8619	3.8702	3.9125	3.9125	3.9211	3.8954	3.8702	3.8537	3.8373	
util living area	0.9208	0.8493	0.7358	0.5650	0.4072	0.2799	0.2021	0.2314	0.3921	0.6680	0.8654	0.9333	(86)
Living	19.9239	20.2867	20.6315	20.8816	20.9706	20.9949	20.9989	20.9982	20.9815	20.8196	20.3493	19.8561	
Non living	18.9154	19.3552	19.7596	20.0449	20.1371	20.1700	20.1730	20.1748	20.1554	19.9903	19.4485	18.8388	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.4495	20.2867	20.6315	20.8816	20.9706	20.9949	20.9989	20.9982	20.9815	20.8196	20.3493	20.0161	(87)
Th 2	20.1445	20.1467	20.1489	20.1601	20.1623	20.1735	20.1735	20.1757	20.1690	20.1623	20.1578	20.1534	(88)
util rest of house	0.9093	0.8306	0.7088	0.5321	0.3725	0.2442	0.1642	0.1902	0.3470	0.6286	0.8451	0.9233	(89)
MIT 2	19.6545	19.3552	19.7596	20.0449	20.1371	20.1700	20.1730	20.1748	20.1554	19.9903	19.4485	19.0757	(90)
Living area fraction										fLA = Living area / (4) =		0.3171	(91)
MIT	19.9066	19.6506	20.0361	20.3103	20.4014	20.4316	20.4349	20.4359	20.4173	20.2533	19.7342	19.3739	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9066	19.6506	20.0361	20.3103	20.4014	20.4316	20.4349	20.4359	20.4173	20.2533	19.7342	19.3739	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9057	0.8187	0.7050	0.5381	0.3825	0.2554	0.1762	0.2033	0.3606	0.6330	0.8337	0.9125	(94)
Useful gains	659.8346	749.1517	776.0278	706.9005	557.8581	373.0566	245.9866	257.9571	402.8308	572.2297	620.9557	624.1649	(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	1040.3663	980.5157	897.2247	745.5287	566.8936	374.4117	246.2151	258.3579	407.9877	628.9035	827.8856	1000.0472	(97)
Space heating kWh	283.1156	155.4766	90.1704	27.8124	6.7224	0.0000	0.0000	0.0000	0.0000	42.1653	148.9895	279.6565	(98a)
Space heating requirement - total per year (kWh/year)												1034.1087	
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	283.1156	155.4766	90.1704	27.8124	6.7224	0.0000	0.0000	0.0000	0.0000	42.1653	148.9895	279.6565	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1034.1087	
Space heating per m2											(98c) / (4) =	14.3826	(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 %) 324.3752 (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	283.1156	155.4766	90.1704	27.8124	6.7224	0.0000	0.0000	0.0000	0.0000	42.1653	148.9895	279.6565	(98)
Space heating efficiency (main heating system 1)	324.3752	324.3752	324.3752	324.3752	324.3752	0.0000	0.0000	0.0000	0.0000	324.3752	324.3752	324.3752	(210)
Space heating fuel (main heating system)	87.2803	47.9311	27.7982	8.5741	2.0724	0.0000	0.0000	0.0000	0.0000	12.9989	45.9312	86.2139	(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	224.4668	198.4552	211.0290	186.3823	181.1469	163.7679	162.1903	168.4486	170.0535	188.9287	199.9631	222.1632	(64)
Efficiency of water heater												163.5904	(216)
(217)m	163.5904	163.5904	163.5904	163.5904	163.5904	163.5904	163.5904	163.5904	163.5904	163.5904	163.5904	163.5904	(217)
Fuel for water heating, kWh/month	137.2127	121.3123	128.9984	113.9323	110.7320	100.1085	99.1441	102.9697	103.9508	115.4889	122.2340	135.8046	(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	12.5719	11.3553	12.5719	12.1664	12.5719	12.1664	12.5719	12.5719	12.1664	12.5719	12.1664	12.5719	(231)
Lighting	19.7361	15.8330	14.2559	10.4445	8.0676	6.5913	7.3595	9.5662	12.4256	16.3030	18.4142	20.2846	(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 1 318.8002 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 163.5904

Water heating fuel used 1391.8884 (219)

Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6750)		
mechanical ventilation fans (SFP = 0.6750)	148.0241	(230a)
Total electricity for the above, kWh/year	148.0241	(231)
Electricity for lighting (calculated in Appendix L)	159.2814	(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	2017.9941	(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	318.8002	0.1581	50.4048	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1391.8884	0.1408	195.9539	(264)
Space and water heating			246.3587	(265)
Pumps, fans and electric keep-hot	148.0241	0.1387	20.5328	(267)
Energy for lighting	159.2814	0.1443	22.9892	(268)
Total CO2, kg/year			289.8807	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.0300	(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	318.8002	1.5852	505.3633	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1391.8884	1.5206	2116.4467	(278)
Space and water heating			2621.8099	(279)
Pumps, fans and electric keep-hot	148.0241	1.5128	223.9309	(281)
Energy for lighting	159.2814	1.5338	244.3112	(282)
Total Primary energy kWh/year			3090.0520	(286)
Dwelling Primary energy Rate (DPER)			42.9800	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	47.5000 (1b)	x	2.5000 (2b)	=	118.7500 (1b) - (3b)	
First floor	24.4000 (1c)	x	2.5000 (2c)	=	61.0000 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 71.9000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	179.7500	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1669	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4169	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3544	(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	0.4518	0.4430	0.4341	0.3898	0.3809	0.3366	0.3366	0.3278	0.3544	0.3809	0.3987	0.4164	(22b)
Effective ac	0.6021	0.5981	0.5942	0.5760	0.5726	0.5567	0.5567	0.5537	0.5628	0.5726	0.5795	0.5867	(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 Opening Type (Uw = 1.20)			11.0900	1.1450	12.6985			(27)
RL			6.8900	1.5918	10.9672			(27a)
Heatloss Floor 1			47.5000	0.1300	6.1750			(28a)
External Wall 1	79.5000	11.0900	68.4100	0.1800	12.3138			(29a)
FR	47.5000	6.8900	40.6100	0.1100	4.4671			(30)
Total net area of external elements Aum(A, m2)			174.5000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.6216			(33)
Party Wall 1			19.2500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 140.4402 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	13.1000	0.1600	2.0960
E14 Flat roof	28.5000	0.0800	2.2800
E16 Corner (normal)	15.0000	0.0900	1.3500
E18 Party wall between dwellings	20.0000	0.0600	1.2000
E1 Steel lintel with perforated steel base plate	7.0000	0.0500	0.3500
E3 Sill	3.8000	0.0500	0.1900
E4 Jamb	23.2000	0.0500	1.1600
E6 Intermediate floor within a dwelling	20.1000	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.6260 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 55.2476 (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	35.7132	35.4781	35.2476	34.1652	33.9627	33.0200	33.0200	32.8454	33.3831	33.9627	34.3724	34.8007	(38)
Heat transfer coeff	90.9608	90.7257	90.4952	89.4128	89.2103	88.2676	88.2676	88.0930	88.6307	89.2103	89.6200	90.0483	(39)
Average = Sum(39)m / 12 =												89.4119	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2651	1.2618	1.2586	1.2436	1.2408	1.2276	1.2276	1.2252	1.2327	1.2408	1.2465	1.2524	(40)
HLP (average)												1.2436	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2914 (42)

Hot water usage for mixer showers

	80.4438	79.2349	77.4733	74.1027	71.6153	68.8414	67.2647	69.0130	70.9295	73.9078	77.3508	80.1356	(42a)

Hot water usage for baths

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)

Hot water usage for other uses

	38.0958	36.7105	35.3252	33.9399	32.5546	31.1693	31.1693	32.5546	33.9399	35.3252	36.7105	38.0958	(42c)

Average daily hot water use (litres/day) 108.7990 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	118.5396	115.9453	112.7984	108.0426	104.1699	100.0107	98.4340	101.5676	104.8693	109.2330	114.0612	118.2313	(44)
Energy conte	187.7377	165.1046	173.3670	147.9049	140.2327	122.9748	119.0474	125.7619	129.3144	148.2281	162.5011	185.1217	(45)
Energy content (annual)										Total = Sum(45)m =		1807.2963	
Distribution loss (46)m = 0.15 x (45)m	28.1607	24.7657	26.0050	22.1857	21.0349	18.4462	17.8571	18.8643	19.3972	22.2342	24.3752	27.7683	(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

	234.3326	207.1903	219.9619	192.9967	186.8276	168.0666	165.6423	172.3568	174.4062	194.8230	207.5930	231.7166	(62)
WWHRS	-36.7755	-32.5246	-34.0579	-28.2013	-26.2826	-22.4902	-21.0810	-22.4175	-23.2692	-27.4318	-31.0769	-36.0945	(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

	197.5570	174.6658	185.9040	164.7954	160.5450	145.5765	144.5613	149.9393	151.1370	167.3912	176.5160	195.6221	(64)

Total per year (kWh/year) = Sum(64)m = 2014.2107 (64)
12Total per year (kWh/year) 2014 (64)
Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month

	99.6987	88.5659	94.9204	85.2518	83.9033	76.9626	76.8592	79.0917	79.0705	86.5618	90.1051	98.8289	(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	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	101.7296	112.6292	101.7296	105.1206	101.7296	105.1206	101.7296	101.7296	105.1206	101.7296	105.1206	101.7296	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.6903	203.7832	198.5091	187.2812	173.1080	159.7873	150.8881	148.7952	154.0693	165.2972	179.4704	192.7912	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	(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)	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	(71)
Water heating gains (Table 5)	134.0036	131.7944	127.5812	118.4053	112.7732	106.8925	103.3053	106.3061	109.8201	116.3465	125.1460	132.8345	(72)
Total internal gains	497.7938	508.5771	488.1903	471.1775	447.9812	429.1706	413.2934	414.2012	426.3803	443.7436	470.1072	487.7256	(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	
Southeast	1.6800	36.7938	0.6300	0.7000	0.7700	18.8911	(77)
Southwest	9.4100	36.7938	0.6300	0.7000	0.7700	105.8124	(79)
Horizontal	6.8900	26.0000	0.6300	0.7000	1.0000	71.1007	(82)

Solar gains	195.8041	360.0867	553.1625	770.3094	928.4079	947.3682	902.9140	783.1439	629.1821	415.2513	239.6091	164.1476	(83)
Total gains	693.5979	868.6638	1041.3527	1241.4869	1376.3891	1376.5388	1316.2074	1197.3451	1055.5624	858.9949	709.7163	651.8732	(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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	30.8364	30.9163	30.9950	31.3703	31.4415	31.7773	31.7773	31.8402	31.6471	31.4415	31.2977	31.1489	
alpha	3.0558	3.0611	3.0663	3.0914	3.0961	3.1185	3.1185	3.1227	3.1098	3.0961	3.0865	3.0766	
util living area	0.9483	0.9060	0.8333	0.7014	0.5456	0.3949	0.2904	0.3308	0.5294	0.7842	0.9158	0.9559	(86)
MIT	19.0963	19.5097	20.0159	20.5306	20.8250	20.9525	20.9863	20.9794	20.8825	20.4344	19.6764	19.0267	(87)
Th 2	19.8683	19.8709	19.8734	19.8853	19.8875	19.8979	19.8979	19.8999	19.8939	19.8875	19.8830	19.8783	(88)
util rest of house	0.9390	0.8904	0.8075	0.6613	0.4928	0.3319	0.2196	0.2547	0.4585	0.7421	0.8989	0.9478	(89)
MIT 2	17.6991	18.2108	18.8241	19.4252	19.7388	19.8671	19.8921	19.8904	19.8093	19.3419	18.4359	17.6187	(90)
Living area fraction										fLA = Living area / (4) =		0.3171	(91)
MIT	18.1421	18.6227	19.2020	19.7757	20.0833	20.2113	20.2391	20.2357	20.1496	19.6883	18.8293	18.0652	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1421	18.6227	19.2020	19.7757	20.0833	20.2113	20.2391	20.2357	20.1496	19.6883	18.8293	18.0652	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9203	0.8692	0.7900	0.6570	0.5025	0.3502	0.2418	0.2783	0.4755	0.7336	0.8791	0.9304	(94)
Useful gains	638.3000	755.0837	822.6358	815.6903	691.5796	482.0107	318.2157	333.2063	501.9667	630.1660	623.8965	606.4786	(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	1259.0915	1245.0002	1149.4708	972.4271	747.8732	495.2936	321.2108	337.8993	536.1803	810.7723	1051.1804	1248.5372	(97)
Space heating kWh	461.8689	329.2239	243.1652	112.8505	41.8825	0.0000	0.0000	0.0000	0.0000	134.3711	307.6444	477.6916	(98a)
Space heating requirement - total per year (kWh/year)												2108.6980	
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	461.8689	329.2239	243.1652	112.8505	41.8825	0.0000	0.0000	0.0000	0.0000	134.3711	307.6444	477.6916	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2108.6980	
Space heating per m2											(98c) / (4) =	29.3282	(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	461.8689	329.2239	243.1652	112.8505	41.8825	0.0000	0.0000	0.0000	0.0000	134.3711	307.6444	477.6916	(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)	500.3997	356.6889	263.4509	122.2649	45.3764	0.0000	0.0000	0.0000	0.0000	145.5808	333.3092	517.5424	(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	197.5570	174.6658	185.9040	164.7954	160.5450	145.5765	144.5613	149.9393	151.1370	167.3912	176.5160	195.6221	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.8977	85.4590	84.6629	83.2286	81.5092	79.8000	79.8000	79.8000	79.8000	83.5716	85.2929	85.9826	(217)
Fuel for water heating, kWh/month	229.9912	204.3853	219.5814	198.0034	196.9655	182.4266	181.1545	187.8939	189.3948	200.2967	206.9528	227.5136	(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	21.1374	16.9572	15.2681	11.1861	8.6404	7.0593	7.8821	10.2454	13.3078	17.4606	19.7217	21.7249	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-41.5965	-57.2485	-80.3746	-88.2259	-93.3998	-86.5904	-85.5198	-81.5612	-74.3404	-64.4376	-45.2324	-36.1291	(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	-27.9529	-58.2261	-114.6789	-170.7455	-224.3441	-224.8829	-222.2274	-188.7984	-139.2473	-82.7495	-37.1495	-22.1477	(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	(235b)

Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)

(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2284.6133	(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	2424.5596	(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)	170.5909	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2347.8065	(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	2617.9573	(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	2284.6133	0.2100	479.7688	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2424.5596	0.2100	509.1575	(264)
Space and water heating			988.9263	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	170.5909	0.1443	24.6215	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-834.6562	0.1351	-112.7530	
PV Unit electricity exported	-1513.1504	0.1262	-190.8938	
Total			-303.6467	(269)
Total CO2, kg/year			721.8304	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.0400	(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	2284.6133	1.1300	2581.6130	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2424.5596	1.1300	2739.7524	(278)
Space and water heating			5321.3653	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	170.5909	1.5338	261.6580	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-834.6562	1.4993	-1251.3951	
PV Unit electricity exported	-1513.1504	0.4631	-700.7297	
Total			-1952.1247	(283)
Total Primary energy kWh/year			3760.9994	(286)
Target Primary Energy Rate (TPER)			52.3100	(287)

Summary for Input Data

elmhurst energy

Property Reference	Unit 4	**Issued on Date**	04/05/2024
Assessment Reference	Unit 4 - Be Lean	**Prop Type Ref**	
Property			

SAP Rating	86 B	**DER**	11.78	**TER**	10.04
Environmental	91 B	**% DER < TER**			-17.33
CO_2 Emissions (t/year)	0.78	**DFEE**	33.99	**TFEE**	38.41
Compliance Check	See BREL	**% DFEE < TFEE**			11.52
% DPER < TPER	-28.26	**DPER**	67.09	**TPER**	52.31

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

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

Orientation	Southwest	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Suburban	
1.0 Property Type	Bungalow, End-Terrace	
Which Floor	0	
2.0 Number of Storeys	2	
3.0 Date Built	2024	
3.0 Property Age Band	L	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	N/A	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Basement:	0.00 m	0.00 m²	0.00 m
Ground floor:	13.10 m	47.50 m²	2.50 m
1st Storey:	18.70 m	24.40 m²	2.50 m
2nd Storey:	0.00 m	0.00 m²	0.00 m
3rd Storey:	0.00 m	0.00 m²	0.00 m
4th Storey:	0.00 m	0.00 m²	0.00 m
5th Storey:	0.00 m	0.00 m²	0.00 m
6th Storey:	0.00 m	0.00 m²	0.00 m
7th Storey:	0.00 m	0.00 m²	0.00 m

8.0 Living Area	22.80	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
External Wall 1	Cavity Wall	Cavity wall : dense plaster, AAC block, filled cavity, any outside structure	0.16	70.00	79.50	67.60	0.00	None	11.90	Calculate Wall Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Plasterboard on dabs mounted on cement render on both sides, AAC blocks, cavity	0.00	45.00	19.25	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	64.00

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area	Shelter Code	Shelter Factor	Calculation Type	Openings

Summary for Input Data

						(m²)				
FR	External Flat Roof	Plasterboard, insulated flat roof	0.10	9.00	47.50	40.10	None	0.00	Enter Gross Area	7.40

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Heatloss Floor 1	Ground Floor - Solid	Lowest occupied	Suspended concrete floor, carpeted	0.10	None	0.00	75.00	47.50

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Windows	Manufacturer	Window	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.20
RLs	Manufacturer	Roof Window	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
SW	Windows	External Wall 1	South West	10.10	0
SE	Windows	External Wall 1	South East	1.80	0
RL	RLs	FR	Horizontal	7.40	0

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	

17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E5 Ground floor (normal)	Gov Approved Scheme	13.10	0.05	0.05	No
E14 Flat roof	Table K1 - Default	28.50	0.16	0.16	No
E16 Corner (normal)	Gov Approved Scheme	15.00	0.04	0.04	No
E18 Party wall between dwellings	Gov Approved Scheme	20.00	0.03	0.03	No
E1 Steel lintel with perforated steel base plate	Gov Approved Scheme	7.00	0.30	0.30	No
E3 Sill	Gov Approved Scheme	3.80	0.03	0.03	No
E4 Jamb	Gov Approved Scheme	23.20	0.02	0.02	No
E6 Intermediate floor within a dwelling	Gov Approved Scheme	20.10	0.00	0.00	No

Y-value	0.05	W/m²K

18.0 Pressure Testing	Yes	
Designed AP_{50}	3.00	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500811
Configuration	2
Manufacturer SFP	0.54
Duct Type	Rigid
MVHR Efficiency	88.00
Wet Rooms	2
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)
Duct Installation Specification	Level 1

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System	No

22.0 Lighting

No Fixed Lighting	No

Name	Efficacy	Power	Capacity	Count
Lighting 1	120.00	6	720	40

Summary for Input Data

24.0 Main Heating 1	Manufacturer	
Percentage of Heat	100.00	%
Database Ref. No.	0	
Fuel Type	Mains gas	
SAP Code	102	
In Winter	89.50	
In Summer	82.00	
Model Name	GB	
Manufacturer	GB	
Controls SAP Code	2110	
Delayed Start Stat	Yes	
Burner Control	On/Off	
HETAS approved System	No	
Oil Pump Inside	No	
Flue Type	None or Unknown	
Fan Assisted Flue	No	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators	
Flow Temperature	Unknown	
Boiler Interlock	Yes	
Combi boiler type	No Combi	
25.0 Main Heating 2	None	
26.0 Heat Networks	None	
28.0 Water Heating		
Water Heating	Main Heating 1	
SAP Code	901	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	Yes	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
Summer Immersion	No	
Cold Water Source	From mains	
Bath Count	0	
Supplementary Immersion	No	
Immersion Only Heating Hot Water	No	

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
S1	Vented hot water system + pump	12.00		Yes	Instantaneous System 1
S2	Vented hot water system + pump	12.00		Yes	Instantaneous System 1

28.3 Waste Water Heat Recovery System Instantaneous System 1		
Database ID	80194	
Brand Model	Zypho, Slim DW50	
Details	Year: 2022 + current Efficiency: 44.7 Utilisation factor: 0.987	
29.0 Hot Water Cylinder	Hot Water Cylinder	

Summary for Input Data

Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	150.00	L
Loss	1.12	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	

31.0 Thermal Store None

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Property Reference	Unit 4	**Issued on Date**	04/05/2024
Assessment Reference	Unit 4 - Be Lean	**Prop Type Ref**	
Property			

SAP Rating	86 B	**DER**	11.78	**TER**	10.04
Environmental	91 B	**% DER < TER**			-17.33
CO_2 Emissions (t/year)	0.78	**DFEE**	33.99	**TFEE**	38.41
Compliance Check	See BREL	**% DFEE < TFEE**			11.52
% DPER < TPER	-28.26	**DPER**	67.09	**TPER**	52.31

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	47.5000 (1b)	x	2.5000 (2b)	=	118.7500	(1b) - (3b)
First floor	24.4000 (1c)	x	2.5000 (2c)	=	61.0000	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.9000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	179.7500	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery		
If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		79.2000 (23c)

Effective ac	0.2666	0.2634	0.2602	0.2442	0.2411	0.2251	0.2251	0.2219	0.2315	0.2411	0.2474	0.2538	(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)			11.9000	1.1450	13.6260			(27)
RL			7.4000	1.1450	8.4733			(27a)
Heatloss Floor 1			47.5000	0.1000	4.7500	75.0000	3562.5000	(28a)
External Wall 1	79.5000	11.9000	67.6000	0.1600	10.8160	70.0000	4732.0000	(29a)
FR	47.5000	7.4000	40.1000	0.1000	4.0100	9.0000	360.9000	(30)
Total net area of external elements Aum(A, m2)			174.5000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		41.6752			(33)
Party Wall 1			19.2500	0.0000	0.0000	45.0000	866.2500	(32)
Internal Wall 1			64.0000			9.0000	576.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10097.6500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		140.4402 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E5 Ground floor (normal)	13.1000	0.0480	0.6288	
E14 Flat roof	28.5000	0.1600	4.5600	
E16 Corner (normal)	15.0000	0.0350	0.5250	
E18 Party wall between dwellings	20.0000	0.0330	0.6600	
E1 Steel lintel with perforated steel base plate	7.0000	0.3020	2.1140	
E3 Sill	3.8000	0.0290	0.1102	
E4 Jamb	23.2000	0.0240	0.5568	
E6 Intermediate floor within a dwelling	20.1000	0.0010	0.0201	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.1749 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 50.8501 (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	15.8118	15.6227	15.4337	14.4883	14.2992	13.3539	13.3539	13.1648	13.7320	14.2992	14.6774	15.0555	(38)
Heat transfer coeff	66.6620	66.4729	66.2838	65.3384	65.1494	64.2040	64.2040	64.0149	64.5821	65.1494	65.5275	65.9057	(39)
Average = Sum(39)m / 12 =												65.2912	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9271	0.9245	0.9219	0.9087	0.9061	0.8930	0.8930	0.8903	0.8982	0.9061	0.9114	0.9166	(40)
HLP (average)												0.9081	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2914 (42)
Hot water usage for mixer showers

120.6657	118.8523	116.2099	111.1541	107.4230	103.2621	100.8971	103.5195	106.3942	110.8617	116.0261	120.2034	(42a)

Hot water usage for baths

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)

Hot water usage for other uses

38.0958	36.7105	35.3252	33.9399	32.5546	31.1693	31.1693	32.5546	33.9399	35.3252	36.7105	38.0958	(42c)

Average daily hot water use (litres/day) 145.8822 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	158.7615	155.5628	151.5350	145.0939	139.9776	134.4314	132.0664	136.0741	140.3341	146.1869	152.7366	158.2991	(44)
Energy conte	251.4393	221.5193	232.9037	198.6263	188.4367	165.2991	159.7228	168.4882	173.0460	198.3742	217.6013	247.8582	(45)
Energy content (annual)										Total = Sum(45)m =		2423.3152	
Distribution loss (46)m = 0.15 x (45)m	37.7159	33.2279	34.9356	29.7939	28.2655	24.7949	23.9584	25.2732	25.9569	29.7561	32.6402	37.1787	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.1200	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.6048	(55)
Total storage loss	18.7488	16.9344	18.7488	18.1440	18.7488	18.1440	18.7488	18.7488	18.1440	18.7488	18.1440	18.7488	(56)
If cylinder contains dedicated solar storage	18.7488	16.9344	18.7488	18.1440	18.7488	18.1440	18.7488	18.7488	18.1440	18.7488	18.1440	18.7488	(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	293.4505	259.4649	274.9149	239.2823	230.4479	205.9551	201.7340	210.4994	213.7020	240.3854	258.2573	289.8694	(62)
WWHRS	-68.9837	-61.0098	-63.8859	-52.9000	-49.3009	-42.1872	-39.5437	-42.0508	-43.6485	-51.4567	-58.2942	-67.7062	(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	224.4668	198.4552	211.0290	186.3823	181.1469	163.7679	162.1903	168.4486	170.0535	188.9287	199.9631	222.1632	(64)
										Total per year (kWh/year) = Sum(64)m =		2276.9955	(64)
12Total per year (kWh/year)												2277	(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	117.2125	104.0117	111.0495	98.5681	96.2642	87.4867	86.7168	89.6313	90.0626	99.5684	104.8772	116.0218	(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	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	101.7296	112.6292	101.7296	105.1206	101.7296	105.1206	101.7296	101.7296	105.1206	101.7296	105.1206	101.7296	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.6903	203.7832	198.5091	187.2812	173.1080	159.7873	150.8881	148.7952	154.0693	165.2972	179.4704	192.7912	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	(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)	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	(71)
Water heating gains (Table 5)	157.5437	154.7793	149.2600	136.9001	129.3873	121.5094	116.5548	120.4721	125.0869	133.8285	145.6628	155.9433	(72)
Total internal gains	521.3339	531.5619	509.8690	489.6722	464.5953	443.7875	426.5429	428.3673	441.6471	461.2256	490.6241	510.8344	(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	
Southeast	1.8000	36.7938	0.6300	0.7000	0.7700	20.2404	(77)
Southwest	10.1000	36.7938	0.6300	0.7000	0.7700	113.5712	(79)
Horizontal	7.4000	26.0000	0.6300	0.7000	1.0000	76.3636	(82)

