



Westcott Court, 13 Holmdale Road, NW6 Energy Statement for Planning

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19.03.24

19.03.24

Signed:

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1.0 Introduction

- 1.1 T16 Design has been appointed to produce this Energy Statement for the proposed development at Westcott Court, 13 Holmdale Road, NW6.
- 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 3-stage Energy Hierarchy expounded by the London Plan, Policy SI 2 and Camden Local Policy CC1.
- 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 achieve net zero carbon 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%

2.0 Project Summary

- 2.1 The proposal site is at Westcott Court, 13 Holmdale Road, NW6. It is currently occupied by three single storey garages.
- 2.2 The proposal is for the demolition of the existing garages to be replaced by a three storey dwelling.
- 2.3 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.
- Policy SI 4 – Managing Heat risk. .

3.1.2 Camden Local Plan Policy CC1 'Climate Change Mitigation.'

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

3.3 It is our understanding that Camden Council is currently consulting on a new Local Plan, but this is not yet active.

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 CO₂.
- 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 L1.
- 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.

Westcott Court – Baseline Emissions	
Regulated Emissions	Baseline Emissions
	1.2 Tonnes CO ₂ /Year

Table 1 –Baseline Emissions

5.0 Baseline Emissions

Notional dwelling specification for new dwellings	
Element or system	Reference value for target setting
Opening areas (windows, roof windows, rooflights and doors)	Same as for actual dwelling not exceed a total area of openings of 25% of total floor area
External walls (inc semi-exposed)	$U = 0.18 \text{ W/(m}^2\text{k)}$
Party walls	$U = 0.00$
Floors	$U = 0.13 \text{ W/(m}^2\text{k)}$
Roofs	$U = 0.11 \text{ W/(m}^2\text{k)}$
Opaque Door (Less than 30% glazed area)	$U = 1.0 \text{ W/(m}^2\text{k)}$
Semi-glazed door (30-60% glazed area)	$U = 1.0 \text{ W/(m}^2\text{k)}$
Windows and glazed with greater than 60% glazed area)	$U = 1.2 \text{ W/(m}^2\text{k)}$ Frame factor = 0.7
Roof windows	$U = 1.2 \text{ W/(m}^2\text{k)}$, when in vertical position (for correction due to angle see specification in SAP 10 appendix R)
Rooflights	$U = 1.7 \text{ W/(m}^2\text{k)}$, when in horizontal position (for correction due to angle see specification in SAP10 appendix R)
Ventilation system	Natural ventilation with intermittent extract fans
Air Permeability	$5 \text{ m}^3 / (\text{hm}^2) \text{ at } 50 \text{ Pa}$
Main heating fuel (space and water)	Mains gas
Boiler	Efficiency, SEDBUK 2009 = 89.5%
Heating system controls	Boiler interlock, Erp Class V
	Either: -Single storey dwelling in which the living area is greater than 70% of the total floor area: programmer and room thermostat -Any other dwelling: time and temperature zone control Thermostatic radiator valves
Hot water system	Heat by boiler (regular or combi as above) Separate time control for space and water heating
Wastewater heat recovery	All showers connected to WWHR, including showers over baths
Hot water cylinder	Instantaneous WWHR with 36% recovery efficiency utilisation of 0.98 If cylinder, declared loss factor = $0.85 \times (0.2 + 0.051 V^{2/3}) \text{ kWh/day}$ Where V is the volume of the cylinder in litres
Lighting	Fixed lighting capacity (lm) = $185 \times \text{total floor area}$ Efficacy of all fixed lighting = 80 lm/W
Air conditioning	None
Photovoltaic (PV) system	For houses: kWp = 40% of ground floor area, including unheated spaces/ 6.5
	For flats: kWp = 40% of dwelling floor area/ (6.5 x number of storeys in block System facing south-east or south west

Table 2– Notional Dwelling Specification

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 A gas combi boiler with an 89.5% efficiency has been assumed at this stage in accordance with the London Plan Energy statement guidance.
- 6.3 Electrical lighting also represents a significant energy use within a building. 100% low energy lighting is proposed to reduce emissions.
- 6.4 Improved thermal bridging details are also proposed for the new dwelling.
- 6.5 It is proposed that a Waste Water Heat Recovery System (WWHRS) will be installed. This is assumed to have an efficiency of 54.9%.
- 6.6 It is assumed that the proposed dwelling will be naturally ventilated, with extract fans in the wet rooms.
- 6.7 The proposed U-values, with the relevant Part L backstop are shown below