Solar gains	210.1752	386.5319	593.8225	826.9745	996.7331	1017.0996	969.3691	840.7651	675.4454	445.7579	257.1985	176.1931	(83)
Total gains	731.5091	918.0939	1103.6915	1316.6467	1461.3283	1460.8872	1395.9120	1269.1324	1117.0925	906.9835	747.8225	687.0275	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	42.0765	42.1962	42.3166	42.9288	43.0534	43.6874	43.6874	43.8164	43.4316	43.0534	42.8050	42.5594	
alpha	3.8051	3.8131	3.8211	3.8619	3.8702	3.9125	3.9125	3.9211	3.8954	3.8702	3.8537	3.8373	
util living area	0.9200	0.8482	0.7346	0.5639	0.4065	0.2799	0.2021	0.2314	0.3921	0.6664	0.8641	0.9325	(86)
MIT	19.9291	20.2905	20.6337	20.8824	20.9708	20.9949	20.9989	20.9982	20.9815	20.8211	20.3533	19.8616	(87)
Th 2	20.1445	20.1467	20.1489	20.1601	20.1623	20.1735	20.1735	20.1757	20.1690	20.1623	20.1578	20.1534	(88)
util rest of house	0.9083	0.8295	0.7076	0.5311	0.3718	0.2442	0.1642	0.1902	0.3470	0.6270	0.8437	0.9224	(89)
MIT 2	18.9217	19.3597	19.7620	20.0457	20.1373	20.1700	20.1730	20.1748	20.1554	19.9917	19.4533	18.8456	(90)
Living area fraction									fLA = Living area / (4) =			0.3171	(91)
MIT	19.2412	19.6548	20.0384	20.3110	20.4016	20.4316	20.4349	20.4359	20.4173	20.2547	19.7387	19.1678	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.0912	19.5048	19.8884	20.1610	20.2516	20.2816	20.2849	20.2859	20.2673	20.1047	19.5887	19.0178	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8912	0.8138	0.6988	0.5311	0.3756	0.2489	0.1693	0.1957	0.3524	0.6241	0.8281	0.9059	(94)
Useful gains	651.9262	747.1035	771.2700	699.3191	548.8027	363.5785	236.3951	248.4199	393.6569	566.0925	619.2946	622.4009	(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	986.0085	970.8263	887.4361	735.7775	557.1328	364.7811	236.5845	248.7557	398.3004	619.2272	818.3535	976.5738	(97)
Space heating kWh	248.5572	150.3417	86.4276	26.2500	6.1975	0.0000	0.0000	0.0000	0.0000	39.5322	143.3224	263.5047	(98a)
Space heating requirement - total per year (kWh/year)												964.1334	
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	248.5572	150.3417	86.4276	26.2500	6.1975	0.0000	0.0000	0.0000	39.5322	143.3224	263.5047	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												964.1334	
Space heating per m2										(98c) / (4) =		13.4094	(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 %) 89.5000 (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	248.5572	150.3417	86.4276	26.2500	6.1975	0.0000	0.0000	0.0000	0.0000	39.5322	143.3224	263.5047	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	277.7175	167.9796	96.5671	29.3296	6.9246	0.0000	0.0000	0.0000	0.0000	44.1701	160.1368	294.4186	(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	224.4668	198.4552	211.0290	186.3823	181.1469	163.7679	162.1903	168.4486	170.0535	188.9287	199.9631	222.1632	(64)
Efficiency of water heater												82.0000	(216)
(217)m	85.7770	85.0728	84.0464	82.8572	82.2279	82.0000	82.0000	82.0000	82.0000	83.2065	84.9729	85.9058	(217)
Fuel for water heating, kWh/month	261.6864	233.2769	251.0864	224.9441	220.2985	199.7170	197.7930	205.4251	207.3823	227.0599	235.3257	258.6126	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	16.0541	14.5005	16.0541	15.5362	16.0541	15.5362	16.0541	16.0541	15.5362	16.0541	15.5362	16.0541	(231)
Lighting	19.7361	15.8330	14.2559	10.4445	8.0676	6.5913	7.3595	9.5662	12.4256	16.3030	18.4142	20.2846	(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 1077.2440 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 82.0000

Water heating fuel used 2722.6078 (219)

Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6750)

mechanical ventilation fans (SFP = 0.6750) 148.0241 (230a)

central heating pump 41.0000 (230c)

Total electricity for the above, kWh/year 189.0241 (231)

Electricity for lighting (calculated in Appendix L)	159.2814 (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	4148.1574 (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	1077.2440	0.2100	226.2212	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2722.6078	0.2100	571.7476	(264)
Space and water heating			797.9689	(265)
Pumps, fans and electric keep-hot	189.0241	0.1387	26.2200	(267)
Energy for lighting	159.2814	0.1443	22.9892	(268)
Total CO2, kg/year			847.1781	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.7800	(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	1077.2440	1.1300	1217.2858	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2722.6078	1.1300	3076.5468	(278)
Space and water heating			4293.8326	(279)
Pumps, fans and electric keep-hot	189.0241	1.5128	285.9557	(281)
Energy for lighting	159.2814	1.5338	244.3112	(282)
Total Primary energy kWh/year			4824.0995	(286)
Dwelling Primary energy Rate (DPER)			67.0900	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	47.5000 (1b)	x	2.5000 (2b)	=	118.7500	(1b) - (3b)
First floor	24.4000 (1c)	x	2.5000 (2c)	=	61.0000	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.9000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	179.7500	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1669 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4169 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3544 (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	0.4518	0.4430	0.4341	0.3898	0.3809	0.3366	0.3366	0.3278	0.3544	0.3809	0.3987	0.4164	(22b)
Effective ac	0.6021	0.5981	0.5942	0.5760	0.5726	0.5567	0.5567	0.5537	0.5628	0.5726	0.5795	0.5867	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K

	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opening Type (Uw = 1.20)			11.0900	1.1450	12.6985			(27)
RL			6.8900	1.5918	10.9672			(27a)
Heatloss Floor 1			47.5000	0.1300	6.1750			(28a)
External Wall 1	79.5000	11.0900	68.4100	0.1800	12.3138			(29a)
FR	47.5000	6.8900	40.6100	0.1100	4.4671			(30)
Total net area of external elements Aum(A, m2)			174.5000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.6216			(33)
Party Wall 1			19.2500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 140.4402 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	13.1000	0.1600	2.0960
E14 Flat roof	28.5000	0.0800	2.2800
E16 Corner (normal)	15.0000	0.0900	1.3500
E18 Party wall between dwellings	20.0000	0.0600	1.2000
E1 Steel lintel with perforated steel base plate	7.0000	0.0500	0.3500
E3 Sill	3.8000	0.0500	0.1900
E4 Jamb	23.2000	0.0500	1.1600
E6 Intermediate floor within a dwelling	20.1000	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.6260 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 55.2476 (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	35.7132	35.4781	35.2476	34.1652	33.9627	33.0200	33.0200	32.8454	33.3831	33.9627	34.3724	34.8007	(38)
Heat transfer coeff	90.9608	90.7257	90.4952	89.4128	89.2103	88.2676	88.2676	88.0930	88.6307	89.2103	89.6200	90.0483	(39)

Average = Sum(39)m / 12 = 89.4119

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2651	1.2618	1.2586	1.2436	1.2408	1.2276	1.2276	1.2252	1.2327	1.2408	1.2465	1.2524	(40)
HLP (average)												1.2436	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2914 (42)

Hot water usage for mixer showers

80.4438	79.2349	77.4733	74.1027	71.6153	68.8414	67.2647	69.0130	70.9295	73.9078	77.3508	80.1356	(42a)

Hot water usage for baths

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)

Hot water usage for other uses

38.0958	36.7105	35.3252	33.9399	32.5546	31.1693	31.1693	32.5546	33.9399	35.3252	36.7105	38.0958	(42c)

Average daily hot water use (litres/day) 108.7990 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	118.5396	115.9453	112.7984	108.0426	104.1699	100.0107	98.4340	101.5676	104.8693	109.2330	114.0612	118.2313	(44)
Energy conte	187.7377	165.1046	173.3670	147.9049	140.2327	122.9748	119.0474	125.7619	129.3144	148.2281	162.5011	185.1217	(45)
Energy content (annual)										Total = Sum(45)m =		1807.2963	
Distribution loss (46)m = 0.15 x (45)m	28.1607	24.7657	26.0050	22.1857	21.0349	18.4462	17.8571	18.8643	19.3972	22.2342	24.3752	27.7683	(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	234.3326	207.1903	219.9619	192.9967	186.8276	168.0666	165.6423	172.3568	174.4062	194.8230	207.5930	231.7166	(62)
WWHRS	-36.7755	-32.5246	-34.0579	-28.2013	-26.2826	-22.4902	-21.0810	-22.4175	-23.2692	-27.4318	-31.0769	-36.0945	(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	197.5570	174.6658	185.9040	164.7954	160.5450	145.5765	144.5613	149.9393	151.1370	167.3912	176.5160	195.6221	(64)
									Total per year (kWh/year) = Sum(64)m =			2014.2107	(64)
12Total per year (kWh/year)												2014	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	99.6987	88.5659	94.9204	85.2518	83.9033	76.9626	76.8592	79.0917	79.0705	86.5618	90.1051	98.8289	(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	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	101.7296	112.6292	101.7296	105.1206	101.7296	105.1206	101.7296	101.7296	105.1206	101.7296	105.1206	101.7296	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.6903	203.7832	198.5091	187.2812	173.1080	159.7873	150.8881	148.7952	154.0693	165.2972	179.4704	192.7912	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	(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)	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	(71)
Water heating gains (Table 5)	134.0036	131.7944	127.5812	118.4053	112.7732	106.8925	103.3053	106.3061	109.8201	116.3465	125.1460	132.8345	(72)
Total internal gains	497.7938	508.5771	488.1903	471.1775	447.9812	429.1706	413.2934	414.2012	426.3803	443.7436	470.1072	487.7256	(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	
Southeast	1.6800	36.7938	0.6300	0.7000	0.7700	18.8911	(77)
Southwest	9.4100	36.7938	0.6300	0.7000	0.7700	105.8124	(79)
Horizontal	6.8900	26.0000	0.6300	0.7000	1.0000	71.1007	(82)

Solar gains	195.8041	360.0867	553.1625	770.3094	928.4079	947.3682	902.9140	783.1439	629.1821	415.2513	239.6091	164.1476	(83)
Total gains	693.5979	868.6638	1041.3527	1241.4869	1376.3891	1376.5388	1316.2074	1197.3451	1055.5624	858.9949	709.7163	651.8732	(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	30.8364	30.9163	30.9950	31.3703	31.4415	31.7773	31.7773	31.8402	31.6471	31.4415	31.2977	31.1489	
alpha	3.0558	3.0611	3.0663	3.0914	3.0961	3.1185	3.1185	3.1227	3.1098	3.0961	3.0865	3.0766	
util living area	0.9483	0.9060	0.8333	0.7014	0.5456	0.3949	0.2904	0.3308	0.5294	0.7842	0.9158	0.9559	(86)
MIT	19.0963	19.5097	20.0159	20.5306	20.8250	20.9525	20.9863	20.9794	20.8825	20.4344	19.6764	19.0267	(87)
Th 2	19.8683	19.8709	19.8734	19.8853	19.8875	19.8979	19.8979	19.8999	19.8939	19.8875	19.8830	19.8783	(88)
util rest of house	0.9390	0.8904	0.8075	0.6613	0.4928	0.3319	0.2196	0.2547	0.4585	0.7421	0.8989	0.9478	(89)
MIT 2	17.6991	18.2108	18.8241	19.4252	19.7388	19.8671	19.8921	19.8904	19.8093	19.3419	18.4359	17.6187	(90)
Living area fraction									fLA = Living area / (4) =			0.3171	(91)
MIT	18.1421	18.6227	19.2020	19.7757	20.0833	20.2113	20.2391	20.2357	20.1496	19.6883	18.8293	18.0652	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1421	18.6227	19.2020	19.7757	20.0833	20.2113	20.2391	20.2357	20.1496	19.6883	18.8293	18.0652	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9203	0.8692	0.7900	0.6570	0.5025	0.3502	0.2418	0.2783	0.4755	0.7336	0.8791	0.9304	(94)
Useful gains	638.3000	755.0837	822.6358	815.6903	691.5796	482.0107	318.2157	333.2063	501.9667	630.1660	623.8965	606.4786	(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	1259.0915	1245.0002	1149.4708	972.4271	747.8732	495.2936	321.2108	337.8993	536.1803	810.7723	1051.1804	1248.5372	(97)
Space heating kWh	461.8689	329.2239	243.1652	112.8505	41.8825	0.0000	0.0000	0.0000	0.0000	134.3711	307.6444	477.6916	(98a)
Space heating requirement - total per year (kWh/year)												2108.6980	
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	461.8689	329.2239	243.1652	112.8505	41.8825	0.0000	0.0000	0.0000	0.0000	134.3711	307.6444	477.6916	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2108.6980	
Space heating per m2											(98c) / (4) =	29.3282	(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	461.8689	329.2239	243.1652	112.8505	41.8825	0.0000	0.0000	0.0000	0.0000	134.3711	307.6444	477.6916	(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)	500.3997	356.6889	263.4509	122.2649	45.3764	0.0000	0.0000	0.0000	0.0000	145.5808	333.3092	517.5424	(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	197.5570	174.6658	185.9040	164.7954	160.5450	145.5765	144.5613	149.9393	151.1370	167.3912	176.5160	195.6221	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.8977	85.4590	84.6629	83.2286	81.5092	79.8000	79.8000	79.8000	79.8000	83.5716	85.2929	85.9826	(217)
Fuel for water heating, kWh/month	229.9912	204.3853	219.5814	198.0034	196.9655	182.4266	181.1545	187.8939	189.3948	200.2967	206.9528	227.5136	(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	21.1374	16.9572	15.2681	11.1861	8.6404	7.0593	7.8821	10.2454	13.3078	17.4606	19.7217	21.7249	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-41.5965	-57.2485	-80.3746	-88.2259	-93.3998	-86.5904	-85.5198	-81.5612	-74.3404	-64.4376	-45.2324	-36.1291	(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	-27.9529	-58.2261	-114.6789	-170.7455	-224.3441	-224.8829	-222.2274	-188.7984	-139.2473	-82.7495	-37.1495	-22.1477	(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	2284.6133	(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	2424.5596	(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)	170.5909	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2347.8065	(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	2617.9573	(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	2284.6133	0.2100	479.7688	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2424.5596	0.2100	509.1575	(264)
Space and water heating			988.9263	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	170.5909	0.1443	24.6215	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-834.6562	0.1351	-112.7530	
PV Unit electricity exported	-1513.1504	0.1262	-190.8938	
Total			-303.6467	(269)
Total CO2, kg/year			721.8304	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.0400	(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	2284.6133	1.1300	2581.6130	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2424.5596	1.1300	2739.7524	(278)
Space and water heating			5321.3653	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	170.5909	1.5338	261.6580	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-834.6562	1.4993	-1251.3951	
PV Unit electricity exported	-1513.1504	0.4631	-700.7297	
Total			-1952.1247	(283)
Total Primary energy kWh/year			3760.9994	(286)
Target Primary Energy Rate (TPER)			52.3100	(287)

Full SAP Calculation Printout

Property Reference	Unit 4	**Issued on Date**	04/05/2024
Assessment Reference	Unit 4 - Be Lean	**Prop Type Ref**	
Property			

SAP Rating	86 B	**DER**	11.78	**TER**	10.04
Environmental	91 B	**% DER < TER**			-17.33
CO_2 Emissions (t/year)	0.78	**DFEE**	33.99	**TFEE**	38.41
Compliance Check	See BREL	**% DFEE < TFEE**			11.52
% DPER < TPER	-28.26	**DPER**	67.09	**TPER**	52.31

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	47.5000 (1b)	x	2.5000 (2b)	=	118.7500	(1b) - (3b)
First floor	24.4000 (1c)	x	2.5000 (2c)	=	61.0000	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.9000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	179.7500	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1669	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.3169	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2694	(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	0.3434	0.3367	0.3300	0.2963	0.2896	0.2559	0.2559	0.2492	0.2694	0.2896	0.3030	0.3165	(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	0.5590	0.5567	0.5544	0.5439	0.5419	0.5327	0.5327	0.5310	0.5363	0.5419	0.5459	0.5501	(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)			11.9000	1.1450	13.6260			(27)
RL			7.4000	1.1450	8.4733			(27a)
Heatloss Floor 1			47.5000	0.1000	4.7500	75.0000	3562.5000	(28a)
External Wall 1	79.5000	11.9000	67.6000	0.1600	10.8160	70.0000	4732.0000	(29a)
FR	47.5000	7.4000	40.1000	0.1000	4.0100	9.0000	360.9000	(30)
Total net area of external elements Aum(A, m2)			174.5000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		41.6752			(33)
Party Wall 1			19.2500	0.0000	0.0000	45.0000	866.2500	(32)
Internal Wall 1			64.0000			9.0000	576.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10097.6500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		140.4402 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	13.1000	0.0480	0.6288
E14 Flat roof	28.5000	0.1600	4.5600
E16 Corner (normal)	15.0000	0.0350	0.5250

E18 Party wall between dwellings	20.0000	0.0330	0.6600	
E1 Steel lintel with perforated steel base plate	7.0000	0.3020	2.1140	
E3 Sill	3.8000	0.0290	0.1102	
E4 Jamb	23.2000	0.0240	0.5568	
E6 Intermediate floor within a dwelling	20.1000	0.0010	0.0201	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.1749 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 50.8501 (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	33.1570	33.0212	32.8880	32.2626	32.1456	31.6009	31.6009	31.5000	31.8107	32.1456	32.3823	32.6298	(38)
Heat transfer coeff	84.0071	83.8713	83.7381	83.1127	82.9957	82.4510	82.4510	82.3501	82.6608	82.9957	83.2324	83.4799	(39)

Average = Sum(39)m / 12 = 83.1122

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1684	1.1665	1.1646	1.1559	1.1543	1.1467	1.1467	1.1453	1.1497	1.1543	1.1576	1.1611	(40)
HLP (average)												1.1559	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2914 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

27.0597	26.6578	26.0919	25.0484	24.2671	23.4007	22.9327	23.4947	24.1066	25.0336	26.0986	26.9682	(42b)

Hot water usage for other uses

38.0958	36.7105	35.3252	33.9399	32.5546	31.1693	31.1693	32.5546	33.9399	35.3252	36.7105	38.0958	(42c)

Average daily hot water use (litres/day) 59.7211 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	65.1554	63.3683	61.4170	58.9883	56.8216	54.5700	54.1020	56.0493	58.0464	60.3588	62.8090	65.0640	(44)
Energy conte	103.1903	90.2356	94.3957	80.7520	76.4929	67.1001	65.4317	69.4007	71.5771	81.9063	89.4830	101.8744	(45)

Energy content (annual) Total = Sum(45)m = 991.8397

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

87.7117	76.7002	80.2363	68.6392	65.0189	57.0351	55.6169	58.9906	60.8405	69.6204	76.0605	86.5933	(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

87.7117	76.7002	80.2363	68.6392	65.0189	57.0351	55.6169	58.9906	60.8405	69.6204	76.0605	86.5933	(64)

Total per year (kWh/year) = Sum(64)m = 843.0638 (64)

12Total per year (kWh/year) 843 (64)

Electric shower(s)

50.1627	44.6954	48.8057	46.5746	47.4486	45.2614	46.7701	47.4486	46.5746	48.8057	47.8879	50.1627	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 570.5979 (64a)

Heat gains from water heating, kWh/month

34.4686	30.3489	32.2605	28.8035	28.1169	25.5741	25.5967	26.6098	26.8538	29.6065	30.9871	34.1890	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	101.7296	112.6292	101.7296	105.1206	101.7296	105.1206	101.7296	101.7296	105.1206	101.7296	105.1206	101.7296	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.6903	203.7832	198.5091	187.2812	173.1080	159.7873	150.8881	148.7952	154.0693	165.2972	179.4704	192.7912	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	(71)
Water heating gains (Table 5)	46.3288	45.1621	43.3609	40.0048	37.7915	35.5196	34.4042	35.7659	37.2969	39.7937	43.0377	45.9529	(72)
Total internal gains	407.1190	418.9447	400.9699	389.7769	369.9995	357.7977	344.3923	343.6610	353.8571	364.1908	384.9989	397.8440	(73)

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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	
Southeast	1.8000	36.7938	0.6300	0.7000	0.7700	20.2404	(77)
Southwest	10.1000	36.7938	0.6300	0.7000	0.7700	113.5712	(79)
Horizontal	7.4000	26.0000	0.6300	0.7000	1.0000	76.3636	(82)

Solar gains	210.1752	386.5319	593.8225	826.9745	996.7331	1017.0996	969.3691	840.7651	675.4454	445.7579	257.1985	176.1931	(83)
Total gains	617.2941	805.4767	994.7924	1216.7514	1366.7325	1374.8974	1313.7614	1184.4261	1029.3025	809.9487	642.1974	574.0371	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	33.3889	33.4429	33.4961	33.7482	33.7957	34.0190	34.0190	34.0607	33.9327	33.7957	33.6996	33.5997	
alpha	3.2259	3.2295	3.2331	3.2499	3.2530	3.2679	3.2679	3.2707	3.2622	3.2530	3.2466	3.2400	
util living area	0.9591	0.9143	0.8335	0.6874	0.5227	0.3733	0.2731	0.3146	0.5149	0.7886	0.9283	0.9666	(86)
MIT	19.1596	19.6060	20.1253	20.6146	20.8692	20.9670	20.9910	20.9857	20.9080	20.4886	19.7234	19.0723	(87)
Th 2	19.9454	19.9469	19.9484	19.9554	19.9567	19.9628	19.9628	19.9640	19.9605	19.9567	19.9541	19.9513	(88)
util rest of house	0.9517	0.9002	0.8088	0.6486	0.4735	0.3162	0.2100	0.2458	0.4484	0.7485	0.9139	0.9604	(89)
MIT 2	18.2957	18.7277	19.2177	19.6602	19.8697	19.9459	19.9597	19.9587	19.9083	19.5687	18.8546	18.2146	(90)
Living area fraction										fLA = Living area / (4) =		0.3171	(91)
MIT	18.5697	19.0062	19.5055	19.9629	20.1866	20.2697	20.2868	20.2844	20.2253	19.8604	19.1301	18.4866	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5697	19.0062	19.5055	19.9629	20.1866	20.2697	20.2868	20.2844	20.2253	19.8604	19.1301	18.4866	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9393	0.8852	0.7971	0.6489	0.4846	0.3333	0.2299	0.2673	0.4659	0.7444	0.9000	0.9492	(94)
Useful gains	579.8346	713.0118	792.9509	789.5905	662.3404	458.2967	302.0186	316.6407	479.6016	602.9607	578.0046	544.8676	(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	1198.7540	1183.1068	1089.0579	919.4643	704.3545	467.4713	303.9776	319.8797	506.3250	768.5751	1001.2982	1192.6454	(97)
Space heating kWh	460.4761	315.9039	220.3037	93.5092	31.2584	0.0000	0.0000	0.0000	0.0000	123.2171	304.7714	481.9467	(98a)
Space heating requirement - total per year (kWh/year)												2031.3864	
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	460.4761	315.9039	220.3037	93.5092	31.2584	0.0000	0.0000	0.0000	0.0000	123.2171	304.7714	481.9467	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2031.3864	
Space heating per m2											(98c) / (4) =	28.2529	(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	775.0396	610.1375	625.8611	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9375	0.9619	0.9475	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	726.6051	586.8865	593.0234	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1469.4199	1405.4046	1272.0778	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	534.8266	608.9775	505.2164	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	133.7067	152.2444	126.3041	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												412.2551	(107)
Energy for space heating												28.2529	(99)
Energy for space cooling												5.7337	(108)
Total												33.9867	(109)
Fabric Energy Efficiency (DFEE)												34.0	(109)

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

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		47.5000 (1b)	x	2.5000 (2b)	=	118.7500 (1b) - (3b)	
First floor		24.4000 (1c)	x	2.5000 (2c)	=	61.0000 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.9000					(4)	
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	179.7500	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1669	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	

Measured/design AP50												5.0000	(17)
Infiltration rate												0.4169	(18)
Number of sides sheltered												2	(19)
Shelter factor								(20) = 1 - [0.075 x (19)] =				0.8500	(20)
Infiltration rate adjusted to include shelter factor								(21) = (18) x (20) =				0.3544	(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	0.4518	0.4430	0.4341	0.3898	0.3809	0.3366	0.3366	0.3278	0.3544	0.3809	0.3987	0.4164	(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	0.6021	0.5981	0.5942	0.5760	0.5726	0.5567	0.5567	0.5537	0.5628	0.5726	0.5795	0.5867	(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 Opening Type (Uw = 1.20)			11.0900	1.1450	12.6985			(27)
RL			6.8900	1.5918	10.9672			(27a)
Heatloss Floor 1			47.5000	0.1300	6.1750			(28a)
External Wall 1	79.5000	11.0900	68.4100	0.1800	12.3138			(29a)
FR	47.5000	6.8900	40.6100	0.1100	4.4671			(30)
Total net area of external elements Aum(A, m2)			174.5000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.6216			(33)
Party Wall 1			19.2500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	140.4402	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	13.1000	0.1600	2.0960
E14 Flat roof	28.5000	0.0800	2.2800
E16 Corner (normal)	15.0000	0.0900	1.3500
E18 Party wall between dwellings	20.0000	0.0600	1.2000
E1 Steel lintel with perforated steel base plate	7.0000	0.0500	0.3500
E3 Sill	3.8000	0.0500	0.1900
E4 Jamb	23.2000	0.0500	1.1600
E6 Intermediate floor within a dwelling	20.1000	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	8.6260	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	55.2476	(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	35.7132	35.4781	35.2476	34.1652	33.9627	33.0200	33.0200	32.8454	33.3831	33.9627	34.3724	34.8007	(38)
Heat transfer coeff	90.9608	90.7257	90.4952	89.4128	89.2103	88.2676	88.2676	88.0930	88.6307	89.2103	89.6200	90.0483	(39)
Average = Sum(39)m / 12 =												89.4119	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2651	1.2618	1.2586	1.2436	1.2408	1.2276	1.2276	1.2252	1.2327	1.2408	1.2465	1.2524	(40)
HLP (average)												1.2436	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2914	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	27.0597	26.6578	26.0919	25.0484	24.2671	23.4007	22.9327	23.4947	24.1066	25.0336	26.0986	26.9682	(42b)
Hot water usage for other uses	38.0958	36.7105	35.3252	33.9399	32.5546	31.1693	31.1693	32.5546	33.9399	35.3252	36.7105	38.0958	(42c)
Average daily hot water use (litres/day)												59.7211	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	65.1554	63.3683	61.4170	58.9883	56.8216	54.5700	54.1020	56.0493	58.0464	60.3588	62.8090	65.0640	(44)
Energy conte	103.1903	90.2356	94.3957	80.7520	76.4929	67.1001	65.4317	69.4007	71.5771	81.9063	89.4830	101.8744	(45)
Energy content (annual)										Total = Sum(45)m =		991.8397	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	87.7117	76.7002	80.2363	68.6392	65.0189	57.0351	55.6169	58.9906	60.8405	69.6204	76.0605	86.5933	(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	87.7117	76.7002	80.2363	68.6392	65.0189	57.0351	55.6169	58.9906	60.8405	69.6204	76.0605	86.5933	(64)
										Total per year (kWh/year) = Sum(64)m =		843.0638	(64)
12Total per year (kWh/year)												843	(64)
Electric shower(s)	50.1627	44.6954	48.8057	46.5746	47.4486	45.2614	46.7701	47.4486	46.5746	48.8057	47.8879	50.1627	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		570.5979	(64a)
Heat gains from water heating, kWh/month	34.4686	30.3489	32.2605	28.8035	28.1169	25.5741	25.5967	26.6098	26.8538	29.6065	30.9871	34.1890	(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	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	101.7296	112.6292	101.7296	105.1206	101.7296	105.1206	101.7296	101.7296	105.1206	101.7296	105.1206	101.7296	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	201.6903	203.7832	198.5091	187.2812	173.1080	159.7873	150.8881	148.7952	154.0693	165.2972	179.4704	192.7912	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	(71)
Water heating gains (Table 5)													
	46.3288	45.1621	43.3609	40.0048	37.7915	35.5196	34.4042	35.7659	37.2969	39.7937	43.0377	45.9529	(72)
Total internal gains													
	407.1190	418.9447	400.9699	389.7769	369.9995	357.7977	344.3923	343.6610	353.8571	364.1908	384.9989	397.8440	(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	
Southeast	1.6800	36.7938	0.6300	0.7000	0.7700	18.8911	(77)
Southwest	9.4100	36.7938	0.6300	0.7000	0.7700	105.8124	(79)
Horizontal	6.8900	26.0000	0.6300	0.7000	1.0000	71.1007	(82)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	195.8041	360.0867	553.1625	770.3094	928.4079	947.3682	902.9140	783.1439	629.1821	415.2513	239.6091	164.1476	(83)
Total gains	602.9231	779.0314	954.1324	1160.0863	1298.4074	1305.1659	1247.3063	1126.8048	983.0392	779.4421	624.6080	561.9916	(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	30.8364	30.9163	30.9950	31.3703	31.4415	31.7773	31.7773	31.8402	31.6471	31.4415	31.2977	31.1489	
alpha	3.0558	3.0611	3.0663	3.0914	3.0961	3.1185	3.1185	3.1227	3.1098	3.0961	3.0865	3.0766	
util living area													
	0.9633	0.9261	0.8586	0.7286	0.5704	0.4142	0.3057	0.3500	0.5595	0.8172	0.9370	0.9696	(86)
MIT	18.9262	19.3647	19.9084	20.4739	20.8018	20.9457	20.9842	20.9759	20.8627	20.3530	19.5328	18.8532	(87)
Th 2	19.8683	19.8709	19.8734	19.8853	19.8875	19.8979	19.8979	19.8999	19.8939	19.8875	19.8830	19.8783	(88)
util rest of house													
	0.9564	0.9131	0.8353	0.6895	0.5168	0.3488	0.2315	0.2701	0.4868	0.7784	0.9237	0.9638	(89)
MIT 2	18.0127	18.4398	18.9584	19.4800	19.7552	19.8703	19.8926	19.8911	19.8159	19.3940	18.6197	17.9483	(90)
Living area fraction									fLA = Living area / (4) =			0.3171	(91)
MIT	18.3024	18.7331	19.2596	19.7952	20.0871	20.2113	20.2387	20.2351	20.1479	19.6981	18.9092	18.2353	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3024	18.7331	19.2596	19.7952	20.0871	20.2113	20.2387	20.2351	20.1479	19.6981	18.9092	18.2353	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9437	0.8970	0.8207	0.6861	0.5268	0.3678	0.2547	0.2949	0.5043	0.7709	0.9090	0.9524	(94)
Useful gains	568.9835	698.8275	783.0536	795.9847	683.9560	480.0392	317.7032	332.3053	495.7226	600.9063	567.7441	535.2193	(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													
	1273.6680	1255.0132	1154.6861	974.1686	748.2175	495.2958	321.1834	337.8437	536.0271	811.6476	1058.3433	1263.8518	(97)
Space heating kWh													
	524.2853	373.7568	276.4946	128.2924	47.8106	0.0000	0.0000	0.0000	0.0000	156.7915	353.2314	542.1025	(98a)
Space heating requirement - total per year (kWh/year)												2402.7652	
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													
	524.2853	373.7568	276.4946	128.2924	47.8106	0.0000	0.0000	0.0000	0.0000	156.7915	353.2314	542.1025	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2402.7652	
Space heating per m2										(98c) / (4) =		33.4182	(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	829.7153	653.1801	669.5068	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9091	0.9419	0.9229	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	754.2941	615.2299	617.9048	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1394.7505	1334.1889	1210.0936	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	461.1286	534.9055	440.5885	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	115.2822	133.7264	110.1471	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												359.1557	(107)
Energy for space heating												33.4182	(99)
Energy for space cooling												4.9952	(108)
Total												38.4134	(109)
Fabric Energy Efficiency (TFEE)												38.4	(109)

Full SAP Calculation Printout

Property Reference	Unit 4	**Issued on Date**	04/05/2024
Assessment Reference	Unit 4 - Be Lean	**Prop Type Ref**	
Property			

SAP Rating	86 B	**DER**	11.78	**TER**	10.04
Environmental	91 B	**% DER < TER**			-17.33
CO_2 Emissions (t/year)	0.78	**DFEE**	33.99	**TFEE**	38.41
Compliance Check	See BREL	**% DFEE < TFEE**			11.52
% DPER < TPER	-28.26	**DPER**	67.09	**TPER**	52.31

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	47.5000 (1b)	x	2.5000 (2b)	=	118.7500	(1b) - (3b)
First floor	24.4000 (1c)	x	2.5000 (2c)	=	61.0000	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.9000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	179.7500	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery		
If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		79.2000 (23c)

Effective ac	0.2666	0.2634	0.2602	0.2442	0.2411	0.2251	0.2251	0.2219	0.2315	0.2411	0.2474	0.2538	(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)			11.9000	1.1450	13.6260			(27)
RL			7.4000	1.1450	8.4733			(27a)
Heatloss Floor 1			47.5000	0.1000	4.7500	75.0000	3562.5000	(28a)
External Wall 1	79.5000	11.9000	67.6000	0.1600	10.8160	70.0000	4732.0000	(29a)
FR	47.5000	7.4000	40.1000	0.1000	4.0100	9.0000	360.9000	(30)
Total net area of external elements Aum(A, m2)			174.5000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		41.6752			(33)
Party Wall 1			19.2500	0.0000	0.0000	45.0000	866.2500	(32)
Internal Wall 1			64.0000			9.0000	576.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10097.6500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		140.4402 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E5 Ground floor (normal)	13.1000	0.0480	0.6288	
E14 Flat roof	28.5000	0.1600	4.5600	
E16 Corner (normal)	15.0000	0.0350	0.5250	
E18 Party wall between dwellings	20.0000	0.0330	0.6600	
E1 Steel lintel with perforated steel base plate	7.0000	0.3020	2.1140	
E3 Sill	3.8000	0.0290	0.1102	
E4 Jamb	23.2000	0.0240	0.5568	
E6 Intermediate floor within a dwelling	20.1000	0.0010	0.0201	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.1749 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 50.8501 (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	15.8118	15.6227	15.4337	14.4883	14.2992	13.3539	13.3539	13.1648	13.7320	14.2992	14.6774	15.0555	(38)
Heat transfer coeff	66.6620	66.4729	66.2838	65.3384	65.1494	64.2040	64.2040	64.0149	64.5821	65.1494	65.5275	65.9057	(39)
Average = Sum(39)m / 12 =												65.2912	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9271	0.9245	0.9219	0.9087	0.9061	0.8930	0.8930	0.8903	0.8982	0.9061	0.9114	0.9166	(40)
HLP (average)												0.9081	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2914 (42)
Hot water usage for mixer showers

120.6657	118.8523	116.2099	111.1541	107.4230	103.2621	100.8971	103.5195	106.3942	110.8617	116.0261	120.2034	(42a)

Hot water usage for baths

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)

Hot water usage for other uses

38.0958	36.7105	35.3252	33.9399	32.5546	31.1693	31.1693	32.5546	33.9399	35.3252	36.7105	38.0958	(42c)

Average daily hot water use (litres/day) 145.8822 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	158.7615	155.5628	151.5350	145.0939	139.9776	134.4314	132.0664	136.0741	140.3341	146.1869	152.7366	158.2991	(44)
Energy conte	251.4393	221.5193	232.9037	198.6263	188.4367	165.2991	159.7228	168.4882	173.0460	198.3742	217.6013	247.8582	(45)
Energy content (annual)										Total = Sum(45)m =		2423.3152	
Distribution loss (46)m = 0.15 x (45)m	37.7159	33.2279	34.9356	29.7939	28.2655	24.7949	23.9584	25.2732	25.9569	29.7561	32.6402	37.1787	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.1200	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.6048	(55)
Total storage loss	18.7488	16.9344	18.7488	18.1440	18.7488	18.1440	18.7488	18.7488	18.1440	18.7488	18.1440	18.7488	(56)
If cylinder contains dedicated solar storage	18.7488	16.9344	18.7488	18.1440	18.7488	18.1440	18.7488	18.7488	18.1440	18.7488	18.1440	18.7488	(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	293.4505	259.4649	274.9149	239.2823	230.4479	205.9551	201.7340	210.4994	213.7020	240.3854	258.2573	289.8694	(62)
WWHRS	-68.9837	-61.0098	-63.8859	-52.9000	-49.3009	-42.1872	-39.5437	-42.0508	-43.6485	-51.4567	-58.2942	-67.7062	(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	224.4668	198.4552	211.0290	186.3823	181.1469	163.7679	162.1903	168.4486	170.0535	188.9287	199.9631	222.1632	(64)
										Total per year (kWh/year) = Sum(64)m =		2276.9955	(64)
12Total per year (kWh/year)												2277	(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	117.2125	104.0117	111.0495	98.5681	96.2642	87.4867	86.7168	89.6313	90.0626	99.5684	104.8772	116.0218	(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	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	101.7296	112.6292	101.7296	105.1206	101.7296	105.1206	101.7296	101.7296	105.1206	101.7296	105.1206	101.7296	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.6903	203.7832	198.5091	187.2812	173.1080	159.7873	150.8881	148.7952	154.0693	165.2972	179.4704	192.7912	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	(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)	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	(71)
Water heating gains (Table 5)	157.5437	154.7793	149.2600	136.9001	129.3873	121.5094	116.5548	120.4721	125.0869	133.8285	145.6628	155.9433	(72)
Total internal gains	521.3339	531.5619	509.8690	489.6722	464.5953	443.7875	426.5429	428.3673	441.6471	461.2256	490.6241	510.8344	(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	
Southeast	1.8000	36.7938	0.6300	0.7000	0.7700	20.2404	(77)
Southwest	10.1000	36.7938	0.6300	0.7000	0.7700	113.5712	(79)
Horizontal	7.4000	26.0000	0.6300	0.7000	1.0000	76.3636	(82)

Solar gains	210.1752	386.5319	593.8225	826.9745	996.7331	1017.0996	969.3691	840.7651	675.4454	445.7579	257.1985	176.1931	(83)
Total gains	731.5091	918.0939	1103.6915	1316.6467	1461.3283	1460.8872	1395.9120	1269.1324	1117.0925	906.9835	747.8225	687.0275	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	42.0765	42.1962	42.3166	42.9288	43.0534	43.6874	43.6874	43.8164	43.4316	43.0534	42.8050	42.5594	
alpha	3.8051	3.8131	3.8211	3.8619	3.8702	3.9125	3.9125	3.9211	3.8954	3.8702	3.8537	3.8373	
util living area	0.9200	0.8482	0.7346	0.5639	0.4065	0.2799	0.2021	0.2314	0.3921	0.6664	0.8641	0.9325	(86)
MIT	19.9291	20.2905	20.6337	20.8824	20.9708	20.9949	20.9989	20.9982	20.9815	20.8211	20.3533	19.8616	(87)
Th 2	20.1445	20.1467	20.1489	20.1601	20.1623	20.1735	20.1735	20.1757	20.1690	20.1623	20.1578	20.1534	(88)
util rest of house	0.9083	0.8295	0.7076	0.5311	0.3718	0.2442	0.1642	0.1902	0.3470	0.6270	0.8437	0.9224	(89)
MIT 2	18.9217	19.3597	19.7620	20.0457	20.1373	20.1700	20.1730	20.1748	20.1554	19.9917	19.4533	18.8456	(90)
Living area fraction									fLA = Living area / (4) =			0.3171	(91)
MIT	19.2412	19.6548	20.0384	20.3110	20.4016	20.4316	20.4349	20.4359	20.4173	20.2547	19.7387	19.1678	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.0912	19.5048	19.8884	20.1610	20.2516	20.2816	20.2849	20.2859	20.2673	20.1047	19.5887	19.0178	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8912	0.8138	0.6988	0.5311	0.3756	0.2489	0.1693	0.1957	0.3524	0.6241	0.8281	0.9059	(94)
Useful gains	651.9262	747.1035	771.2700	699.3191	548.8027	363.5785	236.3951	248.4199	393.6569	566.0925	619.2946	622.4009	(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	986.0085	970.8263	887.4361	735.7775	557.1328	364.7811	236.5845	248.7557	398.3004	619.2272	818.3535	976.5738	(97)
Space heating kWh	248.5572	150.3417	86.4276	26.2500	6.1975	0.0000	0.0000	0.0000	0.0000	39.5322	143.3224	263.5047	(98a)
Space heating requirement - total per year (kWh/year)												964.1334	
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	248.5572	150.3417	86.4276	26.2500	6.1975	0.0000	0.0000	0.0000	39.5322	143.3224	263.5047	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												964.1334	
Space heating per m2										(98c) / (4) =		13.4094	(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 %) 89.5000 (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	248.5572	150.3417	86.4276	26.2500	6.1975	0.0000	0.0000	0.0000	0.0000	39.5322	143.3224	263.5047	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	277.7175	167.9796	96.5671	29.3296	6.9246	0.0000	0.0000	0.0000	0.0000	44.1701	160.1368	294.4186	(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	224.4668	198.4552	211.0290	186.3823	181.1469	163.7679	162.1903	168.4486	170.0535	188.9287	199.9631	222.1632	(64)
Efficiency of water heater												82.0000	(216)
(217)m	85.7770	85.0728	84.0464	82.8572	82.2279	82.0000	82.0000	82.0000	82.0000	83.2065	84.9729	85.9058	(217)
Fuel for water heating, kWh/month	261.6864	233.2769	251.0864	224.9441	220.2985	199.7170	197.7930	205.4251	207.3823	227.0599	235.3257	258.6126	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	16.0541	14.5005	16.0541	15.5362	16.0541	15.5362	16.0541	16.0541	15.5362	16.0541	15.5362	16.0541	(231)
Lighting	19.7361	15.8330	14.2559	10.4445	8.0676	6.5913	7.3595	9.5662	12.4256	16.3030	18.4142	20.2846	(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 1077.2440 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 82.0000

Water heating fuel used 2722.6078 (219)

Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6750)

mechanical ventilation fans (SFP = 0.6750) 148.0241 (230a)

central heating pump 41.0000 (230c)

Total electricity for the above, kWh/year 189.0241 (231)

Electricity for lighting (calculated in Appendix L)	159.2814 (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	4148.1574 (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	1077.2440	0.2100	226.2212	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2722.6078	0.2100	571.7476	(264)
Space and water heating			797.9689	(265)
Pumps, fans and electric keep-hot	189.0241	0.1387	26.2200	(267)
Energy for lighting	159.2814	0.1443	22.9892	(268)
Total CO2, kg/year			847.1781	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.7800	(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	1077.2440	1.1300	1217.2858	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2722.6078	1.1300	3076.5468	(278)
Space and water heating			4293.8326	(279)
Pumps, fans and electric keep-hot	189.0241	1.5128	285.9557	(281)
Energy for lighting	159.2814	1.5338	244.3112	(282)
Total Primary energy kWh/year			4824.0995	(286)
Dwelling Primary energy Rate (DPER)			67.0900	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	47.5000 (1b)	x	2.5000 (2b)	=	118.7500	(1b) - (3b)
First floor	24.4000 (1c)	x	2.5000 (2c)	=	61.0000	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.9000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	179.7500	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1669 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4169 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3544 (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	0.4518	0.4430	0.4341	0.3898	0.3809	0.3366	0.3366	0.3278	0.3544	0.3809	0.3987	0.4164	(22b)
Effective ac	0.6021	0.5981	0.5942	0.5760	0.5726	0.5567	0.5567	0.5537	0.5628	0.5726	0.5795	0.5867	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K

	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opening Type (Uw = 1.20)			11.0900	1.1450	12.6985			(27)
RL			6.8900	1.5918	10.9672			(27a)
Heatloss Floor 1			47.5000	0.1300	6.1750			(28a)
External Wall 1	79.5000	11.0900	68.4100	0.1800	12.3138			(29a)
FR	47.5000	6.8900	40.6100	0.1100	4.4671			(30)
Total net area of external elements Aum(A, m2)			174.5000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.6216			(33)
Party Wall 1			19.2500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 140.4402 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	13.1000	0.1600	2.0960
E14 Flat roof	28.5000	0.0800	2.2800
E16 Corner (normal)	15.0000	0.0900	1.3500
E18 Party wall between dwellings	20.0000	0.0600	1.2000
E1 Steel lintel with perforated steel base plate	7.0000	0.0500	0.3500
E3 Sill	3.8000	0.0500	0.1900
E4 Jamb	23.2000	0.0500	1.1600
E6 Intermediate floor within a dwelling	20.1000	0.0000	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.6260 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 55.2476 (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	35.7132	35.4781	35.2476	34.1652	33.9627	33.0200	33.0200	32.8454	33.3831	33.9627	34.3724	34.8007	(38)
Heat transfer coeff	90.9608	90.7257	90.4952	89.4128	89.2103	88.2676	88.2676	88.0930	88.6307	89.2103	89.6200	90.0483	(39)

Average = Sum(39)m / 12 = 89.4119

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2651	1.2618	1.2586	1.2436	1.2408	1.2276	1.2276	1.2252	1.2327	1.2408	1.2465	1.2524	(40)
HLP (average)												1.2436	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2914 (42)

Hot water usage for mixer showers

80.4438	79.2349	77.4733	74.1027	71.6153	68.8414	67.2647	69.0130	70.9295	73.9078	77.3508	80.1356	(42a)

Hot water usage for baths

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)

Hot water usage for other uses

38.0958	36.7105	35.3252	33.9399	32.5546	31.1693	31.1693	32.5546	33.9399	35.3252	36.7105	38.0958	(42c)

Average daily hot water use (litres/day) 108.7990 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	118.5396	115.9453	112.7984	108.0426	104.1699	100.0107	98.4340	101.5676	104.8693	109.2330	114.0612	118.2313	(44)
Energy conte	187.7377	165.1046	173.3670	147.9049	140.2327	122.9748	119.0474	125.7619	129.3144	148.2281	162.5011	185.1217	(45)
Energy content (annual)										Total = Sum(45)m =		1807.2963	
Distribution loss (46)m = 0.15 x (45)m	28.1607	24.7657	26.0050	22.1857	21.0349	18.4462	17.8571	18.8643	19.3972	22.2342	24.3752	27.7683	(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	234.3326	207.1903	219.9619	192.9967	186.8276	168.0666	165.6423	172.3568	174.4062	194.8230	207.5930	231.7166	(62)
WWHRS	-36.7755	-32.5246	-34.0579	-28.2013	-26.2826	-22.4902	-21.0810	-22.4175	-23.2692	-27.4318	-31.0769	-36.0945	(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	197.5570	174.6658	185.9040	164.7954	160.5450	145.5765	144.5613	149.9393	151.1370	167.3912	176.5160	195.6221	(64)
									Total per year (kWh/year) = Sum(64)m =			2014.2107	(64)
12Total per year (kWh/year)												2014	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	99.6987	88.5659	94.9204	85.2518	83.9033	76.9626	76.8592	79.0917	79.0705	86.5618	90.1051	98.8289	(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	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	114.5677	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	101.7296	112.6292	101.7296	105.1206	101.7296	105.1206	101.7296	101.7296	105.1206	101.7296	105.1206	101.7296	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.6903	203.7832	198.5091	187.2812	173.1080	159.7873	150.8881	148.7952	154.0693	165.2972	179.4704	192.7912	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	34.4568	(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)	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	-91.6542	(71)
Water heating gains (Table 5)	134.0036	131.7944	127.5812	118.4053	112.7732	106.8925	103.3053	106.3061	109.8201	116.3465	125.1460	132.8345	(72)
Total internal gains	497.7938	508.5771	488.1903	471.1775	447.9812	429.1706	413.2934	414.2012	426.3803	443.7436	470.1072	487.7256	(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	
Southeast	1.6800	36.7938	0.6300	0.7000	0.7700	18.8911	(77)
Southwest	9.4100	36.7938	0.6300	0.7000	0.7700	105.8124	(79)
Horizontal	6.8900	26.0000	0.6300	0.7000	1.0000	71.1007	(82)

Solar gains	195.8041	360.0867	553.1625	770.3094	928.4079	947.3682	902.9140	783.1439	629.1821	415.2513	239.6091	164.1476	(83)
Total gains	693.5979	868.6638	1041.3527	1241.4869	1376.3891	1376.5388	1316.2074	1197.3451	1055.5624	858.9949	709.7163	651.8732	(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	30.8364	30.9163	30.9950	31.3703	31.4415	31.7773	31.7773	31.8402	31.6471	31.4415	31.2977	31.1489	
alpha	3.0558	3.0611	3.0663	3.0914	3.0961	3.1185	3.1185	3.1227	3.1098	3.0961	3.0865	3.0766	
util living area	0.9483	0.9060	0.8333	0.7014	0.5456	0.3949	0.2904	0.3308	0.5294	0.7842	0.9158	0.9559	(86)
MIT	19.0963	19.5097	20.0159	20.5306	20.8250	20.9525	20.9863	20.9794	20.8825	20.4344	19.6764	19.0267	(87)
Th 2	19.8683	19.8709	19.8734	19.8853	19.8875	19.8979	19.8979	19.8999	19.8939	19.8875	19.8830	19.8783	(88)
util rest of house	0.9390	0.8904	0.8075	0.6613	0.4928	0.3319	0.2196	0.2547	0.4585	0.7421	0.8989	0.9478	(89)
MIT 2	17.6991	18.2108	18.8241	19.4252	19.7388	19.8671	19.8921	19.8904	19.8093	19.3419	18.4359	17.6187	(90)
Living area fraction									fLA = Living area / (4) =			0.3171	(91)
MIT	18.1421	18.6227	19.2020	19.7757	20.0833	20.2113	20.2391	20.2357	20.1496	19.6883	18.8293	18.0652	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1421	18.6227	19.2020	19.7757	20.0833	20.2113	20.2391	20.2357	20.1496	19.6883	18.8293	18.0652	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9203	0.8692	0.7900	0.6570	0.5025	0.3502	0.2418	0.2783	0.4755	0.7336	0.8791	0.9304	(94)
Useful gains	638.3000	755.0837	822.6358	815.6903	691.5796	482.0107	318.2157	333.2063	501.9667	630.1660	623.8965	606.4786	(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	1259.0915	1245.0002	1149.4708	972.4271	747.8732	495.2936	321.2108	337.8993	536.1803	810.7723	1051.1804	1248.5372	(97)
Space heating kWh	461.8689	329.2239	243.1652	112.8505	41.8825	0.0000	0.0000	0.0000	0.0000	134.3711	307.6444	477.6916	(98a)
Space heating requirement - total per year (kWh/year)												2108.6980	
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	461.8689	329.2239	243.1652	112.8505	41.8825	0.0000	0.0000	0.0000	0.0000	134.3711	307.6444	477.6916	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2108.6980	
Space heating per m2											(98c) / (4) =	29.3282	(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	461.8689	329.2239	243.1652	112.8505	41.8825	0.0000	0.0000	0.0000	0.0000	134.3711	307.6444	477.6916	(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)	500.3997	356.6889	263.4509	122.2649	45.3764	0.0000	0.0000	0.0000	0.0000	145.5808	333.3092	517.5424	(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	197.5570	174.6658	185.9040	164.7954	160.5450	145.5765	144.5613	149.9393	151.1370	167.3912	176.5160	195.6221	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.8977	85.4590	84.6629	83.2286	81.5092	79.8000	79.8000	79.8000	79.8000	83.5716	85.2929	85.9826	(217)
Fuel for water heating, kWh/month	229.9912	204.3853	219.5814	198.0034	196.9655	182.4266	181.1545	187.8939	189.3948	200.2967	206.9528	227.5136	(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	21.1374	16.9572	15.2681	11.1861	8.6404	7.0593	7.8821	10.2454	13.3078	17.4606	19.7217	21.7249	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-41.5965	-57.2485	-80.3746	-88.2259	-93.3998	-86.5904	-85.5198	-81.5612	-74.3404	-64.4376	-45.2324	-36.1291	(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	-27.9529	-58.2261	-114.6789	-170.7455	-224.3441	-224.8829	-222.2274	-188.7984	-139.2473	-82.7495	-37.1495	-22.1477	(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	2284.6133	(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	2424.5596	(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)	170.5909	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2347.8065	(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	2617.9573	(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	2284.6133	0.2100	479.7688	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2424.5596	0.2100	509.1575	(264)
Space and water heating			988.9263	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	170.5909	0.1443	24.6215	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-834.6562	0.1351	-112.7530	
PV Unit electricity exported	-1513.1504	0.1262	-190.8938	
Total			-303.6467	(269)
Total CO2, kg/year			721.8304	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.0400	(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	2284.6133	1.1300	2581.6130	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2424.5596	1.1300	2739.7524	(278)
Space and water heating			5321.3653	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	170.5909	1.5338	261.6580	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-834.6562	1.4993	-1251.3951	
PV Unit electricity exported	-1513.1504	0.4631	-700.7297	
Total			-1952.1247	(283)
Total Primary energy kWh/year			3760.9994	(286)
Target Primary Energy Rate (TPER)			52.3100	(287)