Be Lean Fabric Specification			
Element or system	Notional Value	Proposed Value	% Improvement
External walls	$U = 0.18 \text{ W}/(\text{m}^2\text{k})$	$U = 0.15 \text{ W}/(\text{m}^2\text{k})$	16.15%
Party walls	$U = 0.00$	N/A	N/A
Ground Floor	$U = 0.13 \text{ W}/(\text{m}^2\text{k})$	$U = 0.10 \text{ W}/(\text{m}^2\text{k})$	23.07%
Roofs	$U = 0.11 \text{ W}/(\text{m}^2\text{k})$	$U = 0.10 \text{ W}/(\text{m}^2\text{k})$	10.00%
Glazing	$U = 1.2 \text{ W}/(\text{m}^2\text{k})$	$U = 1.0 \text{ W}/(\text{m}^2\text{k})$	16.15%
Air Permeability	$5 \text{ m}^3/(\text{hm}^2) \text{ at } 50 \text{ Pa}$	$4 \text{ m}^3/(\text{hm}^2) \text{ at } 50 \text{ Pa}$	20.00%
Lighting	Efficacy of all fixed lighting = 80 lm/W	Efficacy of all fixed lighting = 120 lm/W	50.00%

Table 3 – Be Lean Residential Fabric Specification

6.0 Be Lean Strategy

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.

Westcott Court Be Lean Emissions			
	Baseline Emissions	Be Lean Emissions	% Reduction
Regulated Emissions	1.2 (Tonnes CO ₂ /Year)	1.0 (Tonnes CO ₂ /Year)	21%

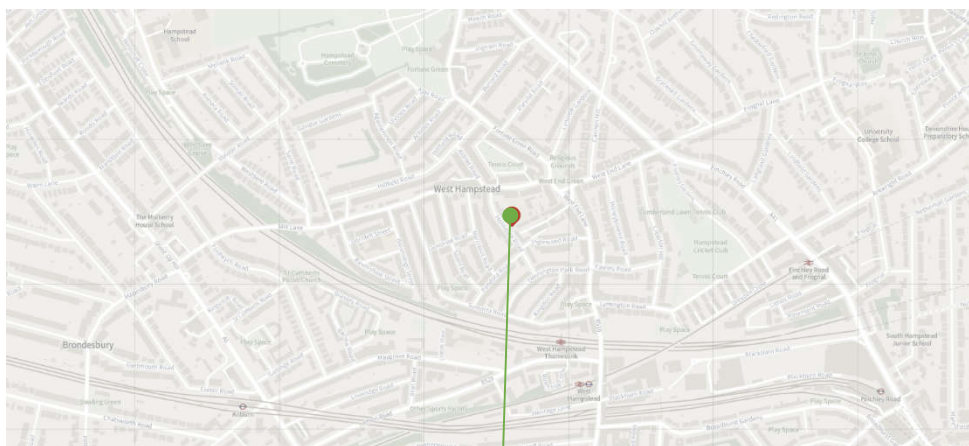
Table 4- Be Lean Emissions

Fabric Energy Efficiency Rates			
Westcott Court	TFEE kgCO ₂ /m ²	DFEE kgCO ₂ /m ²	% Improvement
	42.38	33.85	20.12%

Table 5 – Residential Fabric Energy Efficiency

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 an ASHP with an efficiency of 270% will provide heating and hot water to the dwelling.
- 8.8 Photovoltaics panels are also considered feasible for this site, but are not required in order to achieve a significant reduction in emissions.
- 8.9 The reductions in emissions at the Be Green stage are shown below.

Westcott Court Be Green Emissions			
	Be Lean Emissions	Be Green Emissions	% Reduction
Regulated Emissions	1.0 (Tonnes CO ₂ /Year)	0.6 (Tonnes CO ₂ /Year)	50%

Table 6 –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), an ASHP and PV Panels
- 9.3 The figures below have been calculated using the GLA carbon emission reporting tool and show the total CO₂ emissions expected.
- 9.4 The EUI and Space heating demand calculations are also shown below.