Summary for Input Data

elmhurst energy

Property Reference	Unit 5	**Issued on Date**	04/05/2024
Assessment Reference	Unit 5 - Be Green	**Prop Type Ref**	
Property			

SAP Rating	83 B	**DER**	4.35	**TER**	9.72
Environmental	97 A	**% DER < TER**			55.25
CO_2 Emissions (t/year)	0.27	**DFEE**	38.10	**TFEE**	45.30
Compliance Check	See BREL	**% DFEE < TFEE**			15.89
% DPER < TPER	10.81	**DPER**	46.31	**TPER**	51.92

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

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

Orientation	Southwest	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Suburban	
1.0 Property Type	Bungalow, End-Terrace	
Which Floor	0	
2.0 Number of Storeys	1	
3.0 Date Built	2024	
3.0 Property Age Band	L	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	N/A	kJ/m²K
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
Basement:	0.00 m	0.00 m²	0.00 m
Ground floor:	34.80 m	65.90 m²	2.50 m
1st Storey:	18.70 m	24.40 m²	2.50 m
2nd Storey:	0.00 m	0.00 m²	0.00 m
3rd Storey:	0.00 m	0.00 m²	0.00 m
4th Storey:	0.00 m	0.00 m²	0.00 m
5th Storey:	0.00 m	0.00 m²	0.00 m
6th Storey:	0.00 m	0.00 m²	0.00 m
7th Storey:	0.00 m	0.00 m²	0.00 m

8.0 Living Area	22.80	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
External Wall 1	Cavity Wall	Cavity wall : dense plaster, AAC block, filled cavity, any outside structure	0.16	70.00	87.00	78.30	0.00	None	8.70	Calculate Wall Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Plasterboard on dabs mounted on cement render on both sides, AAC blocks, cavity	0.00	45.00	19.25	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	64.00

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area	Shelter Code	Shelter Factor	Calculation Type	Openings

Summary for Input Data

						(m²)				
FR	External Flat Roof	Plasterboard, insulated flat roof	0.10	9.00	65.90	57.10	None	0.00	Enter Gross Area	8.80

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Heatloss Floor 1	Ground Floor - Solid	Lowest occupied	Suspended concrete floor, carpeted	0.10	None	0.00	75.00	65.90

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Windows	Manufacturer	Window	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.20
RLs	Manufacturer	Roof Window	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
SW	Windows	External Wall 1	South West	8.70	0
RL	RLs	FR	Horizontal	8.80	0

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	
17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E5 Ground floor (normal)	Gov Approved Scheme	34.80	0.05	0.05	No
E14 Flat roof	Table K1 - Default	34.80	0.16	0.16	No
E16 Corner (normal)	Gov Approved Scheme	12.50	0.04	0.04	No
E18 Party wall between dwellings	Gov Approved Scheme	5.00	0.03	0.03	No
E1 Steel lintel with perforated steel base plate	Gov Approved Scheme	4.60	0.30	0.30	No
E3 Sill	Gov Approved Scheme	3.70	0.03	0.03	No
E4 Jamb	Gov Approved Scheme	15.20	0.02	0.02	No

Y-value	0.04	W/m²K
18.0 Pressure Testing	Yes	
Designed AP_{50}	3.00	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	No
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500811
Configuration	1
Manufacturer SFP	0.47
Duct Type	Rigid
MVHR Efficiency	89.00
Wet Rooms	1
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)
Duct Installation Specification	Level 1

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System	No

22.0 Lighting

No Fixed Lighting	No

Name	Efficacy	Power	Capacity	Count
Lighting 1	120.00	6	720	40

24.0 Main Heating 1	Database

Summary for Input Data

Percentage of Heat	100.00	%
Database Ref. No.	102608	
Fuel Type	Electricity	
SAP Code	0	
In Winter	325.07	
In Summer	163.60	
Model Name	aroTHERM 5kW	
Manufacturer	Vaillant Group UK Ltd	
System Type	Heat Pump	
Controls SAP Code	2207	
Delayed Start Stat	Yes	
Burner Control	On/Off	
HETAS approved System	No	
Oil Pump Inside	No	
FI Case	0.00	
Flue Type	None or Unknown	
Fan Assisted Flue	No	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators	
Flow Temperature	Enter value	
Flow Temperature Value	35.00	
Boiler Interlock	Yes	
Combi boiler type	No Combi	

25.0 Main Heating 2	None
26.0 Heat Networks	None

28.0 Water Heating

Water Heating	Main Heating 1
SAP Code	901
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	Yes
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Summer Immersion	No
Cold Water Source	From mains
Bath Count	0
Supplementary Immersion	No
Immersion Only Heating Hot Water	No

28.1 Showers

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

28.3 Waste Water Heat Recovery System Instantaneous System 1

Database ID	80194
Brand Model	Zypho, Slim DW50
Details	Year: 2022 + current Efficiency: 44.7 Utilisation factor: 0.987

Summary for Input Data

29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	150.00	L
Loss	1.12	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	
31.0 Thermal Store	None	
34.0 Small-scale Hydro	None	
Electricity Generated	0.00	
Apportioned	0.00	kWh/Year
Connected to dwelling's electricity meter	Yes	
Electricity Generation	Annual	

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

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Property Reference	Unit 5	**Issued on Date**	04/05/2024
Assessment Reference	Unit 5 - Be Green	**Prop Type Ref**	
Property			

SAP Rating	83 B	**DER**	4.35	**TER**	9.72
Environmental	97 A	**% DER < TER**			55.25
CO_2 Emissions (t/year)	0.27	**DFEE**	38.10	**TFEE**	45.30
Compliance Check	See BREL	**% DFEE < TFEE**			15.89
% DPER < TPER	10.81	**DPER**	46.31	**TPER**	51.92

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	65.9000	(1b)	x 2.5000	(2b) =	164.7500	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.9000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	164.7500	(5)

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2. Ventilation rate

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

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2621	0.2589	0.2557	0.2397	0.2366	0.2206	0.2206	0.2174	0.2270	0.2366	0.2429	0.2493	(25)

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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)			8.7000	1.1450	9.9618			(27)
RL			8.8000	1.1450	10.0763			(27a)
Heatloss Floor 1			65.9000	0.1000	6.5900	75.0000	4942.5000	(28a)
External Wall 1	87.0000	8.7000	78.3000	0.1600	12.5280	70.0000	5481.0000	(29a)
FR	65.9000	8.8000	57.1000	0.1000	5.7100	9.0000	513.9000	(30)
Total net area of external elements Aum(A, m2)			218.8000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		44.8662			(33)
Party Wall 1			19.2500	0.0000	0.0000	45.0000	866.2500	(32)
Internal Wall 1			64.0000			9.0000	576.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 12379.6500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	187.8551	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	34.8000	0.0480	1.6704

E14 Flat roof	34.8000	0.1600	5.5680	
E16 Corner (normal)	12.5000	0.0350	0.4375	
E18 Party wall between dwellings	5.0000	0.0330	0.1650	
E1 Steel lintel with perforated steel base plate	4.6000	0.3020	1.3892	
E3 Sill	3.7000	0.0290	0.1073	
E4 Jamb	15.2000	0.0240	0.3648	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.7022 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 54.5684 (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	14.2477	14.0744	13.9011	13.0346	12.8613	11.9948	11.9948	11.8215	12.3414	12.8613	13.2079	13.5545	(38)
Heat transfer coeff	68.8161	68.6428	68.4695	67.6030	67.4297	66.5632	66.5632	66.3899	66.9098	67.4297	67.7763	68.1229	(39)
Average = Sum(39)m / 12 =												67.5597	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0442	1.0416	1.0390	1.0258	1.0232	1.0101	1.0101	1.0074	1.0153	1.0232	1.0285	1.0337	(40)
HLP (average)												1.0252	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.1426 (42)
Hot water usage for mixer showers

115.8447	114.1037	111.5669	106.7131	103.1311	99.1364	96.8659	99.3836	102.1434	106.4324	111.3905	115.4008	(42a)

Hot water usage for baths

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)

Hot water usage for other uses

36.5727	35.2428	33.9129	32.5829	31.2530	29.9231	29.9231	31.2530	32.5829	33.9129	35.2428	36.5727	(42c)

Average daily hot water use (litres/day) 140.0528 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	152.4174	149.3465	145.4797	139.2960	134.3841	129.0595	126.7890	130.6366	134.7263	140.3452	146.6332	151.9735	(44)
Energy conte	241.3918	212.6675	223.5969	190.6893	180.9068	158.6938	153.3403	161.7554	166.1310	190.4472	208.9059	237.9538	(45)
Energy content (annual)											Total = Sum(45)m =	2326.4797	
Distribution loss (46)m = 0.15 x (45)m	36.2088	31.9001	33.5395	28.6034	27.1360	23.8041	23.0010	24.2633	24.9197	28.5671	31.3359	35.6931	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.1200 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.6048 (55)

Total storage loss												
18.7488	16.9344	18.7488	18.1440	18.7488	18.1440	18.7488	18.7488	18.1440	18.7488	18.1440	18.7488	(56)
If cylinder contains dedicated solar storage												
18.7488	16.9344	18.7488	18.1440	18.7488	18.1440	18.7488	18.7488	18.1440	18.7488	18.1440	18.7488	(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												
283.4030	250.6131	265.6081	231.3453	222.9180	199.3498	195.3515	203.7666	206.7870	232.4584	249.5619	279.9650	(62)
WWHRS -66.2276	-58.5722	-61.3334	-50.7865	-47.3312	-40.5016	-37.9638	-40.3707	-41.9046	-49.4008	-55.9652	-65.0011	(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												
217.1755	192.0409	204.2747	180.5588	175.5868	158.8481	157.3877	163.3959	164.8825	183.0575	193.5968	214.9639	(64)
									Total per year (kWh/year) = Sum(64)m =		2205.7689	(64)
12Total per year (kWh/year)											2206	(64)
Electric shower(s)												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month												
113.8717	101.0684	107.9549	95.9290	93.7605	85.2905	84.5946	87.3926	87.7634	96.9326	101.9860	112.7286	(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	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	94.5952	104.7304	94.5952	97.7483	94.5952	97.7483	94.5952	94.5952	97.7483	94.5952	97.7483	94.5952	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	187.5455	189.4917	184.5875	174.1470	160.9678	148.5812	140.3062	138.3601	143.2643	153.7047	166.8839	179.2705	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	(71)
Water heating gains (Table 5)	153.0534	150.3994	145.1007	133.2347	126.0221	118.4590	113.7024	117.4632	121.8936	130.2858	141.6473	151.5169	(72)
Total internal gains	490.3336	499.7609	479.4228	460.2695	436.7246	419.9280	403.7433	405.5579	418.0456	433.7252	461.4190	480.5221	(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	
Southwest	8.7000	36.7938	0.6300	0.7000	0.7700	97.8287	(79)
Horizontal	8.8000	26.0000	0.6300	0.7000	1.0000	90.8107	(82)

Solar gains	188.6394	355.2453	563.3030	806.4134	987.0319	1012.6854	962.9899	825.9139	648.5407	414.6905	232.4359	157.0681	(83)
Total gains	678.9730	855.0062	1042.7259	1266.6829	1423.7565	1432.6134	1366.7332	1231.4718	1066.5863	848.4156	693.8549	637.5901	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	49.9708	50.0969	50.2237	50.8675	50.9982	51.6621	51.6621	51.7969	51.3944	50.9982	50.7374	50.4793	
alpha	4.3314	4.3398	4.3482	4.3912	4.3999	4.4441	4.4441	4.4531	4.4263	4.3999	4.3825	4.3653	
util living area	0.9554	0.9004	0.7926	0.6087	0.4337	0.2964	0.2141	0.2476	0.4268	0.7301	0.9146	0.9640	(86)
Living	19.9618	20.3040	20.6544	20.9023	20.9799	20.9971	20.9995	20.9990	20.9864	20.8293	20.3598	19.8983	
Non living	18.8725	19.2895	19.6979	19.9725	20.0484	20.0733	20.0748	20.0768	20.0619	19.9101	19.3741	18.8004	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.4689	20.3040	20.6544	20.9023	20.9799	20.9971	20.9995	20.9990	20.9864	20.8293	20.3598	20.0524	(87)
Th 2	20.0466	20.0488	20.0510	20.0619	20.0640	20.0750	20.0750	20.0771	20.0706	20.0640	20.0597	20.0553	(88)
util rest of house	0.9463	0.8827	0.7627	0.5693	0.3920	0.2539	0.1692	0.1981	0.3715	0.6844	0.8960	0.9564	(89)
MIT 2	19.5785	19.2895	19.6979	19.9725	20.0484	20.0733	20.0748	20.0768	20.0619	19.9101	19.3741	19.0266	(90)
Living area fraction										fLA = Living area / (4) =		0.3460	(91)
MIT	19.8866	19.6405	20.0288	20.2942	20.3707	20.3929	20.3947	20.3958	20.3817	20.2282	19.7151	19.3815	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8866	19.6405	20.0288	20.2942	20.3707	20.3929	20.3947	20.3958	20.3817	20.2282	19.7151	19.3815	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9445	0.8742	0.7620	0.5793	0.4058	0.2686	0.1847	0.2152	0.3902	0.6928	0.8882	0.9498	(94)
Useful gains	641.2994	747.4290	794.5489	733.8032	577.7427	384.7692	252.4738	265.0600	416.1544	587.7776	616.2843	605.6015	(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	1072.6071	1011.8291	926.3107	770.2819	584.6636	385.5956	252.5873	265.2836	420.3104	649.2238	855.0060	1034.2060	(97)
Space heating kWh	320.8929	177.6769	98.0307	26.2647	5.1492	0.0000	0.0000	0.0000	0.0000	45.7160	171.8796	318.8818	(98a)
Space heating requirement - total per year (kWh/year)												1164.4917	
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	320.8929	177.6769	98.0307	26.2647	5.1492	0.0000	0.0000	0.0000	0.0000	45.7160	171.8796	318.8818	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1164.4917	
Space heating per m2											(98c) / (4) =	17.6706	(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 %) 325.0669 (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	320.8929	177.6769	98.0307	26.2647	5.1492	0.0000	0.0000	0.0000	0.0000	45.7160	171.8796	318.8818	(98)
Space heating efficiency (main heating system 1)	325.0669	325.0669	325.0669	325.0669	325.0669	0.0000	0.0000	0.0000	0.0000	325.0669	325.0669	325.0669	(210)
Space heating fuel (main heating system)	98.7160	54.6586	30.1571	8.0798	1.5840	0.0000	0.0000	0.0000	0.0000	14.0636	52.8751	98.0973	(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	217.1755	192.0409	204.2747	180.5588	175.5868	158.8481	157.3877	163.3959	164.8825	183.0575	193.5968	214.9639	(64)
Efficiency of water heater												163.6035	(216)
(217)m	163.6035	163.6035	163.6035	163.6035	163.6035	163.6035	163.6035	163.6035	163.6035	163.6035	163.6035	163.6035	(217)
Fuel for water heating, kWh/month	132.7450	117.3819	124.8597	110.3637	107.3246	97.0934	96.2007	99.8731	100.7818	111.8910	118.3329	131.3932	(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	11.2326	10.1456	11.2326	10.8703	11.2326	10.8703	11.2326	11.2326	10.8703	11.2326	10.8703	11.2326	(231)
Lighting	18.8551	15.1263	13.6195	9.9783	7.7075	6.2971	7.0310	9.1392	11.8709	15.5753	17.5923	19.3792	(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 1 358.2314 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 163.6035

Water heating fuel used 1348.2410 (219)

Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6580)

mechanical ventilation fans (SFP = 0.6580) 132.2547 (230a)

Total electricity for the above, kWh/year	132.2547	(231)
Electricity for lighting (calculated in Appendix L)	152.1717	(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	1990.8988	(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	358.2314	0.1583	56.7013	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1348.2410	0.1408	189.7841	(264)
Space and water heating			246.4854	(265)
Pumps, fans and electric keep-hot	132.2547	0.1387	18.3454	(267)
Energy for lighting	152.1717	0.1443	21.9631	(268)
Total CO2, kg/year			286.7938	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.3500	(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	358.2314	1.5858	568.0970	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1348.2410	1.5205	2049.9845	(278)
Space and water heating			2618.0815	(279)
Pumps, fans and electric keep-hot	132.2547	1.5128	200.0749	(281)
Energy for lighting	152.1717	1.5338	233.4061	(282)
Total Primary energy kWh/year			3051.5625	(286)
Dwelling Primary energy Rate (DPER)			46.3100	(287)

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

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		65.9000 (1b)	x	2.5000 (2b)	=	164.7500	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.9000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	164.7500	(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)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1214	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3714	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3157	(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	0.4025	0.3946	0.3867	0.3473	0.3394	0.2999	0.2999	0.2920	0.3157	0.3394	0.3551	0.3709	(22b)
Effective ac	0.5810	0.5779	0.5748	0.5603	0.5576	0.5450	0.5450	0.5426	0.5498	0.5576	0.5631	0.5688	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K

	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opening Type (Uw = 1.20)			8.1900	1.1450	9.3779			(27)
RL			8.2800	1.5918	13.1798			(27a)
Heatloss Floor 1			65.9000	0.1300	8.5670			(28a)
External Wall 1	87.0000	8.1900	78.8100	0.1800	14.1858			(29a)
FR	65.9000	8.2800	57.6200	0.1100	6.3382			(30)
Total net area of external elements Aum(A, m2)			218.8000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		51.6486			(33)
Party Wall 1			19.2500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 187.8551 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	34.8000	0.1600	5.5680
E14 Flat roof	34.8000	0.0800	2.7840
E16 Corner (normal)	12.5000	0.0900	1.1250
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E1 Steel lintel with perforated steel base plate	4.6000	0.0500	0.2300
E3 Sill	3.7000	0.0500	0.1850
E4 Jamb	15.2000	0.0500	0.7600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.9520 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 62.6006 (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	31.5877	31.4167	31.2491	30.4617	30.3144	29.6287	29.6287	29.5017	29.8928	30.3144	30.6124	30.9240	(38)
Heat transfer coeff	94.1883	94.0173	93.8497	93.0624	92.9151	92.2293	92.2293	92.1023	92.4935	92.9151	93.2131	93.5246	(39)
Average = Sum(39)m / 12 =												93.0617	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4293	1.4267	1.4241	1.4122	1.4099	1.3995	1.3995	1.3976	1.4035	1.4099	1.4145	1.4192	(40)
HLP (average)												1.4122	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.1426 (42)

Hot water usage for mixer showers

77.2298	76.0692	74.3779	71.1420	68.7540	66.0910	64.5773	66.2557	68.0956	70.9549	74.2603	76.9339	(42a)

Hot water usage for baths

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)

Hot water usage for other uses

36.5727	35.2428	33.9129	32.5829	31.2530	29.9231	29.9231	31.2530	32.5829	33.9129	35.2428	36.5727	(42c)

Average daily hot water use (litres/day) 104.4512 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	113.8025	111.3119	108.2908	103.7250	100.0071	96.0141	94.5004	97.5087	100.6785	104.8678	109.5031	113.5066	(44)
Energy conte	180.2353	158.5067	166.4389	141.9943	134.6287	118.0605	114.2900	120.7362	124.1467	142.3046	156.0072	177.7239	(45)
Energy content (annual)											Total = Sum(45)m =	1735.0730	
Distribution loss (46)m = 0.15 x (45)m	27.0353	23.7760	24.9658	21.2991	20.1943	17.7091	17.1435	18.1104	18.6220	21.3457	23.4011	26.6586	(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

226.8302	200.5924	213.0338	187.0861	181.2236	163.1523	160.8849	167.3311	169.2385	188.8995	201.0991	224.3188	(62)
WWHRS -35.3062	-31.2251	-32.6971	-27.0745	-25.2325	-21.5916	-20.2387	-21.5218	-22.3395	-26.3358	-29.8353	-34.6524	(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

191.5240	169.3673	180.3366	160.0116	155.9911	141.5607	140.6462	145.8092	146.8990	162.5637	171.2638	189.6663	(64)
										Total per year (kWh/year) = Sum(64)m =	1955.6396	(64)
12Total per year (kWh/year)											1956	(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

97.2042	86.3721	92.6169	83.2866	82.0400	75.3286	75.2774	77.4207	77.3522	84.5922	87.9459	96.3691	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	94.5952	104.7304	94.5952	97.7483	94.5952	97.7483	94.5952	94.5952	97.7483	94.5952	97.7483	94.5952	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	187.5455	189.4917	184.5875	174.1470	160.9678	148.5812	140.3062	138.3601	143.2643	153.7047	166.8839	179.2705	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	(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)	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	(71)
Water heating gains (Table 5)	130.6507	128.5298	124.4850	115.6758	110.2688	104.6230	101.1792	104.0601	107.4337	113.6992	122.1470	129.5284	(72)
Total internal gains	470.9309	480.8913	461.8071	445.7106	423.9712	406.0921	391.2201	392.1548	403.5858	420.1385	444.9188	461.5335	(73)

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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	
Southwest	8.1900	36.7938	0.6300	0.7000	0.7700	92.0939	(79)
Horizontal	8.2800	26.0000	0.6300	0.7000	1.0000	85.4446	(82)

Solar gains	177.5385	334.3319	530.1242	758.8946	928.8561	952.9926	906.2284	777.2404	610.3339	390.2726	218.7562	147.8261 (83)
Total gains	648.4694	815.2232	991.9313	1204.6052	1352.8273	1359.0847	1297.4484	1169.3952	1013.9196	810.4112	663.6750	609.3597 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	36.5097	36.5761	36.6415	36.9515	37.0101	37.2852	37.2852	37.3366	37.1788	37.0101	36.8917	36.7688	
alpha	3.4340	3.4384	3.4428	3.4634	3.4673	3.4857	3.4857	3.4891	3.4786	3.4673	3.4594	3.4513	
util living area	0.9714	0.9413	0.8790	0.7491	0.5824	0.4206	0.3090	0.3555	0.5761	0.8390	0.9492	0.9764	(86)
MIT	19.2045	19.5782	20.0682	20.5726	20.8542	20.9642	20.9907	20.9849	20.8965	20.4524	19.7285	19.1372	(87)
Th 2	19.7410	19.7429	19.7449	19.7540	19.7557	19.7637	19.7637	19.7652	19.7606	19.7557	19.7523	19.7487	(88)
util rest of house	0.9644	0.9279	0.8533	0.7034	0.5191	0.3445	0.2239	0.2631	0.4900	0.7946	0.9352	0.9705	(89)
MIT 2	17.7157	18.1807	18.7748	19.3548	19.6423	19.7438	19.7606	19.7597	19.6948	19.2485	18.3829	17.6362	(90)
Living area fraction									fLA = Living area / (4) =			0.3460	(91)
MIT	18.2308	18.6642	19.2223	19.7761	20.0616	20.1661	20.1862	20.1836	20.1106	19.6650	18.8485	18.1555	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2308	18.6642	19.2223	19.7761	20.0616	20.1661	20.1862	20.1836	20.1106	19.6650	18.8485	18.1555	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9530	0.9133	0.8407	0.7043	0.5353	0.3697	0.2533	0.2949	0.5155	0.7909	0.9220	0.9602	(94)
Useful gains	617.9706	744.5466	833.9358	848.3445	724.1464	502.4872	328.6449	344.8801	522.6308	640.9355	611.8902	585.0982	(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	1312.1177	1294.0767	1193.9795	1012.1564	776.9171	513.3538	330.7515	348.4766	555.9370	842.2782	1095.1130	1305.1849	(97)
Space heating kWh	516.4455	369.2842	267.8725	117.9446	39.2614	0.0000	0.0000	0.0000	0.0000	149.7990	347.9203	535.7445	(98a)
Space heating requirement - total per year (kWh/year)												2344.2721	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	516.4455	369.2842	267.8725	117.9446	39.2614	0.0000	0.0000	0.0000	0.0000	149.7990	347.9203	535.7445	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2344.2721	
Space heating per m2											(98c) / (4) =	35.5732	(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	516.4455	369.2842	267.8725	117.9446	39.2614	0.0000	0.0000	0.0000	0.0000	149.7990	347.9203	535.7445	(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)	559.5292	400.0913	290.2194	127.7839	42.5368	0.0000	0.0000	0.0000	0.0000	162.2958	376.9451	580.4382	(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	191.5240	169.3673	180.3366	160.0116	155.9911	141.5607	140.6462	145.8092	146.8990	162.5637	171.2638	189.6663	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.1709	85.7588	84.9454	83.3861	81.4601	79.8000	79.8000	79.8000	79.8000	83.8768	85.6148	86.2565	(217)
Fuel for water heating, kWh/month	222.2606	197.4926	212.2972	191.8924	191.4938	177.3944	176.2484	182.7184	184.0840	193.8124	200.0398	219.8865	(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	19.6550	15.7680	14.1973	10.4016	8.0345	6.5642	7.3293	9.5269	12.3745	16.2360	18.3386	20.2013	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-51.4472	-67.8984	-91.4775	-96.2601	-98.6425	-90.3576	-89.2554	-86.6922	-81.5520	-74.3709	-54.8966	-45.0477	(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	-45.0434	-92.3074	-179.1337	-263.0287	-342.1853	-341.7706	-337.7033	-288.3961	-214.7729	-129.8319	-59.3975	-35.8037	(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												2539.8397	(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	2349.6205	(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)	158.6272	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-3257.2726	(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	1876.8147	(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	2539.8397	0.2100	533.3663	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2349.6205	0.2100	493.4203	(264)
Space and water heating			1026.7866	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	158.6272	0.1443	22.8948	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-927.8982	0.1360	-126.1874	
PV Unit electricity exported	-2329.3745	0.1266	-294.8511	
Total			-421.0386	(269)
Total CO2, kg/year			640.5721	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.7200	(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	2539.8397	1.1300	2870.0189	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2349.6205	1.1300	2655.0711	(278)
Space and water heating			5525.0900	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	158.6272	1.5338	243.3077	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-927.8982	1.5027	-1394.3363	
PV Unit electricity exported	-2329.3745	0.4647	-1082.3778	
Total			-2476.7141	(283)
Total Primary energy kWh/year			3421.7844	(286)
Target Primary Energy Rate (TPER)			51.9200	(287)

Full SAP Calculation Printout

Property Reference	Unit 5	**Issued on Date**	04/05/2024
Assessment Reference	Unit 5 - Be Green	**Prop Type Ref**	
Property			

SAP Rating	83 B	**DER**	4.35	**TER**	9.72
Environmental	97 A	**% DER < TER**			55.25
CO_2 Emissions (t/year)	0.27	**DFEE**	38.10	**TFEE**	45.30
Compliance Check	See BREL	**% DFEE < TFEE**			15.89
% DPER < TPER	10.81	**DPER**	46.31	**TPER**	51.92

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	65.9000	(1b)	x 2.5000	(2b) =	164.7500	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.9000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		164.7500	(5)

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2. Ventilation rate

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	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)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1214	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2714	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2307	(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	0.2941	0.2884	0.2826	0.2538	0.2480	0.2192	0.2192	0.2134	0.2307	0.2480	0.2595	0.2711	(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	0.5433	0.5416	0.5399	0.5322	0.5307	0.5240	0.5240	0.5228	0.5266	0.5307	0.5337	0.5367	(25)

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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)			8.7000	1.1450	9.9618			(27)
RL			8.8000	1.1450	10.0763			(27a)
Heatloss Floor 1			65.9000	0.1000	6.5900	75.0000	4942.5000	(28a)
External Wall 1	87.0000	8.7000	78.3000	0.1600	12.5280	70.0000	5481.0000	(29a)
FR	65.9000	8.8000	57.1000	0.1000	5.7100	9.0000	513.9000	(30)
Total net area of external elements Aum(A, m2)			218.8000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.8662			(33)
Party Wall 1			19.2500	0.0000	0.0000	45.0000	866.2500	(32)
Internal Wall 1			64.0000			9.0000	576.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12379.6500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		187.8551	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	34.8000	0.0480	1.6704
E14 Flat roof	34.8000	0.1600	5.5680
E16 Corner (normal)	12.5000	0.0350	0.4375
E18 Party wall between dwellings	5.0000	0.0330	0.1650

E1 Steel lintel with perforated steel base plate	4.6000	0.3020	1.3892	
E3 Sill	3.7000	0.0290	0.1073	
E4 Jamb	15.2000	0.0240	0.3648	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.7022 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 54.5684 (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	29.5354	29.4441	29.3546	28.9342	28.8555	28.4893	28.4893	28.4215	28.6304	28.8555	29.0146	29.1810	(38)
Heat transfer coeff	84.1038	84.0125	83.9230	83.5025	83.4239	83.0577	83.0577	82.9899	83.1987	83.4239	83.5830	83.7494	(39)
Average = Sum(39)m / 12 =												83.5022	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2762	1.2748	1.2735	1.2671	1.2659	1.2604	1.2604	1.2593	1.2625	1.2659	1.2683	1.2709	(40)
HLP (average)												1.2671	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.1426 (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

25.9873	25.6014	25.0579	24.0558	23.3054	22.4734	22.0239	22.5636	23.1513	24.0416	25.0643	25.8995	(42b)

Hot water usage for other uses

36.5727	35.2428	33.9129	32.5829	31.2530	29.9231	29.9231	31.2530	32.5829	33.9129	35.2428	36.5727	(42c)

Average daily hot water use (litres/day) 57.3422 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	62.5600	60.8442	58.9707	56.6387	54.5584	52.3965	51.9471	53.8167	55.7342	57.9544	60.3071	62.4722	(44)
Energy conte	99.0798	86.6413	90.6358	77.5356	73.4461	64.4276	62.8255	66.6363	68.7259	78.6436	85.9185	97.8163	(45)
Energy content (annual)										Total = Sum(45)m =		952.3322	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

84.2178	73.6451	77.0405	65.9052	62.4292	54.7634	53.4016	56.6408	58.4170	66.8471	73.0307	83.1439	(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

84.2178	73.6451	77.0405	65.9052	62.4292	54.7634	53.4016	56.6408	58.4170	66.8471	73.0307	83.1439	(64)
								Total per year (kWh/year) = Sum(64)m =			809.4823	(64)
12Total per year (kWh/year)											809	(64)

Electric shower(s)

48.1657	42.9161	46.8627	44.7205	45.5597	43.4595	44.9081	45.5597	44.7205	46.8627	45.9815	48.1657	(64a)
				Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							547.8823	(64a)

Heat gains from water heating, kWh/month

33.0959	29.1403	30.9758	27.6564	26.9972	24.5557	24.5774	25.5501	25.7844	28.4274	29.7531	32.8274	(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	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	94.5952	104.7304	94.5952	97.7483	94.5952	97.7483	94.5952	94.5952	97.7483	94.5952	97.7483	94.5952	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	187.5455	189.4917	184.5875	174.1470	160.9678	148.5812	140.3062	138.3601	143.2643	153.7047	166.8839	179.2705	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	(71)
Water heating gains (Table 5)	44.4837	43.3635	41.6341	38.4117	36.2866	34.1052	33.0342	34.3416	35.8116	38.2089	41.3237	44.1228	(72)
Total internal gains	381.7639	392.7250	375.9562	365.4465	346.9890	335.5742	323.0750	322.4363	331.9637	341.6483	361.0954	373.1280	(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	
Southwest	8.7000	36.7938	0.6300	0.7000	0.7700	97.8287	(79)
Horizontal	8.8000	26.0000	0.6300	0.7000	1.0000	90.8107	(82)

Solar gains	188.6394	355.2453	563.3030	806.4134	987.0319	1012.6854	962.9899	825.9139	648.5407	414.6905	232.4359	157.0681	(83)
Total gains	570.4033	747.9703	939.2593	1171.8600	1334.0209	1348.2596	1286.0649	1148.3501	980.5044	756.3387	593.5314	530.1961	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	40.8875	40.9319	40.9756	41.1819	41.2207	41.4024	41.4024	41.4363	41.3323	41.2207	41.1422	41.0605

alpha	3.7258	3.7288	3.7317	3.7455	3.7480	3.7602	3.7602	3.7624	3.7555	3.7480	3.7428	3.7374	
util living area	0.9790	0.9477	0.8771	0.7272	0.5470	0.3870	0.2824	0.3289	0.5502	0.8399	0.9587	0.9836	(86)
MIT	19.3347	19.7327	20.2259	20.6881	20.9091	20.9806	20.9954	20.9920	20.9317	20.5416	19.8312	19.2551	(87)
Th 2	19.8595	19.8606	19.8617	19.8667	19.8676	19.8720	19.8720	19.8728	19.8703	19.8676	19.8657	19.8637	(88)
util rest of house	0.9739	0.9360	0.8523	0.6831	0.4898	0.3216	0.2108	0.2499	0.4719	0.7980	0.9473	0.9796	(89)
MIT 2	18.3773	18.7645	19.2299	19.6395	19.8123	19.8635	19.8708	19.8705	19.8361	19.5331	18.8706	18.3022	(90)
Living area fraction									fLA = Living area / (4) =			0.3460	(91)
MIT	18.7085	19.0995	19.5745	20.0023	20.1918	20.2500	20.2599	20.2585	20.2151	19.8820	19.2030	18.6319	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7085	19.0995	19.5745	20.0023	20.1918	20.2500	20.2599	20.2585	20.2151	19.8820	19.2030	18.6319	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9671	0.9265	0.8452	0.6887	0.5066	0.3437	0.2356	0.2772	0.4967	0.7986	0.9390	0.9737	(94)
Useful gains	551.6487	692.9845	793.8899	807.0894	675.8155	463.4509	302.9571	318.3201	486.9777	603.9887	557.3014	516.2316	(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	1211.8126	1192.9311	1097.2506	927.0670	708.4181	469.2724	303.9822	320.2155	508.7724	774.3393	1011.6021	1208.6592	(97)
Space heating kWh	491.1620	335.9641	225.7004	86.3838	24.2563	0.0000	0.0000	0.0000	0.0000	126.7409	327.0965	515.1662	(98a)
Space heating requirement - total per year (kWh/year)												2132.4701	
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	491.1620	335.9641	225.7004	86.3838	24.2563	0.0000	0.0000	0.0000	0.0000	126.7409	327.0965	515.1662	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2132.4701	
Space heating per m2											(98c) / (4) =	32.3592	(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	780.7423	614.6269	630.7231	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9499	0.9716	0.9576	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	741.5977	597.1656	603.9972	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1422.7182	1358.3638	1218.0991	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	490.4068	566.3315	456.8918	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	122.6017	141.5829	114.2230	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												378.4075	(107)
Energy for space heating												32.3592	(99)
Energy for space cooling												5.7421	(108)
Total												38.1013	(109)
Fabric Energy Efficiency (DFEE)												38.1	(109)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	65.9000	(1b)	x 2.5000	(2b) =	164.7500	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.9000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		164.7500	(5)

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2. Ventilation rate

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	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)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1214 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3714 (18)
Number of sides sheltered		2 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3157 (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	0.4025	0.3946	0.3867	0.3473	0.3394	0.2999	0.2999	0.2920	0.3157	0.3394	0.3551	0.3709	(22b)
Effective ac	0.5810	0.5779	0.5748	0.5603	0.5576	0.5450	0.5450	0.5426	0.5498	0.5576	0.5631	0.5688	(25)

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)

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 Opening Type (Uw = 1.20)			8.1900	1.1450	9.3779			(27)
RL			8.2800	1.5918	13.1798			(27a)
Heatloss Floor 1			65.9000	0.1300	8.5670			(28a)
External Wall 1	87.0000	8.1900	78.8100	0.1800	14.1858			(29a)
FR	65.9000	8.2800	57.6200	0.1100	6.3382			(30)
Total net area of external elements Aum(A, m2)			218.8000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		51.6486			(33)
Party Wall 1			19.2500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 187.8551 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	34.8000	0.1600	5.5680
E14 Flat roof	34.8000	0.0800	2.7840
E16 Corner (normal)	12.5000	0.0900	1.1250
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E1 Steel lintel with perforated steel base plate	4.6000	0.0500	0.2300
E3 Sill	3.7000	0.0500	0.1850
E4 Jamb	15.2000	0.0500	0.7600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.9520 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 62.6006 (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	31.5877	31.4167	31.2491	30.4617	30.3144	29.6287	29.6287	29.5017	29.8928	30.3144	30.6124	30.9240	(38)
Heat transfer coeff	94.1883	94.0173	93.8497	93.0624	92.9151	92.2293	92.2293	92.1023	92.4935	92.9151	93.2131	93.5246	(39)
Average = Sum(39)m / 12 =												93.0617	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4293	1.4267	1.4241	1.4122	1.4099	1.3995	1.3995	1.3976	1.4035	1.4099	1.4145	1.4192	(40)
HLP (average)												1.4122	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.1426 (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

25.9873	25.6014	25.0579	24.0558	23.3054	22.4734	22.0239	22.5636	23.1513	24.0416	25.0643	25.8995	(42b)

Hot water usage for other uses

36.5727	35.2428	33.9129	32.5829	31.2530	29.9231	29.9231	31.2530	32.5829	33.9129	35.2428	36.5727	(42c)

Average daily hot water use (litres/day) 57.3422 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	62.5600	60.8442	58.9707	56.6387	54.5584	52.3965	51.9471	53.8167	55.7342	57.9544	60.3071	62.4722	(44)
Energy conte	99.0798	86.6413	90.6358	77.5356	73.4461	64.4276	62.8255	66.6363	68.7259	78.6436	85.9185	97.8163	(45)
Energy content (annual)										Total = Sum(45)m =		952.3322	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	84.2178	73.6451	77.0405	65.9052	62.4292	54.7634	53.4016	56.6408	58.4170	66.8471	73.0307	83.1439	(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	84.2178	73.6451	77.0405	65.9052	62.4292	54.7634	53.4016	56.6408	58.4170	66.8471	73.0307	83.1439	(64)
									Total per year (kWh/year) = Sum(64)m =			809.4823	(64)
12Total per year (kWh/year)												809	(64)
Electric shower(s)	48.1657	42.9161	46.8627	44.7205	45.5597	43.4595	44.9081	45.5597	44.7205	46.8627	45.9815	48.1657	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							547.8823	(64a)
Heat gains from water heating, kWh/month	33.0959	29.1403	30.9758	27.6564	26.9972	24.5557	24.5774	25.5501	25.7844	28.4274	29.7531	32.8274	(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	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	94.5952	104.7304	94.5952	97.7483	94.5952	97.7483	94.5952	94.5952	97.7483	94.5952	97.7483	94.5952	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													

	187.5455	189.4917	184.5875	174.1470	160.9678	148.5812	140.3062	138.3601	143.2643	153.7047	166.8839	179.2705	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	(71)
Water heating gains (Table 5)													
	44.4837	43.3635	41.6341	38.4117	36.2866	34.1052	33.0342	34.3416	35.8116	38.2089	41.3237	44.1228	(72)
Total internal gains													
	381.7639	392.7250	375.9562	365.4465	346.9890	335.5742	323.0750	322.4363	331.9637	341.6483	361.0954	373.1280	(73)

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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	
Southwest	8.1900	36.7938	0.6300	0.7000	0.7700	92.0939	(79)
Horizontal	8.2800	26.0000	0.6300	0.7000	1.0000	85.4446	(82)

Solar gains	177.5385	334.3319	530.1242	758.8946	928.8561	952.9926	906.2284	777.2404	610.3339	390.2726	218.7562	147.8261	(83)
Total gains	559.3024	727.0569	906.0804	1124.3411	1275.8451	1288.5668	1229.3034	1099.6767	942.2976	731.9209	579.8516	520.9541	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	36.5097	36.5761	36.6415	36.9515	37.0101	37.2852	37.2852	37.3366	37.1788	37.0101	36.8917	36.7688	
alpha	3.4340	3.4384	3.4428	3.4634	3.4673	3.4857	3.4857	3.4891	3.4786	3.4673	3.4594	3.4513	
util living area													
	0.9813	0.9566	0.9014	0.7765	0.6086	0.4412	0.3254	0.3767	0.6090	0.8698	0.9648	0.9851	(86)
MIT	19.0502	19.4413	19.9630	20.5166	20.8326	20.9584	20.9890	20.9818	20.8768	20.3697	19.5938	18.9812	(87)
Th 2	19.7410	19.7429	19.7449	19.7540	19.7557	19.7637	19.7637	19.7652	19.7606	19.7557	19.7523	19.7487	(88)
util rest of house													
	0.9765	0.9461	0.8790	0.7327	0.5446	0.3623	0.2362	0.2794	0.5212	0.8306	0.9545	0.9812	(89)
MIT 2	18.0118	18.3949	18.8937	19.3980	19.6532	19.7456	19.7608	19.7600	19.6985	19.2915	18.5568	17.9493	(90)
Living area fraction										fLA = Living area / (4) =		0.3460	(91)
MIT	18.3711	18.7570	19.2637	19.7850	20.0612	20.1652	20.1858	20.1827	20.1062	19.6645	18.9156	18.3063	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3711	18.7570	19.2637	19.7850	20.0612	20.1652	20.1858	20.1827	20.1062	19.6645	18.9156	18.3063	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9695	0.9357	0.8689	0.7339	0.5611	0.3885	0.2670	0.3129	0.5471	0.8272	0.9454	0.9751	(94)
Useful gains	542.2216	680.2991	787.3040	825.1503	715.8239	500.5879	328.2176	344.0600	515.4914	605.4532	548.2007	507.9847	(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													
	1325.3303	1302.7937	1197.8679	1012.9875	776.8831	513.2740	330.7121	348.3990	555.5305	842.2331	1101.3668	1319.2905	(97)
Space heating kWh													
	582.6329	418.3164	305.4596	135.2427	45.4281	0.0000	0.0000	0.0000	0.0000	176.1642	398.2796	603.6115	(98a)
Space heating requirement - total per year (kWh/year)												2665.1350	
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													
	582.6329	418.3164	305.4596	135.2427	45.4281	0.0000	0.0000	0.0000	0.0000	176.1642	398.2796	603.6115	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2665.1350	
Space heating per m2											(98c) / (4) =	40.4421	(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	866.9557	682.4971	699.9778	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9130	0.9466	0.9252	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	791.5090	646.0712	647.5865	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1359.9163	1298.6048	1166.6786	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	409.2533	485.4850	386.2046	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	102.3133	121.3713	96.5511	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												320.2357	(107)
Energy for space heating												40.4421	(99)
Energy for space cooling												4.8594	(108)
Total												45.3015	(109)
Fabric Energy Efficiency (TFEE)												45.3	(109)

Full SAP Calculation Printout

Property Reference	Unit 5	**Issued on Date**	04/05/2024
Assessment Reference	Unit 5 - Be Green	**Prop Type Ref**	
Property			

SAP Rating	83 B	**DER**	4.35	**TER**	9.72
Environmental	97 A	**% DER < TER**			55.25
CO_2 Emissions (t/year)	0.27	**DFEE**	38.10	**TFEE**	45.30
Compliance Check	See BREL	**% DFEE < TFEE**			15.89
% DPER < TPER	10.81	**DPER**	46.31	**TPER**	51.92

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	65.9000	(1b)	x 2.5000	(2b) =	164.7500	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.9000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	164.7500	(5)

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2. Ventilation rate

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

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2621	0.2589	0.2557	0.2397	0.2366	0.2206	0.2206	0.2174	0.2270	0.2366	0.2429	0.2493	(25)

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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)			8.7000	1.1450	9.9618			(27)
RL			8.8000	1.1450	10.0763			(27a)
Heatloss Floor 1			65.9000	0.1000	6.5900	75.0000	4942.5000	(28a)
External Wall 1	87.0000	8.7000	78.3000	0.1600	12.5280	70.0000	5481.0000	(29a)
FR	65.9000	8.8000	57.1000	0.1000	5.7100	9.0000	513.9000	(30)
Total net area of external elements Aum(A, m2)			218.8000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		44.8662			(33)
Party Wall 1			19.2500	0.0000	0.0000	45.0000	866.2500	(32)
Internal Wall 1			64.0000			9.0000	576.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 12379.6500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	187.8551	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	34.8000	0.0480	1.6704

E14 Flat roof	34.8000	0.1600	5.5680	
E16 Corner (normal)	12.5000	0.0350	0.4375	
E18 Party wall between dwellings	5.0000	0.0330	0.1650	
E1 Steel lintel with perforated steel base plate	4.6000	0.3020	1.3892	
E3 Sill	3.7000	0.0290	0.1073	
E4 Jamb	15.2000	0.0240	0.3648	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.7022 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 54.5684 (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	14.2477	14.0744	13.9011	13.0346	12.8613	11.9948	11.9948	11.8215	12.3414	12.8613	13.2079	13.5545	(38)
Heat transfer coeff	68.8161	68.6428	68.4695	67.6030	67.4297	66.5632	66.5632	66.3899	66.9098	67.4297	67.7763	68.1229	(39)
Average = Sum(39)m / 12 =												67.5597	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0442	1.0416	1.0390	1.0258	1.0232	1.0101	1.0101	1.0074	1.0153	1.0232	1.0285	1.0337	(40)
HLP (average)												1.0252	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.1426 (42)
Hot water usage for mixer showers

115.8447	114.1037	111.5669	106.7131	103.1311	99.1364	96.8659	99.3836	102.1434	106.4324	111.3905	115.4008	(42a)

Hot water usage for baths

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)

Hot water usage for other uses

36.5727	35.2428	33.9129	32.5829	31.2530	29.9231	29.9231	31.2530	32.5829	33.9129	35.2428	36.5727	(42c)

Average daily hot water use (litres/day) 140.0528 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	152.4174	149.3465	145.4797	139.2960	134.3841	129.0595	126.7890	130.6366	134.7263	140.3452	146.6332	151.9735	(44)
Energy conte	241.3918	212.6675	223.5969	190.6893	180.9068	158.6938	153.3403	161.7554	166.1310	190.4472	208.9059	237.9538	(45)
Energy content (annual)											Total = Sum(45)m =	2326.4797	
Distribution loss (46)m = 0.15 x (45)m	36.2088	31.9001	33.5395	28.6034	27.1360	23.8041	23.0010	24.2633	24.9197	28.5671	31.3359	35.6931	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.1200 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.6048 (55)

Total storage loss												
18.7488	16.9344	18.7488	18.1440	18.7488	18.1440	18.7488	18.7488	18.1440	18.7488	18.1440	18.7488	(56)
If cylinder contains dedicated solar storage												
18.7488	16.9344	18.7488	18.1440	18.7488	18.1440	18.7488	18.7488	18.1440	18.7488	18.1440	18.7488	(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												
283.4030	250.6131	265.6081	231.3453	222.9180	199.3498	195.3515	203.7666	206.7870	232.4584	249.5619	279.9650	(62)
WWHRS -66.2276	-58.5722	-61.3334	-50.7865	-47.3312	-40.5016	-37.9638	-40.3707	-41.9046	-49.4008	-55.9652	-65.0011	(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												
217.1755	192.0409	204.2747	180.5588	175.5868	158.8481	157.3877	163.3959	164.8825	183.0575	193.5968	214.9639	(64)
									Total per year (kWh/year) = Sum(64)m =		2205.7689	(64)
12Total per year (kWh/year)											2206	(64)
Electric shower(s)												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month												
113.8717	101.0684	107.9549	95.9290	93.7605	85.2905	84.5946	87.3926	87.7634	96.9326	101.9860	112.7286	(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	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	94.5952	104.7304	94.5952	97.7483	94.5952	97.7483	94.5952	94.5952	97.7483	94.5952	97.7483	94.5952	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	187.5455	189.4917	184.5875	174.1470	160.9678	148.5812	140.3062	138.3601	143.2643	153.7047	166.8839	179.2705	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	(71)
Water heating gains (Table 5)	153.0534	150.3994	145.1007	133.2347	126.0221	118.4590	113.7024	117.4632	121.8936	130.2858	141.6473	151.5169	(72)
Total internal gains	490.3336	499.7609	479.4228	460.2695	436.7246	419.9280	403.7433	405.5579	418.0456	433.7252	461.4190	480.5221	(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	
Southwest	8.7000	36.7938	0.6300	0.7000	0.7700	97.8287	(79)
Horizontal	8.8000	26.0000	0.6300	0.7000	1.0000	90.8107	(82)