Westcott Court	CO ₂ Emissions (Tonnes)	% Reduction
Baseline (Part L 2022)	1.2	
After energy demand reduction	1.0	21%
After heat network / CHP	1.0	0%
After renewable energy	0.6	50%
Total Savings	3.0	71%

Table 7– Residential Carbon emissions savings at each stage of the Energy Hierarchy

EUI & Space Heating Demand				
Westcott Court	EUI (kWh/m ² /year)	Space heating demand (kWh/m ² /year)	EUI value requirement	Space heating demand requirement
	24.2	9.2	35	15

Table 8 EUI & Space Heating Demand

10.0 Conclusions

- 10.1 This Energy Statement has been produced to accompany an application for the proposed dwelling at West Court, 13 Holmdale Road, NW6, 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
 - Waste Water Heat Recovery
 - Good air tightness
- 10.5 The measures proposed at Be Green can be summarised as
- ASHP with an efficiency of at least 270%
- 10.6 The results in Section 10 show that an overall reduction of 71% of regulated CO₂ emissions is achieved, using the GLA's carbon emission reporting spreadsheet.
- 10.7 The dwelling meets the EUI and Space Heating demand requirements set out in the London Plan.
- 10.8 The requirement for a 10% improvement at the Be Lean stage for residential has also been achieved.



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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.



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

0

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	
	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

0

#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

0

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

0

#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
> 2.8m	1

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
>50%	4	2
>35%	2	1

0

#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%
Single-aspect	3	4
Dual aspect	2	3

2

TOTAL SCORE **7** = Sum of contributing factors: **10**

minus

Sum of mitigating factors: **3**

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

Summary for Input Data



Property Reference	Westcott Court	Issued on Date	14/03/2024
Assessment Reference	Westcott Court - Be Lean	Prop Type Ref	
Property			

SAP Rating	87 B	DER	12.31	TER	12.06
Environmental	89 B	% DER < TER			-2.07
CO ₂ Emissions (t/year)	1.12	DFEE	33.85	TFEE	42.38
Compliance Check	See BREL	% DFEE < TFEE			20.12
% DPER < TPER	-7.79	DPER	68.01	TPER	63.09

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	House, Semi-Detached	
Which Floor	0	
2.0 Number of Storeys	3	
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 m ²	0.00 m
Ground floor:	19.90 m	43.40 m ²	2.50 m
1st Storey:	18.20 m	37.60 m ²	2.60 m
2nd Storey:	9.30 m	19.50 m ²	2.10 m
3rd Storey:	0.00 m	0.00 m ²	0.00 m
4th Storey:	0.00 m	0.00 m ²	0.00 m
5th Storey:	0.00 m	0.00 m ²	0.00 m
6th Storey:	0.00 m	0.00 m ²	0.00 m
7th Storey:	0.00 m	0.00 m ²	0.00 m

8.0 Living Area	29.60	m ²
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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	116.60	85.30	0.00	None	31.30	Calculate Wall Area

10.0 External Roofs										
Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
Flat Roof	External Flat Roof	Plasterboard, insulated flat roof	0.10	9.00	17.90	17.90	None	0.00	Enter Gross Area	0.00
Slope	External Slope Roof	Plasterboard, insulated slope	0.10	9.00	23.00	22.30	None	0.00	Enter Gross Area	0.70

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	0.00	43.90

12.0 Opening Types

Summary for Input Data

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Windows	Manufacturer	Window	Triple Low-E Soft 0.05		Air Filled	0.57	Wood	0.70	1.00
RL	Manufacturer	Roof Light	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.00
Half-Glazed	Manufacturer	Half Glazed Door	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	10.20	0
Front	Half-Glazed	External Wall 1	South West	3.10	0
RL	RL	Slope	South West	0.70	30
NE	Windows	External Wall 1	North East	18.00	0

14.0 Conservatory

15.0 Draught Proofing

 %

16.0 Draught Lobby

17.0 Thermal Bridging

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E5 Ground floor (normal)		19.90	0.00	0.00	Yes
E6 Intermediate floor within a dwelling		27.50	0.00	0.00	No
E16 Corner (normal)		24.60	0.00	0.00	No
E18 Party wall between dwellings		14.20	0.00	0.00	No
E1 Steel lintel with perforated steel base plate		19.00	0.00	0.00	No
E3 Sill		4.95	0.00	0.00	No
E4 Jamb		33.00	0.00	0.00	No
E11 Eaves (insulation at rafter level)		5.90	0.00	0.00	No
E13 Gable (insulation at rafter level)		3.30	0.00	0.00	No
E15 Flat roof with parapet		14.30	0.00	0.00	No
E14 Flat roof		8.20	0.00	0.00	No
P1 Party wall - Ground floor		6.40	0.00	0.00	No
P2 Party wall - Intermediate floor within a dwelling		6.40	0.00	0.00	No
P5 Party wall - Roof (insulation at rafter level)		5.40	0.00	0.00	No

Y-value W/m²K

Description

18.0 Pressure Testing

Designed AP₅₀ m³/(h.m²) @ 50 Pa

Property Tested?

Test Method

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System

22.0 Lighting

No Fixed Lighting

Name	Efficacy	Power	Capacity	Count
Lighting 1	120.00	5	600	35

24.0 Main Heating 1

Percentage of Heat %

Database Ref. No.

Fuel Type

SAP Code

In Winter

In Summer

Model Name

Manufacturer

Controls SAP Code

Delayed Start Stat

Burner Control

Summary for Input Data

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	Standard Combi
Combi keep hot type	None

25.0 Main Heating 2	None
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26.0 Heat Networks	None
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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	1
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
S2	Vented hot water system	7.00		Yes	Instantaneous System 1
S3	Vented hot water system	7.00		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: 0 Utilisation factor: 0.987

29.0 Hot Water Cylinder	None
Cylinder Stat	No
Cylinder In Heated Space	No
Independent Time Control	No
In Airing Cupboard	No

31.0 Thermal Store	None
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Recommendations	
Lower cost measures	None
Further measures to achieve even higher standards	None

Full SAP Calculation Printout



Property Reference	Westcott Court			Issued on Date	14/03/2024
Assessment Reference	Westcott Court - Be Lean	Prop Type Ref			
Property					
SAP Rating	87 B	DER	12.31	TER	12.06
Environmental	89 B	% DER < TER			-2.07
CO ₂ Emissions (t/year)	1.12	DFEE	33.85	TFEE	42.38
Compliance Check	See BREL	% DFEE < TFEE			20.12
% DPER < TPER	-7.79	DPER	68.01	TPER	63.09
Assessor Details	Mr. Samuel Westover			Assessor ID	AX13-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)		Storey height (m)		Volume (m ³)	
Ground floor	43.4000 (1b)	x	2.5000 (2b)	=	108.5000 (1b)	- (3b)
First floor	37.6000 (1c)	x	2.6000 (2c)	=	97.7600 (1c)	- (3c)
Second floor	19.5000 (1d)	x	2.1000 (2d)	=	40.9500 (1d)	- (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.5000					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	247.2100	(5)

2. Ventilation rate

	m ³ per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1618 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	4.0000	(17)
Infiltration rate	0.3618	(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) =	0.3075 (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	0.3921	0.3844	0.3767	0.3383	0.3306	0.2922	0.2922	0.2845	0.3075	0.3306	0.3460	0.3614	(22b)
Effective ac	0.5769	0.5739	0.5710	0.5572	0.5546	0.5427	0.5427	0.5405	0.5473	0.5546	0.5598	0.5653	(25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K	
Windows (Uw = 1.00)			28.2000	0.9615	27.1154			(27)
Half-Glazed			3.1000	1.2000	3.7200			(26a)
RL			0.7000	0.9615	0.6731			(27a)
Heatloss Floor 1			43.9000	0.1000	4.3900	75.0000	3292.5000	(28a)
External Wall 1	116.6000	31.3000	85.3000	0.1500	12.7950	70.0000	5971.0000	(29a)
Flat Roof	17.9000		17.9000	0.1000	1.7900	9.0000	161.1000	(30)
Slope	23.0000	0.7000	22.3000	0.1000	2.2300	9.0000	200.7000	(30)
Total net area of external elements Aum(A, m ²)			201.4000					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	52.7135		(33)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) =	9625.3000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K								95.7741 (35)
Thermal bridges (User defined value 0.030 * total exposed area)								6.0420 (36)
Point Thermal bridges						(36a) =		0.0000
Total fabric heat loss						(33) + (36) + (36a) =		58.7555 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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(38)m 47.0610 46.8174 46.5787 45.4576 45.2478 44.2713 44.2713 44.0905 44.6474 45.2478 45.6722 46.1158 (38)
 Heat transfer coeff 105.8164 105.5729 105.3342 104.2130 104.0033 103.0268 103.0268 102.8459 103.4029 104.0033 104.4276 104.8713 (39)
 Average = Sum(39)m / 12 = 104.2120