Solar gains	188.6394	355.2453	563.3030	806.4134	987.0319	1012.6854	962.9899	825.9139	648.5407	414.6905	232.4359	157.0681	(83)
Total gains	678.9730	855.0062	1042.7259	1266.6829	1423.7565	1432.6134	1366.7332	1231.4718	1066.5863	848.4156	693.8549	637.5901	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	49.9708	50.0969	50.2237	50.8675	50.9982	51.6621	51.6621	51.7969	51.3944	50.9982	50.7374	50.4793	
alpha	4.3314	4.3398	4.3482	4.3912	4.3999	4.4441	4.4441	4.4531	4.4263	4.3999	4.3825	4.3653	
util living area	0.9554	0.9004	0.7926	0.6087	0.4337	0.2964	0.2141	0.2476	0.4268	0.7301	0.9146	0.9640	(86)
Living	19.9618	20.3040	20.6544	20.9023	20.9799	20.9971	20.9995	20.9990	20.9864	20.8293	20.3598	19.8983	
Non living	18.8725	19.2895	19.6979	19.9725	20.0484	20.0733	20.0748	20.0768	20.0619	19.9101	19.3741	18.8004	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.4689	20.3040	20.6544	20.9023	20.9799	20.9971	20.9995	20.9990	20.9864	20.8293	20.3598	20.0524	(87)
Th 2	20.0466	20.0488	20.0510	20.0619	20.0640	20.0750	20.0750	20.0771	20.0706	20.0640	20.0597	20.0553	(88)
util rest of house	0.9463	0.8827	0.7627	0.5693	0.3920	0.2539	0.1692	0.1981	0.3715	0.6844	0.8960	0.9564	(89)
MIT 2	19.5785	19.2895	19.6979	19.9725	20.0484	20.0733	20.0748	20.0768	20.0619	19.9101	19.3741	19.0266	(90)
Living area fraction										fLA = Living area / (4) =		0.3460	(91)
MIT	19.8866	19.6405	20.0288	20.2942	20.3707	20.3929	20.3947	20.3958	20.3817	20.2282	19.7151	19.3815	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8866	19.6405	20.0288	20.2942	20.3707	20.3929	20.3947	20.3958	20.3817	20.2282	19.7151	19.3815	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9445	0.8742	0.7620	0.5793	0.4058	0.2686	0.1847	0.2152	0.3902	0.6928	0.8882	0.9498	(94)
Useful gains	641.2994	747.4290	794.5489	733.8032	577.7427	384.7692	252.4738	265.0600	416.1544	587.7776	616.2843	605.6015	(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	1072.6071	1011.8291	926.3107	770.2819	584.6636	385.5956	252.5873	265.2836	420.3104	649.2238	855.0060	1034.2060	(97)
Space heating kWh	320.8929	177.6769	98.0307	26.2647	5.1492	0.0000	0.0000	0.0000	0.0000	45.7160	171.8796	318.8818	(98a)
Space heating requirement - total per year (kWh/year)												1164.4917	
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	320.8929	177.6769	98.0307	26.2647	5.1492	0.0000	0.0000	0.0000	0.0000	45.7160	171.8796	318.8818	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1164.4917	
Space heating per m2											(98c) / (4) =	17.6706	(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 %) 325.0669 (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	320.8929	177.6769	98.0307	26.2647	5.1492	0.0000	0.0000	0.0000	0.0000	45.7160	171.8796	318.8818	(98)
Space heating efficiency (main heating system 1)	325.0669	325.0669	325.0669	325.0669	325.0669	0.0000	0.0000	0.0000	0.0000	325.0669	325.0669	325.0669	(210)
Space heating fuel (main heating system)	98.7160	54.6586	30.1571	8.0798	1.5840	0.0000	0.0000	0.0000	0.0000	14.0636	52.8751	98.0973	(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	217.1755	192.0409	204.2747	180.5588	175.5868	158.8481	157.3877	163.3959	164.8825	183.0575	193.5968	214.9639	(64)
Efficiency of water heater												163.6035	(216)
(217)m	163.6035	163.6035	163.6035	163.6035	163.6035	163.6035	163.6035	163.6035	163.6035	163.6035	163.6035	163.6035	(217)
Fuel for water heating, kWh/month	132.7450	117.3819	124.8597	110.3637	107.3246	97.0934	96.2007	99.8731	100.7818	111.8910	118.3329	131.3932	(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	11.2326	10.1456	11.2326	10.8703	11.2326	10.8703	11.2326	11.2326	10.8703	11.2326	10.8703	11.2326	(231)
Lighting	18.8551	15.1263	13.6195	9.9783	7.7075	6.2971	7.0310	9.1392	11.8709	15.5753	17.5923	19.3792	(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 1 358.2314 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 163.6035

Water heating fuel used 1348.2410 (219)

Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6580)

mechanical ventilation fans (SFP = 0.6580) 132.2547 (230a)

Total electricity for the above, kWh/year	132.2547	(231)
Electricity for lighting (calculated in Appendix L)	152.1717	(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	1990.8988	(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	358.2314	0.1583	56.7013	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1348.2410	0.1408	189.7841	(264)
Space and water heating			246.4854	(265)
Pumps, fans and electric keep-hot	132.2547	0.1387	18.3454	(267)
Energy for lighting	152.1717	0.1443	21.9631	(268)
Total CO2, kg/year			286.7938	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.3500	(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	358.2314	1.5858	568.0970	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1348.2410	1.5205	2049.9845	(278)
Space and water heating			2618.0815	(279)
Pumps, fans and electric keep-hot	132.2547	1.5128	200.0749	(281)
Energy for lighting	152.1717	1.5338	233.4061	(282)
Total Primary energy kWh/year			3051.5625	(286)
Dwelling Primary energy Rate (DPER)			46.3100	(287)

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

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		65.9000 (1b)	x	2.5000 (2b)	=	164.7500	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.9000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	164.7500	(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)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1214	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3714	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3157	(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	0.4025	0.3946	0.3867	0.3473	0.3394	0.2999	0.2999	0.2920	0.3157	0.3394	0.3551	0.3709	(22b)
Effective ac	0.5810	0.5779	0.5748	0.5603	0.5576	0.5450	0.5450	0.5426	0.5498	0.5576	0.5631	0.5688	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K

	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opening Type (Uw = 1.20)			8.1900	1.1450	9.3779			(27)
RL			8.2800	1.5918	13.1798			(27a)
Heatloss Floor 1			65.9000	0.1300	8.5670			(28a)
External Wall 1	87.0000	8.1900	78.8100	0.1800	14.1858			(29a)
FR	65.9000	8.2800	57.6200	0.1100	6.3382			(30)
Total net area of external elements Aum(A, m2)			218.8000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		51.6486			(33)
Party Wall 1			19.2500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 187.8551 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	34.8000	0.1600	5.5680
E14 Flat roof	34.8000	0.0800	2.7840
E16 Corner (normal)	12.5000	0.0900	1.1250
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E1 Steel lintel with perforated steel base plate	4.6000	0.0500	0.2300
E3 Sill	3.7000	0.0500	0.1850
E4 Jamb	15.2000	0.0500	0.7600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.9520 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 62.6006 (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	31.5877	31.4167	31.2491	30.4617	30.3144	29.6287	29.6287	29.5017	29.8928	30.3144	30.6124	30.9240	(38)
Heat transfer coeff	94.1883	94.0173	93.8497	93.0624	92.9151	92.2293	92.2293	92.1023	92.4935	92.9151	93.2131	93.5246	(39)
Average = Sum(39)m / 12 =												93.0617	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4293	1.4267	1.4241	1.4122	1.4099	1.3995	1.3995	1.3976	1.4035	1.4099	1.4145	1.4192	(40)
HLP (average)												1.4122	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.1426 (42)

Hot water usage for mixer showers

77.2298	76.0692	74.3779	71.1420	68.7540	66.0910	64.5773	66.2557	68.0956	70.9549	74.2603	76.9339	(42a)

Hot water usage for baths

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)

Hot water usage for other uses

36.5727	35.2428	33.9129	32.5829	31.2530	29.9231	29.9231	31.2530	32.5829	33.9129	35.2428	36.5727	(42c)

Average daily hot water use (litres/day) 104.4512 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	113.8025	111.3119	108.2908	103.7250	100.0071	96.0141	94.5004	97.5087	100.6785	104.8678	109.5031	113.5066	(44)
Energy conte	180.2353	158.5067	166.4389	141.9943	134.6287	118.0605	114.2900	120.7362	124.1467	142.3046	156.0072	177.7239	(45)
Energy content (annual)											Total = Sum(45)m =	1735.0730	
Distribution loss (46)m = 0.15 x (45)m	27.0353	23.7760	24.9658	21.2991	20.1943	17.7091	17.1435	18.1104	18.6220	21.3457	23.4011	26.6586	(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

226.8302	200.5924	213.0338	187.0861	181.2236	163.1523	160.8849	167.3311	169.2385	188.8995	201.0991	224.3188	(62)
WWHRS -35.3062	-31.2251	-32.6971	-27.0745	-25.2325	-21.5916	-20.2387	-21.5218	-22.3395	-26.3358	-29.8353	-34.6524	(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

191.5240	169.3673	180.3366	160.0116	155.9911	141.5607	140.6462	145.8092	146.8990	162.5637	171.2638	189.6663	(64)
										Total per year (kWh/year) = Sum(64)m =	1955.6396	(64)
12Total per year (kWh/year)											1956	(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

97.2042	86.3721	92.6169	83.2866	82.0400	75.3286	75.2774	77.4207	77.3522	84.5922	87.9459	96.3691	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	94.5952	104.7304	94.5952	97.7483	94.5952	97.7483	94.5952	94.5952	97.7483	94.5952	97.7483	94.5952	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	187.5455	189.4917	184.5875	174.1470	160.9678	148.5812	140.3062	138.3601	143.2643	153.7047	166.8839	179.2705	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	(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)	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	(71)
Water heating gains (Table 5)	130.6507	128.5298	124.4850	115.6758	110.2688	104.6230	101.1792	104.0601	107.4337	113.6992	122.1470	129.5284	(72)
Total internal gains	470.9309	480.8913	461.8071	445.7106	423.9712	406.0921	391.2201	392.1548	403.5858	420.1385	444.9188	461.5335	(73)

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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	
Southwest	8.1900	36.7938	0.6300	0.7000	0.7700	92.0939	(79)
Horizontal	8.2800	26.0000	0.6300	0.7000	1.0000	85.4446	(82)

Solar gains	177.5385	334.3319	530.1242	758.8946	928.8561	952.9926	906.2284	777.2404	610.3339	390.2726	218.7562	147.8261 (83)
Total gains	648.4694	815.2232	991.9313	1204.6052	1352.8273	1359.0847	1297.4484	1169.3952	1013.9196	810.4112	663.6750	609.3597 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	36.5097	36.5761	36.6415	36.9515	37.0101	37.2852	37.2852	37.3366	37.1788	37.0101	36.8917	36.7688	
alpha	3.4340	3.4384	3.4428	3.4634	3.4673	3.4857	3.4857	3.4891	3.4786	3.4673	3.4594	3.4513	
util living area	0.9714	0.9413	0.8790	0.7491	0.5824	0.4206	0.3090	0.3555	0.5761	0.8390	0.9492	0.9764	(86)
MIT	19.2045	19.5782	20.0682	20.5726	20.8542	20.9642	20.9907	20.9849	20.8965	20.4524	19.7285	19.1372	(87)
Th 2	19.7410	19.7429	19.7449	19.7540	19.7557	19.7637	19.7637	19.7652	19.7606	19.7557	19.7523	19.7487	(88)
util rest of house	0.9644	0.9279	0.8533	0.7034	0.5191	0.3445	0.2239	0.2631	0.4900	0.7946	0.9352	0.9705	(89)
MIT 2	17.7157	18.1807	18.7748	19.3548	19.6423	19.7438	19.7606	19.7597	19.6948	19.2485	18.3829	17.6362	(90)
Living area fraction									fLA = Living area / (4) =			0.3460	(91)
MIT	18.2308	18.6642	19.2223	19.7761	20.0616	20.1661	20.1862	20.1836	20.1106	19.6650	18.8485	18.1555	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2308	18.6642	19.2223	19.7761	20.0616	20.1661	20.1862	20.1836	20.1106	19.6650	18.8485	18.1555	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9530	0.9133	0.8407	0.7043	0.5353	0.3697	0.2533	0.2949	0.5155	0.7909	0.9220	0.9602	(94)
Useful gains	617.9706	744.5466	833.9358	848.3445	724.1464	502.4872	328.6449	344.8801	522.6308	640.9355	611.8902	585.0982	(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	1312.1177	1294.0767	1193.9795	1012.1564	776.9171	513.3538	330.7515	348.4766	555.9370	842.2782	1095.1130	1305.1849	(97)
Space heating kWh	516.4455	369.2842	267.8725	117.9446	39.2614	0.0000	0.0000	0.0000	0.0000	149.7990	347.9203	535.7445	(98a)
Space heating requirement - total per year (kWh/year)												2344.2721	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	516.4455	369.2842	267.8725	117.9446	39.2614	0.0000	0.0000	0.0000	0.0000	149.7990	347.9203	535.7445	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2344.2721	
Space heating per m2											(98c) / (4) =	35.5732	(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	516.4455	369.2842	267.8725	117.9446	39.2614	0.0000	0.0000	0.0000	0.0000	149.7990	347.9203	535.7445	(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)	559.5292	400.0913	290.2194	127.7839	42.5368	0.0000	0.0000	0.0000	0.0000	162.2958	376.9451	580.4382	(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	191.5240	169.3673	180.3366	160.0116	155.9911	141.5607	140.6462	145.8092	146.8990	162.5637	171.2638	189.6663	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.1709	85.7588	84.9454	83.3861	81.4601	79.8000	79.8000	79.8000	79.8000	83.8768	85.6148	86.2565	(217)
Fuel for water heating, kWh/month	222.2606	197.4926	212.2972	191.8924	191.4938	177.3944	176.2484	182.7184	184.0840	193.8124	200.0398	219.8865	(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	19.6550	15.7680	14.1973	10.4016	8.0345	6.5642	7.3293	9.5269	12.3745	16.2360	18.3386	20.2013	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-51.4472	-67.8984	-91.4775	-96.2601	-98.6425	-90.3576	-89.2554	-86.6922	-81.5520	-74.3709	-54.8966	-45.0477	(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	-45.0434	-92.3074	-179.1337	-263.0287	-342.1853	-341.7706	-337.7033	-288.3961	-214.7729	-129.8319	-59.3975	-35.8037	(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												2539.8397	(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	2349.6205	(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)	158.6272	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-3257.2726	(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	1876.8147	(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	2539.8397	0.2100	533.3663	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2349.6205	0.2100	493.4203	(264)
Space and water heating			1026.7866	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	158.6272	0.1443	22.8948	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-927.8982	0.1360	-126.1874	
PV Unit electricity exported	-2329.3745	0.1266	-294.8511	
Total			-421.0386	(269)
Total CO2, kg/year			640.5721	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.7200	(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	2539.8397	1.1300	2870.0189	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2349.6205	1.1300	2655.0711	(278)
Space and water heating			5525.0900	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	158.6272	1.5338	243.3077	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-927.8982	1.5027	-1394.3363	
PV Unit electricity exported	-2329.3745	0.4647	-1082.3778	
Total			-2476.7141	(283)
Total Primary energy kWh/year			3421.7844	(286)
Target Primary Energy Rate (TPER)			51.9200	(287)

Summary for Input Data

elmhurst energy

Property Reference	Unit 5	**Issued on Date**	04/05/2024
Assessment Reference	Unit 5 - Be Lean	**Prop Type Ref**	
Property			

SAP Rating	85 B	**DER**	12.96	**TER**	9.72
Environmental	90 B	**% DER < TER**			-33.33
CO_2 Emissions (t/year)	0.78	**DFEE**	38.10	**TFEE**	45.30
Compliance Check	See BREL	**% DFEE < TFEE**			15.89
% DPER < TPER	-41.61	**DPER**	73.52	**TPER**	51.92

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

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

Orientation	Southwest	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Suburban	
1.0 Property Type	Bungalow, End-Terrace	
Which Floor	0	
2.0 Number of Storeys	1	
3.0 Date Built	2024	
3.0 Property Age Band	L	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	N/A	kJ/m²K
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
Basement:	0.00 m	0.00 m²	0.00 m
Ground floor:	34.80 m	65.90 m²	2.50 m
1st Storey:	18.70 m	24.40 m²	2.50 m
2nd Storey:	0.00 m	0.00 m²	0.00 m
3rd Storey:	0.00 m	0.00 m²	0.00 m
4th Storey:	0.00 m	0.00 m²	0.00 m
5th Storey:	0.00 m	0.00 m²	0.00 m
6th Storey:	0.00 m	0.00 m²	0.00 m
7th Storey:	0.00 m	0.00 m²	0.00 m

8.0 Living Area	22.80	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
External Wall 1	Cavity Wall	Cavity wall : dense plaster, AAC block, filled cavity, any outside structure	0.16	70.00	87.00	78.30	0.00	None	8.70	Calculate Wall Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall 1	Filled Cavity with Edge Sealing	Plasterboard on dabs mounted on cement render on both sides, AAC blocks, cavity	0.00	45.00	19.25	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Plasterboard on timber frame	9.00	64.00

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area	Shelter Code	Shelter Factor	Calculation Type	Openings

Summary for Input Data

elmhurst energy

						(m²)				
FR	External Flat Roof	Plasterboard, insulated flat roof	0.10	9.00	65.90	57.10	None	0.00	Enter Gross Area	8.80

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Heatloss Floor 1	Ground Floor - Solid	Lowest occupied	Suspended concrete floor, carpeted	0.10	None	0.00	75.00	65.90

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Windows	Manufacturer	Window	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.20
RLs	Manufacturer	Roof Window	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
SW	Windows	External Wall 1	South West	8.70	0
RL	RLs	FR	Horizontal	8.80	0

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	
17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E5 Ground floor (normal)	Gov Approved Scheme	34.80	0.05	0.05	No
E14 Flat roof	Table K1 - Default	34.80	0.16	0.16	No
E16 Corner (normal)	Gov Approved Scheme	12.50	0.04	0.04	No
E18 Party wall between dwellings	Gov Approved Scheme	5.00	0.03	0.03	No
E1 Steel lintel with perforated steel base plate	Gov Approved Scheme	4.60	0.30	0.30	No
E3 Sill	Gov Approved Scheme	3.70	0.03	0.03	No
E4 Jamb	Gov Approved Scheme	15.20	0.02	0.02	No

Y-value	0.04	W/m²K
18.0 Pressure Testing	Yes	
Designed AP_{50}	3.00	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	No
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500811
Configuration	1
Manufacturer SFP	0.47
Duct Type	Rigid
MVHR Efficiency	89.00
Wet Rooms	1
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)
Duct Installation Specification	Level 1

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System	No

22.0 Lighting

No Fixed Lighting	No

Name	Efficacy	Power	Capacity	Count
Lighting 1	120.00	6	720	40

24.0 Main Heating 1	Manufacturer

Summary for Input Data

Percentage of Heat	100.00	%
Database Ref. No.	0	
Fuel Type	Mains gas	
SAP Code	102	
In Winter	89.50	
In Summer	82.00	
Model Name	GB	
Manufacturer	GB	
Controls SAP Code	2110	
Delayed Start Stat	Yes	
Burner Control	On/Off	
HETAS approved System	No	
Oil Pump Inside	No	
Flue Type	None or Unknown	
Fan Assisted Flue	No	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators	
Flow Temperature	Unknown	
Boiler Interlock	Yes	
Combi boiler type	No Combi	

25.0 Main Heating 2 — None

26.0 Heat Networks — None

28.0 Water Heating

Water Heating	Main Heating 1
SAP Code	901
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	Yes
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Summer Immersion	No
Cold Water Source	From mains
Bath Count	0
Supplementary Immersion	No
Immersion Only Heating Hot Water	No

28.1 Showers

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

28.3 Waste Water Heat Recovery System Instantaneous System 1

Database ID	80194
Brand Model	Zypho, Slim DW50
Details	Year: 2022 + current Efficiency: 44.7 Utilisation factor: 0.987

29.0 Hot Water Cylinder — Hot Water Cylinder

Cylinder Stat	Yes
Cylinder In Heated Space	Yes

Summary for Input Data

Independent Time Control	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	150.00	L
Loss	1.12	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	
31.0 Thermal Store	None	
34.0 Small-scale Hydro	None	
Electricity Generated	0.00	
Apportioned	0.00	kWh/Year
Connected to dwelling's electricity meter	Yes	
Electricity Generation	Annual	

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

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Property Reference	Unit 5	**Issued on Date**	04/05/2024
Assessment Reference	Unit 5 - Be Lean	**Prop Type Ref**	
Property			

SAP Rating	85 B	**DER**	12.96	**TER**	9.72
Environmental	90 B	**% DER < TER**			-33.33
CO_2 Emissions (t/year)	0.78	**DFEE**	38.10	**TFEE**	45.30
Compliance Check	See BREL	**% DFEE < TFEE**			15.89
% DPER < TPER	-41.61	**DPER**	73.52	**TPER**	51.92

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	65.9000	(1b)	x 2.5000	(2b) =	164.7500	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.9000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	164.7500	(5)

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2. Ventilation rate

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

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2621	0.2589	0.2557	0.2397	0.2366	0.2206	0.2206	0.2174	0.2270	0.2366	0.2429	0.2493	(25)

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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)			8.7000	1.1450	9.9618			(27)
RL			8.8000	1.1450	10.0763			(27a)
Heatloss Floor 1			65.9000	0.1000	6.5900	75.0000	4942.5000	(28a)
External Wall 1	87.0000	8.7000	78.3000	0.1600	12.5280	70.0000	5481.0000	(29a)
FR	65.9000	8.8000	57.1000	0.1000	5.7100	9.0000	513.9000	(30)
Total net area of external elements Aum(A, m2)			218.8000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.8662			(33)
Party Wall 1			19.2500	0.0000	0.0000	45.0000	866.2500	(32)
Internal Wall 1			64.0000			9.0000	576.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 12379.6500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	187.8551	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	34.8000	0.0480	1.6704

E14 Flat roof	34.8000	0.1600	5.5680	
E16 Corner (normal)	12.5000	0.0350	0.4375	
E18 Party wall between dwellings	5.0000	0.0330	0.1650	
E1 Steel lintel with perforated steel base plate	4.6000	0.3020	1.3892	
E3 Sill	3.7000	0.0290	0.1073	
E4 Jamb	15.2000	0.0240	0.3648	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.7022 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 54.5684 (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	14.2477	14.0744	13.9011	13.0346	12.8613	11.9948	11.9948	11.8215	12.3414	12.8613	13.2079	13.5545	(38)
Heat transfer coeff	68.8161	68.6428	68.4695	67.6030	67.4297	66.5632	66.5632	66.3899	66.9098	67.4297	67.7763	68.1229	(39)

Average = Sum(39)m / 12 = 67.5597

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0442	1.0416	1.0390	1.0258	1.0232	1.0101	1.0101	1.0074	1.0153	1.0232	1.0285	1.0337	(40)
HLP (average)												1.0252	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.1426 (42)

Hot water usage for mixer showers

115.8447	114.1037	111.5669	106.7131	103.1311	99.1364	96.8659	99.3836	102.1434	106.4324	111.3905	115.4008	(42a)

Hot water usage for baths

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)

Hot water usage for other uses

36.5727	35.2428	33.9129	32.5829	31.2530	29.9231	29.9231	31.2530	32.5829	33.9129	35.2428	36.5727	(42c)

Average daily hot water use (litres/day) 140.0528 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	152.4174	149.3465	145.4797	139.2960	134.3841	129.0595	126.7890	130.6366	134.7263	140.3452	146.6332	151.9735	(44)
Energy conte	241.3918	212.6675	223.5969	190.6893	180.9068	158.6938	153.3403	161.7554	166.1310	190.4472	208.9059	237.9538	(45)
Energy content (annual)										Total = Sum(45)m =		2326.4797	
Distribution loss (46)m = 0.15 x (45)m	36.2088	31.9001	33.5395	28.6034	27.1360	23.8041	23.0010	24.2633	24.9197	28.5671	31.3359	35.6931	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.1200 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.6048 (55)

Total storage loss

18.7488	16.9344	18.7488	18.1440	18.7488	18.1440	18.7488	18.7488	18.1440	18.7488	18.1440	18.7488	(56)

If cylinder contains dedicated solar storage

18.7488	16.9344	18.7488	18.1440	18.7488	18.1440	18.7488	18.7488	18.1440	18.7488	18.1440	18.7488	(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

283.4030	250.6131	265.6081	231.3453	222.9180	199.3498	195.3515	203.7666	206.7870	232.4584	249.5619	279.9650	(62)
WWHRS	-66.2276	-58.5722	-61.3334	-50.7865	-47.3312	-40.5016	-37.9638	-40.3707	-41.9046	-49.4008	-55.9652	-65.0011	(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

217.1755	192.0409	204.2747	180.5588	175.5868	158.8481	157.3877	163.3959	164.8825	183.0575	193.5968	214.9639	(64)

Total per year (kWh/year) = Sum(64)m = 2205.7689 (64)

12Total per year (kWh/year) 2206 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

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

Heat gains from water heating, kWh/month

113.8717	101.0684	107.9549	95.9290	93.7605	85.2905	84.5946	87.3926	87.7634	96.9326	101.9860	112.7286	(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	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	94.5952	104.7304	94.5952	97.7483	94.5952	97.7483	94.5952	94.5952	97.7483	94.5952	97.7483	94.5952	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	187.5455	189.4917	184.5875	174.1470	160.9678	148.5812	140.3062	138.3601	143.2643	153.7047	166.8839	179.2705	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	(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)	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	(71)
Water heating gains (Table 5)	153.0534	150.3994	145.1007	133.2347	126.0221	118.4590	113.7024	117.4632	121.8936	130.2858	141.6473	151.5169	(72)
Total internal gains	493.3336	502.7609	482.4228	463.2695	439.7246	419.9280	403.7433	405.5579	418.0456	436.7252	464.4190	483.5221	(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	
Southwest	8.7000	36.7938	0.6300	0.7000	0.7700	97.8287	(79)
Horizontal	8.8000	26.0000	0.6300	0.7000	1.0000	90.8107	(82)

Solar gains	188.6394	355.2453	563.3030	806.4134	987.0319	1012.6854	962.9899	825.9139	648.5407	414.6905	232.4359	157.0681	(83)
Total gains	681.9730	858.0062	1045.7259	1269.6829	1426.7565	1432.6134	1366.7332	1231.4718	1066.5863	851.4156	696.8549	640.5901	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	49.9708	50.0969	50.2237	50.8675	50.9982	51.6621	51.6621	51.7969	51.3944	50.9982	50.7374	50.4793	
alpha	4.3314	4.3398	4.3482	4.3912	4.3999	4.4441	4.4441	4.4531	4.4263	4.3999	4.3825	4.3653	
util living area	0.9548	0.8994	0.7913	0.6076	0.4328	0.2964	0.2141	0.2476	0.4268	0.7284	0.9135	0.9634	(86)
MIT	19.9669	20.3079	20.6567	20.9030	20.9801	20.9971	20.9995	20.9990	20.9864	20.8309	20.3640	19.9036	(87)
Th 2	20.0466	20.0488	20.0510	20.0619	20.0640	20.0750	20.0750	20.0771	20.0706	20.0640	20.0597	20.0553	(88)
util rest of house	0.9455	0.8817	0.7614	0.5682	0.3912	0.2539	0.1692	0.1981	0.3715	0.6826	0.8948	0.9557	(89)
MIT 2	18.8787	19.2941	19.7003	19.9732	20.0486	20.0733	20.0748	20.0768	20.0619	19.9117	19.3790	18.8069	(90)
Living area fraction										fLA = Living area / (4) =		0.3460	(91)
MIT	19.2552	19.6449	20.0312	20.2949	20.3709	20.3929	20.3947	20.3958	20.3817	20.2297	19.7198	19.1863	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.1052	19.4949	19.8812	20.1449	20.2209	20.2429	20.2447	20.2458	20.2317	20.0797	19.5698	19.0363	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9341	0.8698	0.7557	0.5718	0.3983	0.2617	0.1774	0.2072	0.3812	0.6834	0.8834	0.9452	(94)
Useful gains	637.0621	746.3109	790.2439	725.9620	568.2383	374.8880	242.5108	255.1417	406.5751	581.8895	615.5951	605.5053	(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	1018.8332	1001.8316	916.2046	760.1888	574.5583	375.6111	242.6028	255.3251	410.2739	639.2142	845.1543	1010.6942	(97)
Space heating kWh	284.0377	171.7099	93.7147	24.6433	4.7020	0.0000	0.0000	0.0000	0.0000	42.6496	165.2826	301.4605	(98a)
Space heating requirement - total per year (kWh/year)												1088.2003	
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	284.0377	171.7099	93.7147	24.6433	4.7020	0.0000	0.0000	0.0000	0.0000	42.6496	165.2826	301.4605	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1088.2003	
Space heating per m2											(98c) / (4) =	16.5129	(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 %) 89.5000 (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	284.0377	171.7099	93.7147	24.6433	4.7020	0.0000	0.0000	0.0000	0.0000	42.6496	165.2826	301.4605	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	317.3605	191.8546	104.7092	27.5344	5.2537	0.0000	0.0000	0.0000	0.0000	47.6532	184.6733	336.8274	(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	217.1755	192.0409	204.2747	180.5588	175.5868	158.8481	157.3877	163.3959	164.8825	183.0575	193.5968	214.9639	(64)
Efficiency of water heater												82.0000	(216)
(217)m	86.0882	85.3773	84.2195	82.8336	82.1796	82.0000	82.0000	82.0000	82.0000	83.3193	85.2917	86.2175	(217)
Fuel for water heating, kWh/month	252.2708	224.9319	242.5503	217.9777	213.6623	193.7172	191.9362	199.2632	201.0762	219.7059	226.9819	249.3274	(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	14.7148	13.2908	14.7148	14.2401	14.7148	14.2401	14.7148	14.7148	14.2401	14.7148	14.2401	14.7148	(231)
Lighting	18.8551	15.1263	13.6195	9.9783	7.7075	6.2971	7.0310	9.1392	11.8709	15.5753	17.5923	19.3792	(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 1215.8663 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 82.0000
Water heating fuel used 2633.4011 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6580)
mechanical ventilation fans (SFP = 0.6580) 132.2547 (230a)
central heating pump 41.0000 (230c)
Total electricity for the above, kWh/year 173.2547 (231)
Electricity for lighting (calculated in Appendix L) 152.1717 (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	4174.6938	(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	1215.8663	0.2100	255.3319	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2633.4011	0.2100	553.0142	(264)
Space and water heating			808.3461	(265)
Pumps, fans and electric keep-hot	173.2547	0.1387	24.0326	(267)
Energy for lighting	152.1717	0.1443	21.9631	(268)
Total CO2, kg/year			854.3418	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.9600	(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	1215.8663	1.1300	1373.9289	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2633.4011	1.1300	2975.7432	(278)
Space and water heating			4349.6721	(279)
Pumps, fans and electric keep-hot	173.2547	1.5128	262.0997	(281)
Energy for lighting	152.1717	1.5338	233.4061	(282)
Total Primary energy kWh/year			4845.1779	(286)
Dwelling Primary energy Rate (DPER)			73.5200	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	65.9000	(1b)	x 2.5000	(2b) =	164.7500	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.9000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		164.7500	(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)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1214	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3714	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3157	(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	0.4025	0.3946	0.3867	0.3473	0.3394	0.2999	0.2999	0.2920	0.3157	0.3394	0.3551	0.3709	(22b)
Effective ac	0.5810	0.5779	0.5748	0.5603	0.5576	0.5450	0.5450	0.5426	0.5498	0.5576	0.5631	0.5688	(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 Opening Type (Uw = 1.20)			8.1900	1.1450	9.3779			(27)
RL			8.2800	1.5918	13.1798			(27a)
Heatloss Floor 1			65.9000	0.1300	8.5670			(28a)

External Wall 1	87.0000	8.1900	78.8100	0.1800	14.1858	(29a)
FR	65.9000	8.2800	57.6200	0.1100	6.3382	(30)
Total net area of external elements Aum(A, m2)			218.8000			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		51.6486	(33)
Party Wall 1			19.2500	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 187.8551 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	34.8000	0.1600	5.5680
E14 Flat roof	34.8000	0.0800	2.7840
E16 Corner (normal)	12.5000	0.0900	1.1250
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E1 Steel lintel with perforated steel base plate	4.6000	0.0500	0.2300
E3 Sill	3.7000	0.0500	0.1850
E4 Jamb	15.2000	0.0500	0.7600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.9520 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 62.6006 (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	31.5877	31.4167	31.2491	30.4617	30.3144	29.6287	29.6287	29.5017	29.8928	30.3144	30.6124	30.9240	(38)
Heat transfer coeff	94.1883	94.0173	93.8497	93.0624	92.9151	92.2293	92.2293	92.1023	92.4935	92.9151	93.2131	93.5246	(39)

Average = Sum(39)m / 12 = 93.0617

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4293	1.4267	1.4241	1.4122	1.4099	1.3995	1.3995	1.3976	1.4035	1.4099	1.4145	1.4192	(40)
HLP (average)												1.4122	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.1426 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
77.2298	76.0692	74.3779	71.1420	68.7540	66.0910	64.5773	66.2557	68.0956	70.9549	74.2603	76.9339	(42a)

Hot water usage for baths

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)

Hot water usage for other uses

36.5727	35.2428	33.9129	32.5829	31.2530	29.9231	29.9231	31.2530	32.5829	33.9129	35.2428	36.5727	(42c)

Average daily hot water use (litres/day) 104.4512 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	113.8025	111.3119	108.2908	103.7250	100.0071	96.0141	94.5004	97.5087	100.6785	104.8678	109.5031	113.5066	(44)
Energy conte	180.2353	158.5067	166.4389	141.9943	134.6287	118.0605	114.2900	120.7362	124.1467	142.3046	156.0072	177.7239	(45)
Energy content (annual)										Total = Sum(45)m =		1735.0730	
Distribution loss (46)m = 0.15 x (45)m	27.0353	23.7760	24.9658	21.2991	20.1943	17.7091	17.1435	18.1104	18.6220	21.3457	23.4011	26.6586	(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

226.8302	200.5924	213.0338	187.0861	181.2236	163.1523	160.8849	167.3311	169.2385	188.8995	201.0991	224.3188	(62)
WWHRS -35.3062	-31.2251	-32.6971	-27.0745	-25.2325	-21.5916	-20.2387	-21.5218	-22.3395	-26.3358	-29.8353	-34.6524	(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

191.5240	169.3673	180.3366	160.0116	155.9911	141.5607	140.6462	145.8092	146.8990	162.5637	171.2638	189.6663	(64)

Total per year (kWh/year) = Sum(64)m = 1955.6396 (64)

12Total per year (kWh/year) 1956 (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

97.2042	86.3721	92.6169	83.2866	82.0400	75.3286	75.2774	77.4207	77.3522	84.5922	87.9459	96.3691	(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	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	94.5952	104.7304	94.5952	97.7483	94.5952	97.7483	94.5952	94.5952	97.7483	94.5952	97.7483	94.5952	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	187.5455	189.4917	184.5875	174.1470	160.9678	148.5812	140.3062	138.3601	143.2643	153.7047	166.8839	179.2705	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	(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)	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	(71)
Water heating gains (Table 5)	130.6507	128.5298	124.4850	115.6758	110.2688	104.6230	101.1792	104.0601	107.4337	113.6992	122.1470	129.5284	(72)
Total internal gains	470.9309	480.8913	461.8071	445.7106	423.9712	406.0921	391.2201	392.1548	403.5858	420.1385	444.9188	461.5335	(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

Southwest			8.1900		36.7938		0.6300		0.7000		0.7700	92.0939	(79)
Horizontal			8.2800		26.0000		0.6300		0.7000		1.0000	85.4446	(82)
Solar gains	177.5385	334.3319	530.1242	758.8946	928.8561	952.9926	906.2284	777.2404	610.3339	390.2726	218.7562	147.8261	(83)
Total gains	648.4694	815.2232	991.9313	1204.6052	1352.8273	1359.0847	1297.4484	1169.3952	1013.9196	810.4112	663.6750	609.3597	(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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	36.5097	36.5761	36.6415	36.9515	37.0101	37.2852	37.2852	37.3366	37.1788	37.0101	36.8917	36.7688	
alpha	3.4340	3.4384	3.4428	3.4634	3.4673	3.4857	3.4857	3.4891	3.4786	3.4673	3.4594	3.4513	
util living area	0.9714	0.9413	0.8790	0.7491	0.5824	0.4206	0.3090	0.3555	0.5761	0.8390	0.9492	0.9764	(86)
MIT	19.2045	19.5782	20.0682	20.5726	20.8542	20.9642	20.9907	20.9849	20.8965	20.4524	19.7285	19.1372	(87)
Th 2	19.7410	19.7429	19.7449	19.7540	19.7557	19.7637	19.7637	19.7652	19.7606	19.7557	19.7523	19.7487	(88)
util rest of house	0.9644	0.9279	0.8533	0.7034	0.5191	0.3445	0.2239	0.2631	0.4900	0.7946	0.9352	0.9705	(89)
MIT 2	17.7157	18.1807	18.7748	19.3548	19.6423	19.7438	19.7606	19.7597	19.6948	19.2485	18.3829	17.6362	(90)
Living area fraction										fLA = Living area / (4) =		0.3460	(91)
MIT	18.2308	18.6642	19.2223	19.7761	20.0616	20.1661	20.1862	20.1836	20.1106	19.6650	18.8485	18.1555	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2308	18.6642	19.2223	19.7761	20.0616	20.1661	20.1862	20.1836	20.1106	19.6650	18.8485	18.1555	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9530	0.9133	0.8407	0.7043	0.5353	0.3697	0.2533	0.2949	0.5155	0.7909	0.9220	0.9602	(94)
Useful gains	617.9706	744.5466	833.9358	848.3445	724.1464	502.4872	328.6449	344.8801	522.6308	640.9355	611.8902	585.0982	(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	1312.1177	1294.0767	1193.9795	1012.1564	776.9171	513.3538	330.7515	348.4766	555.9370	842.2782	1095.1130	1305.1849	(97)
Space heating kWh	516.4455	369.2842	267.8725	117.9446	39.2614	0.0000	0.0000	0.0000	0.0000	149.7990	347.9203	535.7445	(98a)
Space heating requirement - total per year (kWh/year)												2344.2721	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	516.4455	369.2842	267.8725	117.9446	39.2614	0.0000	0.0000	0.0000	0.0000	149.7990	347.9203	535.7445	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2344.2721	
Space heating per m2											(98c) / (4) =	35.5732	(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	516.4455	369.2842	267.8725	117.9446	39.2614	0.0000	0.0000	0.0000	0.0000	149.7990	347.9203	535.7445	(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)	559.5292	400.0913	290.2194	127.7839	42.5368	0.0000	0.0000	0.0000	0.0000	162.2958	376.9451	580.4382	(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	191.5240	169.3673	180.3366	160.0116	155.9911	141.5607	140.6462	145.8092	146.8990	162.5637	171.2638	189.6663	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.1709	85.7588	84.9454	83.3861	81.4601	79.8000	79.8000	79.8000	79.8000	83.8768	85.6148	86.2565	(217)
Fuel for water heating, kWh/month	222.2606	197.4926	212.2972	191.8924	191.4938	177.3944	176.2484	182.7184	184.0840	193.8124	200.0398	219.8865	(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	19.6550	15.7680	14.1973	10.4016	8.0345	6.5642	7.3293	9.5269	12.3745	16.2360	18.3386	20.2013	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-51.4472	-67.8984	-91.4775	-96.2601	-98.6425	-90.3576	-89.2554	-86.6922	-81.5520	-74.3709	-54.8966	-45.0477	(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	-45.0434	-92.3074	-179.1337	-263.0287	-342.1853	-341.7706	-337.7033	-288.3961	-214.7729	-129.8319	-59.3975	-35.8037	(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												2539.8397	(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												2349.6205	(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)	158.6272	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-3257.2726	(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	1876.8147	(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	2539.8397	0.2100	533.3663	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2349.6205	0.2100	493.4203	(264)
Space and water heating			1026.7866	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	158.6272	0.1443	22.8948	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-927.8982	0.1360	-126.1874	
PV Unit electricity exported	-2329.3745	0.1266	-294.8511	
Total			-421.0386	(269)
Total CO2, kg/year			640.5721	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.7200	(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	2539.8397	1.1300	2870.0189	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2349.6205	1.1300	2655.0711	(278)
Space and water heating			5525.0900	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	158.6272	1.5338	243.3077	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-927.8982	1.5027	-1394.3363	
PV Unit electricity exported	-2329.3745	0.4647	-1082.3778	
Total			-2476.7141	(283)
Total Primary energy kWh/year			3421.7844	(286)
Target Primary Energy Rate (TPER)			51.9200	(287)

Full SAP Calculation Printout

Property Reference	Unit 5	**Issued on Date**	04/05/2024
Assessment Reference	Unit 5 - Be Lean	**Prop Type Ref**	
Property			

SAP Rating	85 B	**DER**	12.96	**TER**	9.72
Environmental	90 B	**% DER < TER**			-33.33
CO_2 Emissions (t/year)	0.78	**DFEE**	38.10	**TFEE**	45.30
Compliance Check	See BREL	**% DFEE < TFEE**			15.89
% DPER < TPER	-41.61	**DPER**	73.52	**TPER**	51.92

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	65.9000	(1b)	x 2.5000	(2b) =	164.7500	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.9000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		164.7500	(5)

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2. Ventilation rate

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	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)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1214	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2714	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2307	(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	0.2941	0.2884	0.2826	0.2538	0.2480	0.2192	0.2192	0.2134	0.2307	0.2480	0.2595	0.2711	(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	0.5433	0.5416	0.5399	0.5322	0.5307	0.5240	0.5240	0.5228	0.5266	0.5307	0.5337	0.5367	(25)

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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)			8.7000	1.1450	9.9618			(27)
RL			8.8000	1.1450	10.0763			(27a)
Heatloss Floor 1			65.9000	0.1000	6.5900	75.0000	4942.5000	(28a)
External Wall 1	87.0000	8.7000	78.3000	0.1600	12.5280	70.0000	5481.0000	(29a)
FR	65.9000	8.8000	57.1000	0.1000	5.7100	9.0000	513.9000	(30)
Total net area of external elements Aum(A, m2)			218.8000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.8662			(33)
Party Wall 1			19.2500	0.0000	0.0000	45.0000	866.2500	(32)
Internal Wall 1			64.0000			9.0000	576.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12379.6500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		187.8551	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	34.8000	0.0480	1.6704
E14 Flat roof	34.8000	0.1600	5.5680
E16 Corner (normal)	12.5000	0.0350	0.4375
E18 Party wall between dwellings	5.0000	0.0330	0.1650

E1 Steel lintel with perforated steel base plate	4.6000	0.3020	1.3892	
E3 Sill	3.7000	0.0290	0.1073	
E4 Jamb	15.2000	0.0240	0.3648	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.7022 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 54.5684 (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	29.5354	29.4441	29.3546	28.9342	28.8555	28.4893	28.4893	28.4215	28.6304	28.8555	29.0146	29.1810	(38)
Heat transfer coeff	84.1038	84.0125	83.9230	83.5025	83.4239	83.0577	83.0577	82.9899	83.1987	83.4239	83.5830	83.7494	(39)
Average = Sum(39)m / 12 =												83.5022	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2762	1.2748	1.2735	1.2671	1.2659	1.2604	1.2604	1.2593	1.2625	1.2659	1.2683	1.2709	(40)
HLP (average)												1.2671	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.1426 (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

25.9873	25.6014	25.0579	24.0558	23.3054	22.4734	22.0239	22.5636	23.1513	24.0416	25.0643	25.8995	(42b)

Hot water usage for other uses

36.5727	35.2428	33.9129	32.5829	31.2530	29.9231	29.9231	31.2530	32.5829	33.9129	35.2428	36.5727	(42c)

Average daily hot water use (litres/day) 57.3422 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	62.5600	60.8442	58.9707	56.6387	54.5584	52.3965	51.9471	53.8167	55.7342	57.9544	60.3071	62.4722	(44)
Energy conte	99.0798	86.6413	90.6358	77.5356	73.4461	64.4276	62.8255	66.6363	68.7259	78.6436	85.9185	97.8163	(45)
Energy content (annual)										Total = Sum(45)m =		952.3322	

Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss:
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

84.2178	73.6451	77.0405	65.9052	62.4292	54.7634	53.4016	56.6408	58.4170	66.8471	73.0307	83.1439	(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

84.2178	73.6451	77.0405	65.9052	62.4292	54.7634	53.4016	56.6408	58.4170	66.8471	73.0307	83.1439	(64)
								Total per year (kWh/year) = Sum(64)m =			809.4823	(64)
12Total per year (kWh/year)											809	(64)

Electric shower(s)

48.1657	42.9161	46.8627	44.7205	45.5597	43.4595	44.9081	45.5597	44.7205	46.8627	45.9815	48.1657	(64a)
				Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							547.8823	(64a)

Heat gains from water heating, kWh/month

33.0959	29.1403	30.9758	27.6564	26.9972	24.5557	24.5774	25.5501	25.7844	28.4274	29.7531	32.8274	(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	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	94.5952	104.7304	94.5952	97.7483	94.5952	97.7483	94.5952	94.5952	97.7483	94.5952	97.7483	94.5952	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	187.5455	189.4917	184.5875	174.1470	160.9678	148.5812	140.3062	138.3601	143.2643	153.7047	166.8839	179.2705	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	(71)
Water heating gains (Table 5)	44.4837	43.3635	41.6341	38.4117	36.2866	34.1052	33.0342	34.3416	35.8116	38.2089	41.3237	44.1228	(72)
Total internal gains	381.7639	392.7250	375.9562	365.4465	346.9890	335.5742	323.0750	322.4363	331.9637	341.6483	361.0954	373.1280	(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	
Southwest	8.7000	36.7938	0.6300	0.7000	0.7700	97.8287	(79)
Horizontal	8.8000	26.0000	0.6300	0.7000	1.0000	90.8107	(82)

Solar gains	188.6394	355.2453	563.3030	806.4134	987.0319	1012.6854	962.9899	825.9139	648.5407	414.6905	232.4359	157.0681	(83)
Total gains	570.4033	747.9703	939.2593	1171.8600	1334.0209	1348.2596	1286.0649	1148.3501	980.5044	756.3387	593.5314	530.1961	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	40.8875	40.9319	40.9756	41.1819	41.2207	41.4024	41.4024	41.4363	41.3323	41.2207	41.1422	41.0605

alpha	3.7258	3.7288	3.7317	3.7455	3.7480	3.7602	3.7602	3.7624	3.7555	3.7480	3.7428	3.7374	
util living area	0.9790	0.9477	0.8771	0.7272	0.5470	0.3870	0.2824	0.3289	0.5502	0.8399	0.9587	0.9836	(86)
MIT	19.3347	19.7327	20.2259	20.6881	20.9091	20.9806	20.9954	20.9920	20.9317	20.5416	19.8312	19.2551	(87)
Th 2	19.8595	19.8606	19.8617	19.8667	19.8676	19.8720	19.8720	19.8728	19.8703	19.8676	19.8657	19.8637	(88)
util rest of house	0.9739	0.9360	0.8523	0.6831	0.4898	0.3216	0.2108	0.2499	0.4719	0.7980	0.9473	0.9796	(89)
MIT 2	18.3773	18.7645	19.2299	19.6395	19.8123	19.8635	19.8708	19.8705	19.8361	19.5331	18.8706	18.3022	(90)
Living area fraction									fLA = Living area / (4) =			0.3460	(91)
MIT	18.7085	19.0995	19.5745	20.0023	20.1918	20.2500	20.2599	20.2585	20.2151	19.8820	19.2030	18.6319	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7085	19.0995	19.5745	20.0023	20.1918	20.2500	20.2599	20.2585	20.2151	19.8820	19.2030	18.6319	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9671	0.9265	0.8452	0.6887	0.5066	0.3437	0.2356	0.2772	0.4967	0.7986	0.9390	0.9737	(94)
Useful gains	551.6487	692.9845	793.8899	807.0894	675.8155	463.4509	302.9571	318.3201	486.9777	603.9887	557.3014	516.2316	(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	1211.8126	1192.9311	1097.2506	927.0670	708.4181	469.2724	303.9822	320.2155	508.7724	774.3393	1011.6021	1208.6592	(97)
Space heating kWh	491.1620	335.9641	225.7004	86.3838	24.2563	0.0000	0.0000	0.0000	0.0000	126.7409	327.0965	515.1662	(98a)
Space heating requirement - total per year (kWh/year)												2132.4701	
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	491.1620	335.9641	225.7004	86.3838	24.2563	0.0000	0.0000	0.0000	0.0000	126.7409	327.0965	515.1662	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2132.4701	
Space heating per m2											(98c) / (4) =	32.3592	(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	780.7423	614.6269	630.7231	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9499	0.9716	0.9576	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	741.5977	597.1656	603.9972	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1422.7182	1358.3638	1218.0991	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	490.4068	566.3315	456.8918	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	122.6017	141.5829	114.2230	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												378.4075	(107)
Energy for space heating												32.3592	(99)
Energy for space cooling												5.7421	(108)
Total												38.1013	(109)
Fabric Energy Efficiency (DFEE)												38.1	(109)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	65.9000	(1b)	x 2.5000	(2b) =	164.7500	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.9000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		164.7500	(5)

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2. Ventilation rate

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	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)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1214 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3714 (18)
Number of sides sheltered		2 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3157 (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	0.4025	0.3946	0.3867	0.3473	0.3394	0.2999	0.2999	0.2920	0.3157	0.3394	0.3551	0.3709	(22b)
Effective ac	0.5810	0.5779	0.5748	0.5603	0.5576	0.5450	0.5450	0.5426	0.5498	0.5576	0.5631	0.5688	(25)

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)

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 Opening Type (Uw = 1.20)			8.1900	1.1450	9.3779			(27)
RL			8.2800	1.5918	13.1798			(27a)
Heatloss Floor 1			65.9000	0.1300	8.5670			(28a)
External Wall 1	87.0000	8.1900	78.8100	0.1800	14.1858			(29a)
FR	65.9000	8.2800	57.6200	0.1100	6.3382			(30)
Total net area of external elements Aum(A, m2)			218.8000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		51.6486			(33)
Party Wall 1			19.2500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 187.8551 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	34.8000	0.1600	5.5680
E14 Flat roof	34.8000	0.0800	2.7840
E16 Corner (normal)	12.5000	0.0900	1.1250
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E1 Steel lintel with perforated steel base plate	4.6000	0.0500	0.2300
E3 Sill	3.7000	0.0500	0.1850
E4 Jamb	15.2000	0.0500	0.7600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.9520 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 62.6006 (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	31.5877	31.4167	31.2491	30.4617	30.3144	29.6287	29.6287	29.5017	29.8928	30.3144	30.6124	30.9240	(38)
Heat transfer coeff	94.1883	94.0173	93.8497	93.0624	92.9151	92.2293	92.2293	92.1023	92.4935	92.9151	93.2131	93.5246	(39)
Average = Sum(39)m / 12 =												93.0617	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4293	1.4267	1.4241	1.4122	1.4099	1.3995	1.3995	1.3976	1.4035	1.4099	1.4145	1.4192	(40)
HLP (average)												1.4122	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.1426 (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

25.9873	25.6014	25.0579	24.0558	23.3054	22.4734	22.0239	22.5636	23.1513	24.0416	25.0643	25.8995	(42b)

Hot water usage for other uses

36.5727	35.2428	33.9129	32.5829	31.2530	29.9231	29.9231	31.2530	32.5829	33.9129	35.2428	36.5727	(42c)

Average daily hot water use (litres/day) 57.3422 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	62.5600	60.8442	58.9707	56.6387	54.5584	52.3965	51.9471	53.8167	55.7342	57.9544	60.3071	62.4722	(44)
Energy conte	99.0798	86.6413	90.6358	77.5356	73.4461	64.4276	62.8255	66.6363	68.7259	78.6436	85.9185	97.8163	(45)
Energy content (annual)										Total = Sum(45)m =		952.3322	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	84.2178	73.6451	77.0405	65.9052	62.4292	54.7634	53.4016	56.6408	58.4170	66.8471	73.0307	83.1439	(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	84.2178	73.6451	77.0405	65.9052	62.4292	54.7634	53.4016	56.6408	58.4170	66.8471	73.0307	83.1439	(64)
									Total per year (kWh/year) = Sum(64)m =			809.4823	(64)
12Total per year (kWh/year)												809	(64)
Electric shower(s)	48.1657	42.9161	46.8627	44.7205	45.5597	43.4595	44.9081	45.5597	44.7205	46.8627	45.9815	48.1657	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							547.8823	(64a)
Heat gains from water heating, kWh/month	33.0959	29.1403	30.9758	27.6564	26.9972	24.5557	24.5774	25.5501	25.7844	28.4274	29.7531	32.8274	(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	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	94.5952	104.7304	94.5952	97.7483	94.5952	97.7483	94.5952	94.5952	97.7483	94.5952	97.7483	94.5952	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													

	187.5455	189.4917	184.5875	174.1470	160.9678	148.5812	140.3062	138.3601	143.2643	153.7047	166.8839	179.2705	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	(71)
Water heating gains (Table 5)													
	44.4837	43.3635	41.6341	38.4117	36.2866	34.1052	33.0342	34.3416	35.8116	38.2089	41.3237	44.1228	(72)
Total internal gains													
	381.7639	392.7250	375.9562	365.4465	346.9890	335.5742	323.0750	322.4363	331.9637	341.6483	361.0954	373.1280	(73)

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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	
Southwest	8.1900	36.7938	0.6300	0.7000	0.7700	92.0939	(79)
Horizontal	8.2800	26.0000	0.6300	0.7000	1.0000	85.4446	(82)

Solar gains	177.5385	334.3319	530.1242	758.8946	928.8561	952.9926	906.2284	777.2404	610.3339	390.2726	218.7562	147.8261	(83)
Total gains	559.3024	727.0569	906.0804	1124.3411	1275.8451	1288.5668	1229.3034	1099.6767	942.2976	731.9209	579.8516	520.9541	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	36.5097	36.5761	36.6415	36.9515	37.0101	37.2852	37.2852	37.3366	37.1788	37.0101	36.8917	36.7688	
alpha	3.4340	3.4384	3.4428	3.4634	3.4673	3.4857	3.4857	3.4891	3.4786	3.4673	3.4594	3.4513	
util living area													
	0.9813	0.9566	0.9014	0.7765	0.6086	0.4412	0.3254	0.3767	0.6090	0.8698	0.9648	0.9851	(86)
MIT	19.0502	19.4413	19.9630	20.5166	20.8326	20.9584	20.9890	20.9818	20.8768	20.3697	19.5938	18.9812	(87)
Th 2	19.7410	19.7429	19.7449	19.7540	19.7557	19.7637	19.7637	19.7652	19.7606	19.7557	19.7523	19.7487	(88)
util rest of house													
	0.9765	0.9461	0.8790	0.7327	0.5446	0.3623	0.2362	0.2794	0.5212	0.8306	0.9545	0.9812	(89)
MIT 2	18.0118	18.3949	18.8937	19.3980	19.6532	19.7456	19.7608	19.7600	19.6985	19.2915	18.5568	17.9493	(90)
Living area fraction										fLA = Living area / (4) =		0.3460	(91)
MIT	18.3711	18.7570	19.2637	19.7850	20.0612	20.1652	20.1858	20.1827	20.1062	19.6645	18.9156	18.3063	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3711	18.7570	19.2637	19.7850	20.0612	20.1652	20.1858	20.1827	20.1062	19.6645	18.9156	18.3063	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9695	0.9357	0.8689	0.7339	0.5611	0.3885	0.2670	0.3129	0.5471	0.8272	0.9454	0.9751	(94)
Useful gains	542.2216	680.2991	787.3040	825.1503	715.8239	500.5879	328.2176	344.0600	515.4914	605.4532	548.2007	507.9847	(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													
	1325.3303	1302.7937	1197.8679	1012.9875	776.8831	513.2740	330.7121	348.3990	555.5305	842.2331	1101.3668	1319.2905	(97)
Space heating kWh													
	582.6329	418.3164	305.4596	135.2427	45.4281	0.0000	0.0000	0.0000	0.0000	176.1642	398.2796	603.6115	(98a)
Space heating requirement - total per year (kWh/year)												2665.1350	
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													
	582.6329	418.3164	305.4596	135.2427	45.4281	0.0000	0.0000	0.0000	0.0000	176.1642	398.2796	603.6115	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2665.1350	
Space heating per m2											(98c) / (4) =	40.4421	(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	866.9557	682.4971	699.9778	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9130	0.9466	0.9252	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	791.5090	646.0712	647.5865	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1359.9163	1298.6048	1166.6786	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	409.2533	485.4850	386.2046	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	102.3133	121.3713	96.5511	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												320.2357	(107)
Energy for space heating												40.4421	(99)
Energy for space cooling												4.8594	(108)
Total												45.3015	(109)
Fabric Energy Efficiency (TFEE)												45.3	(109)

Full SAP Calculation Printout

Property Reference	Unit 5	**Issued on Date**	04/05/2024
Assessment Reference	Unit 5 - Be Lean	**Prop Type Ref**	
Property			

SAP Rating	85 B	**DER**	12.96	**TER**	9.72
Environmental	90 B	**% DER < TER**			-33.33
CO_2 Emissions (t/year)	0.78	**DFEE**	38.10	**TFEE**	45.30
Compliance Check	See BREL	**% DFEE < TFEE**			15.89
% DPER < TPER	-41.61	**DPER**	73.52	**TPER**	51.92

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	65.9000	(1b)	x 2.5000	(2b) =	164.7500	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.9000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	164.7500	(5)

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2. Ventilation rate

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

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	80.1000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2621	0.2589	0.2557	0.2397	0.2366	0.2206	0.2206	0.2174	0.2270	0.2366	0.2429	0.2493	(25)

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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)			8.7000	1.1450	9.9618			(27)
RL			8.8000	1.1450	10.0763			(27a)
Heatloss Floor 1			65.9000	0.1000	6.5900	75.0000	4942.5000	(28a)
External Wall 1	87.0000	8.7000	78.3000	0.1600	12.5280	70.0000	5481.0000	(29a)
FR	65.9000	8.8000	57.1000	0.1000	5.7100	9.0000	513.9000	(30)
Total net area of external elements Aum(A, m2)			218.8000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.8662			(33)
Party Wall 1			19.2500	0.0000	0.0000	45.0000	866.2500	(32)
Internal Wall 1			64.0000			9.0000	576.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 12379.6500	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	187.8551	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	34.8000	0.0480	1.6704

E14 Flat roof	34.8000	0.1600	5.5680	
E16 Corner (normal)	12.5000	0.0350	0.4375	
E18 Party wall between dwellings	5.0000	0.0330	0.1650	
E1 Steel lintel with perforated steel base plate	4.6000	0.3020	1.3892	
E3 Sill	3.7000	0.0290	0.1073	
E4 Jamb	15.2000	0.0240	0.3648	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.7022 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 54.5684 (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	14.2477	14.0744	13.9011	13.0346	12.8613	11.9948	11.9948	11.8215	12.3414	12.8613	13.2079	13.5545	(38)
Heat transfer coeff	68.8161	68.6428	68.4695	67.6030	67.4297	66.5632	66.5632	66.3899	66.9098	67.4297	67.7763	68.1229	(39)

Average = Sum(39)m / 12 = 67.5597

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0442	1.0416	1.0390	1.0258	1.0232	1.0101	1.0101	1.0074	1.0153	1.0232	1.0285	1.0337	(40)
HLP (average)												1.0252	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.1426 (42)

Hot water usage for mixer showers

115.8447	114.1037	111.5669	106.7131	103.1311	99.1364	96.8659	99.3836	102.1434	106.4324	111.3905	115.4008	(42a)

Hot water usage for baths

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)

Hot water usage for other uses

36.5727	35.2428	33.9129	32.5829	31.2530	29.9231	29.9231	31.2530	32.5829	33.9129	35.2428	36.5727	(42c)

Average daily hot water use (litres/day) 140.0528 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	152.4174	149.3465	145.4797	139.2960	134.3841	129.0595	126.7890	130.6366	134.7263	140.3452	146.6332	151.9735	(44)
Energy conte	241.3918	212.6675	223.5969	190.6893	180.9068	158.6938	153.3403	161.7554	166.1310	190.4472	208.9059	237.9538	(45)
Energy content (annual)										Total = Sum(45)m =		2326.4797	
Distribution loss (46)m = 0.15 x (45)m	36.2088	31.9001	33.5395	28.6034	27.1360	23.8041	23.0010	24.2633	24.9197	28.5671	31.3359	35.6931	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.1200 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.6048 (55)

Total storage loss

18.7488	16.9344	18.7488	18.1440	18.7488	18.1440	18.7488	18.7488	18.1440	18.7488	18.1440	18.7488	(56)

If cylinder contains dedicated solar storage

18.7488	16.9344	18.7488	18.1440	18.7488	18.1440	18.7488	18.7488	18.1440	18.7488	18.1440	18.7488	(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

283.4030	250.6131	265.6081	231.3453	222.9180	199.3498	195.3515	203.7666	206.7870	232.4584	249.5619	279.9650	(62)
WWHRS	-66.2276	-58.5722	-61.3334	-50.7865	-47.3312	-40.5016	-37.9638	-40.3707	-41.9046	-49.4008	-55.9652	-65.0011	(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

217.1755	192.0409	204.2747	180.5588	175.5868	158.8481	157.3877	163.3959	164.8825	183.0575	193.5968	214.9639	(64)

Total per year (kWh/year) = Sum(64)m = 2205.7689 (64)

12Total per year (kWh/year) 2206 (64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

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

Heat gains from water heating, kWh/month

113.8717	101.0684	107.9549	95.9290	93.7605	85.2905	84.5946	87.3926	87.7634	96.9326	101.9860	112.7286	(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	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	94.5952	104.7304	94.5952	97.7483	94.5952	97.7483	94.5952	94.5952	97.7483	94.5952	97.7483	94.5952	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	187.5455	189.4917	184.5875	174.1470	160.9678	148.5812	140.3062	138.3601	143.2643	153.7047	166.8839	179.2705	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	(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)	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	(71)
Water heating gains (Table 5)	153.0534	150.3994	145.1007	133.2347	126.0221	118.4590	113.7024	117.4632	121.8936	130.2858	141.6473	151.5169	(72)
Total internal gains	493.3336	502.7609	482.4228	463.2695	439.7246	419.9280	403.7433	405.5579	418.0456	436.7252	464.4190	483.5221	(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	
Southwest	8.7000	36.7938	0.6300	0.7000	0.7700	97.8287	(79)
Horizontal	8.8000	26.0000	0.6300	0.7000	1.0000	90.8107	(82)

Solar gains	188.6394	355.2453	563.3030	806.4134	987.0319	1012.6854	962.9899	825.9139	648.5407	414.6905	232.4359	157.0681	(83)
Total gains	681.9730	858.0062	1045.7259	1269.6829	1426.7565	1432.6134	1366.7332	1231.4718	1066.5863	851.4156	696.8549	640.5901	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	49.9708	50.0969	50.2237	50.8675	50.9982	51.6621	51.6621	51.7969	51.3944	50.9982	50.7374	50.4793	
alpha	4.3314	4.3398	4.3482	4.3912	4.3999	4.4441	4.4441	4.4531	4.4263	4.3999	4.3825	4.3653	
util living area	0.9548	0.8994	0.7913	0.6076	0.4328	0.2964	0.2141	0.2476	0.4268	0.7284	0.9135	0.9634	(86)
MIT	19.9669	20.3079	20.6567	20.9030	20.9801	20.9971	20.9995	20.9990	20.9864	20.8309	20.3640	19.9036	(87)
Th 2	20.0466	20.0488	20.0510	20.0619	20.0640	20.0750	20.0750	20.0771	20.0706	20.0640	20.0597	20.0553	(88)
util rest of house	0.9455	0.8817	0.7614	0.5682	0.3912	0.2539	0.1692	0.1981	0.3715	0.6826	0.8948	0.9557	(89)
MIT 2	18.8787	19.2941	19.7003	19.9732	20.0486	20.0733	20.0748	20.0768	20.0619	19.9117	19.3790	18.8069	(90)
Living area fraction										fLA = Living area / (4) =		0.3460	(91)
MIT	19.2552	19.6449	20.0312	20.2949	20.3709	20.3929	20.3947	20.3958	20.3817	20.2297	19.7198	19.1863	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.1052	19.4949	19.8812	20.1449	20.2209	20.2429	20.2447	20.2458	20.2317	20.0797	19.5698	19.0363	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9341	0.8698	0.7557	0.5718	0.3983	0.2617	0.1774	0.2072	0.3812	0.6834	0.8834	0.9452	(94)
Useful gains	637.0621	746.3109	790.2439	725.9620	568.2383	374.8880	242.5108	255.1417	406.5751	581.8895	615.5951	605.5053	(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	1018.8332	1001.8316	916.2046	760.1888	574.5583	375.6111	242.6028	255.3251	410.2739	639.2142	845.1543	1010.6942	(97)
Space heating kWh	284.0377	171.7099	93.7147	24.6433	4.7020	0.0000	0.0000	0.0000	0.0000	42.6496	165.2826	301.4605	(98a)
Space heating requirement - total per year (kWh/year)												1088.2003	
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	284.0377	171.7099	93.7147	24.6433	4.7020	0.0000	0.0000	0.0000	0.0000	42.6496	165.2826	301.4605	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1088.2003	
Space heating per m2											(98c) / (4) =	16.5129	(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 %) 89.5000 (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	284.0377	171.7099	93.7147	24.6433	4.7020	0.0000	0.0000	0.0000	0.0000	42.6496	165.2826	301.4605	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	317.3605	191.8546	104.7092	27.5344	5.2537	0.0000	0.0000	0.0000	0.0000	47.6532	184.6733	336.8274	(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	217.1755	192.0409	204.2747	180.5588	175.5868	158.8481	157.3877	163.3959	164.8825	183.0575	193.5968	214.9639	(64)
Efficiency of water heater												82.0000	(216)
(217)m	86.0882	85.3773	84.2195	82.8336	82.1796	82.0000	82.0000	82.0000	82.0000	83.3193	85.2917	86.2175	(217)
Fuel for water heating, kWh/month	252.2708	224.9319	242.5503	217.9777	213.6623	193.7172	191.9362	199.2632	201.0762	219.7059	226.9819	249.3274	(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	14.7148	13.2908	14.7148	14.2401	14.7148	14.2401	14.7148	14.7148	14.2401	14.7148	14.2401	14.7148	(231)
Lighting	18.8551	15.1263	13.6195	9.9783	7.7075	6.2971	7.0310	9.1392	11.8709	15.5753	17.5923	19.3792	(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 1215.8663 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 82.0000
Water heating fuel used 2633.4011 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.6580)
mechanical ventilation fans (SFP = 0.6580) 132.2547 (230a)
central heating pump 41.0000 (230c)
Total electricity for the above, kWh/year 173.2547 (231)
Electricity for lighting (calculated in Appendix L) 152.1717 (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	4174.6938	(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	1215.8663	0.2100	255.3319	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2633.4011	0.2100	553.0142	(264)
Space and water heating			808.3461	(265)
Pumps, fans and electric keep-hot	173.2547	0.1387	24.0326	(267)
Energy for lighting	152.1717	0.1443	21.9631	(268)
Total CO2, kg/year			854.3418	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.9600	(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	1215.8663	1.1300	1373.9289	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2633.4011	1.1300	2975.7432	(278)
Space and water heating			4349.6721	(279)
Pumps, fans and electric keep-hot	173.2547	1.5128	262.0997	(281)
Energy for lighting	152.1717	1.5338	233.4061	(282)
Total Primary energy kWh/year			4845.1779	(286)
Dwelling Primary energy Rate (DPER)			73.5200	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	65.9000	(1b)	x 2.5000	(2b) =	164.7500	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.9000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		164.7500	(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)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1214	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3714	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3157	(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	0.4025	0.3946	0.3867	0.3473	0.3394	0.2999	0.2999	0.2920	0.3157	0.3394	0.3551	0.3709	(22b)
Effective ac	0.5810	0.5779	0.5748	0.5603	0.5576	0.5450	0.5450	0.5426	0.5498	0.5576	0.5631	0.5688	(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 Opening Type (Uw = 1.20)			8.1900	1.1450	9.3779			(27)
RL			8.2800	1.5918	13.1798			(27a)
Heatloss Floor 1			65.9000	0.1300	8.5670			(28a)

External Wall 1	87.0000	8.1900	78.8100	0.1800	14.1858	(29a)
FR	65.9000	8.2800	57.6200	0.1100	6.3382	(30)
Total net area of external elements Aum(A, m2)			218.8000			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		51.6486	(33)
Party Wall 1			19.2500	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 187.8551 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	34.8000	0.1600	5.5680
E14 Flat roof	34.8000	0.0800	2.7840
E16 Corner (normal)	12.5000	0.0900	1.1250
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E1 Steel lintel with perforated steel base plate	4.6000	0.0500	0.2300
E3 Sill	3.7000	0.0500	0.1850
E4 Jamb	15.2000	0.0500	0.7600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.9520 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 62.6006 (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	31.5877	31.4167	31.2491	30.4617	30.3144	29.6287	29.6287	29.5017	29.8928	30.3144	30.6124	30.9240	(38)
Heat transfer coeff	94.1883	94.0173	93.8497	93.0624	92.9151	92.2293	92.2293	92.1023	92.4935	92.9151	93.2131	93.5246	(39)

Average = Sum(39)m / 12 = 93.0617

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4293	1.4267	1.4241	1.4122	1.4099	1.3995	1.3995	1.3976	1.4035	1.4099	1.4145	1.4192	(40)
HLP (average)												1.4122	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.1426 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
77.2298	76.0692	74.3779	71.1420	68.7540	66.0910	64.5773	66.2557	68.0956	70.9549	74.2603	76.9339	(42a)

Hot water usage for baths

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)

Hot water usage for other uses

36.5727	35.2428	33.9129	32.5829	31.2530	29.9231	29.9231	31.2530	32.5829	33.9129	35.2428	36.5727	(42c)

Average daily hot water use (litres/day) 104.4512 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	113.8025	111.3119	108.2908	103.7250	100.0071	96.0141	94.5004	97.5087	100.6785	104.8678	109.5031	113.5066	(44)
Energy conte	180.2353	158.5067	166.4389	141.9943	134.6287	118.0605	114.2900	120.7362	124.1467	142.3046	156.0072	177.7239	(45)
Energy content (annual)										Total = Sum(45)m =		1735.0730	
Distribution loss (46)m = 0.15 x (45)m	27.0353	23.7760	24.9658	21.2991	20.1943	17.7091	17.1435	18.1104	18.6220	21.3457	23.4011	26.6586	(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

226.8302	200.5924	213.0338	187.0861	181.2236	163.1523	160.8849	167.3311	169.2385	188.8995	201.0991	224.3188	(62)
WWHRS -35.3062	-31.2251	-32.6971	-27.0745	-25.2325	-21.5916	-20.2387	-21.5218	-22.3395	-26.3358	-29.8353	-34.6524	(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

191.5240	169.3673	180.3366	160.0116	155.9911	141.5607	140.6462	145.8092	146.8990	162.5637	171.2638	189.6663	(64)

Total per year (kWh/year) = Sum(64)m = 1955.6396 (64)

12Total per year (kWh/year) 1956 (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

97.2042	86.3721	92.6169	83.2866	82.0400	75.3286	75.2774	77.4207	77.3522	84.5922	87.9459	96.3691	(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	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	107.1316	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	94.5952	104.7304	94.5952	97.7483	94.5952	97.7483	94.5952	94.5952	97.7483	94.5952	97.7483	94.5952	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	187.5455	189.4917	184.5875	174.1470	160.9678	148.5812	140.3062	138.3601	143.2643	153.7047	166.8839	179.2705	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	33.7132	(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)	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	-85.7053	(71)
Water heating gains (Table 5)	130.6507	128.5298	124.4850	115.6758	110.2688	104.6230	101.1792	104.0601	107.4337	113.6992	122.1470	129.5284	(72)
Total internal gains	470.9309	480.8913	461.8071	445.7106	423.9712	406.0921	391.2201	392.1548	403.5858	420.1385	444.9188	461.5335	(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

Southwest			8.1900		36.7938		0.6300		0.7000		0.7700	92.0939	(79)
Horizontal			8.2800		26.0000		0.6300		0.7000		1.0000	85.4446	(82)
Solar gains	177.5385	334.3319	530.1242	758.8946	928.8561	952.9926	906.2284	777.2404	610.3339	390.2726	218.7562	147.8261	(83)
Total gains	648.4694	815.2232	991.9313	1204.6052	1352.8273	1359.0847	1297.4484	1169.3952	1013.9196	810.4112	663.6750	609.3597	(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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	36.5097	36.5761	36.6415	36.9515	37.0101	37.2852	37.2852	37.3366	37.1788	37.0101	36.8917	36.7688	
alpha	3.4340	3.4384	3.4428	3.4634	3.4673	3.4857	3.4857	3.4891	3.4786	3.4673	3.4594	3.4513	
util living area	0.9714	0.9413	0.8790	0.7491	0.5824	0.4206	0.3090	0.3555	0.5761	0.8390	0.9492	0.9764	(86)
MIT	19.2045	19.5782	20.0682	20.5726	20.8542	20.9642	20.9907	20.9849	20.8965	20.4524	19.7285	19.1372	(87)
Th 2	19.7410	19.7429	19.7449	19.7540	19.7557	19.7637	19.7637	19.7652	19.7606	19.7557	19.7523	19.7487	(88)
util rest of house	0.9644	0.9279	0.8533	0.7034	0.5191	0.3445	0.2239	0.2631	0.4900	0.7946	0.9352	0.9705	(89)
MIT 2	17.7157	18.1807	18.7748	19.3548	19.6423	19.7438	19.7606	19.7597	19.6948	19.2485	18.3829	17.6362	(90)
Living area fraction										fLA = Living area / (4) =		0.3460	(91)
MIT	18.2308	18.6642	19.2223	19.7761	20.0616	20.1661	20.1862	20.1836	20.1106	19.6650	18.8485	18.1555	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2308	18.6642	19.2223	19.7761	20.0616	20.1661	20.1862	20.1836	20.1106	19.6650	18.8485	18.1555	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9530	0.9133	0.8407	0.7043	0.5353	0.3697	0.2533	0.2949	0.5155	0.7909	0.9220	0.9602	(94)
Useful gains	617.9706	744.5466	833.9358	848.3445	724.1464	502.4872	328.6449	344.8801	522.6308	640.9355	611.8902	585.0982	(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	1312.1177	1294.0767	1193.9795	1012.1564	776.9171	513.3538	330.7515	348.4766	555.9370	842.2782	1095.1130	1305.1849	(97)
Space heating kWh	516.4455	369.2842	267.8725	117.9446	39.2614	0.0000	0.0000	0.0000	0.0000	149.7990	347.9203	535.7445	(98a)
Space heating requirement - total per year (kWh/year)												2344.2721	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	516.4455	369.2842	267.8725	117.9446	39.2614	0.0000	0.0000	0.0000	0.0000	149.7990	347.9203	535.7445	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2344.2721	
Space heating per m2											(98c) / (4) =	35.5732	(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	516.4455	369.2842	267.8725	117.9446	39.2614	0.0000	0.0000	0.0000	0.0000	149.7990	347.9203	535.7445	(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)	559.5292	400.0913	290.2194	127.7839	42.5368	0.0000	0.0000	0.0000	0.0000	162.2958	376.9451	580.4382	(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	191.5240	169.3673	180.3366	160.0116	155.9911	141.5607	140.6462	145.8092	146.8990	162.5637	171.2638	189.6663	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.1709	85.7588	84.9454	83.3861	81.4601	79.8000	79.8000	79.8000	79.8000	83.8768	85.6148	86.2565	(217)
Fuel for water heating, kWh/month	222.2606	197.4926	212.2972	191.8924	191.4938	177.3944	176.2484	182.7184	184.0840	193.8124	200.0398	219.8865	(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	19.6550	15.7680	14.1973	10.4016	8.0345	6.5642	7.3293	9.5269	12.3745	16.2360	18.3386	20.2013	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-51.4472	-67.8984	-91.4775	-96.2601	-98.6425	-90.3576	-89.2554	-86.6922	-81.5520	-74.3709	-54.8966	-45.0477	(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	-45.0434	-92.3074	-179.1337	-263.0287	-342.1853	-341.7706	-337.7033	-288.3961	-214.7729	-129.8319	-59.3975	-35.8037	(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												2539.8397	(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												2349.6205	(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)	158.6272	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-3257.2726	(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	1876.8147	(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	2539.8397	0.2100	533.3663	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2349.6205	0.2100	493.4203	(264)
Space and water heating			1026.7866	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	158.6272	0.1443	22.8948	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-927.8982	0.1360	-126.1874	
PV Unit electricity exported	-2329.3745	0.1266	-294.8511	
Total			-421.0386	(269)
Total CO2, kg/year			640.5721	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.7200	(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	2539.8397	1.1300	2870.0189	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2349.6205	1.1300	2655.0711	(278)
Space and water heating			5525.0900	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	158.6272	1.5338	243.3077	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-927.8982	1.5027	-1394.3363	
PV Unit electricity exported	-2329.3745	0.4647	-1082.3778	
Total			-2476.7141	(283)
Total Primary energy kWh/year			3421.7844	(286)
Target Primary Energy Rate (TPER)			51.9200	(287)