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0529	1.0505	1.0481	1.0369	1.0349	1.0251	1.0251	1.0233	1.0289	1.0349	1.0391	1.0435	(40)
HLP (average)												1.0369	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.7441 (42)
 Hot water usage for mixer showers 70.2294 69.1740 67.6361 64.6935 62.5220 60.1003 58.7238 60.2501 61.9232 64.5234 67.5291 69.9604 (42a)
 Hot water usage for baths 30.3242 29.8738 29.2396 28.0703 27.1947 26.2238 25.6994 26.3291 27.0148 28.0537 29.2471 30.2217 (42b)
 Hot water usage for other uses 42.7324 41.1785 39.6246 38.0707 36.5168 34.9629 34.9629 36.5168 38.0707 39.6246 41.1785 42.7324 (42c)
 Average daily hot water use (litres/day) 131.7121 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	143.2860	140.2263	136.5003	130.8345	126.2334	121.2869	119.3860	123.0960	127.0087	132.2016	137.9548	142.9144	(44)
Energy conte	226.9300	199.6804	209.7959	179.1058	169.9344	149.1364	144.3870	152.4185	156.6144	179.3964	196.5418	223.7694	(45)
Energy content (annual)										Total = Sum(45)m =		2187.7107	
Distribution loss (46)m = 0.15 x (45)m	34.0395	29.9521	31.4694	26.8659	25.4902	22.3705	21.6581	22.8628	23.4922	26.9095	29.4813	33.5654	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	277.8889	245.7078	260.7548	228.4209	220.8934	198.4515	195.3459	203.3775	205.9295	230.3553	245.8569	274.7283	(62)
WWHRS	-49.3113	-43.6113	-45.6673	-37.8143	-35.2416	-30.1565	-28.2669	-30.0590	-31.2010	-36.7826	-41.6702	-48.3981	(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	228.5776	202.0965	215.0875	190.6066	185.6518	168.2950	167.0791	173.3185	174.7284	193.5727	204.1867	226.3302	(64)
12Total per year (kWh/year)												2329.5305	(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	88.1940	77.9006	82.4968	71.8815	69.2429	61.9166	60.7484	63.4189	64.4031	72.3890	77.6789	87.1431	(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	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	129.6944	143.5902	129.6944	134.0175	129.6944	134.0175	129.6944	129.6944	134.0175	129.6944	134.0175	129.6944	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	257.1336	259.8018	253.0779	238.7636	220.6943	203.7117	192.3663	189.6980	196.4219	210.7363	228.8056	245.7881	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	(71)
Water heating gains (Table 5)	118.5403	115.9235	110.8829	99.8354	93.0685	85.9953	81.6511	85.2404	89.4487	97.2971	107.8874	117.1278	(72)
Total internal gains	572.5298	586.4771	560.8167	539.7780	510.6187	487.8861	467.8733	468.7944	484.0497	504.8893	537.8721	559.7719	(73)

6. Solar gains

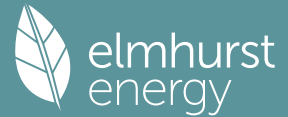
[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W							
Northeast	18.0000	11.2829	0.5700	0.7000	0.7700	56.1566	(75)						
Southwest	10.2000	36.7938	0.5700	0.7000	0.7700	103.7723	(79)						
Southwest	0.7000	37.0308	0.6300	0.7000	1.0000	10.2883	(82)						
Solar gains	170.2172	310.5979	478.8827	682.1593	843.9994	872.7505	826.9420	701.0728	548.5740	357.9044	207.6656	143.2089	(83)
Total gains	742.7469	897.0750	1039.6995	1221.9373	1354.6181	1360.6366	1294.8153	1169.8672	1032.6237	862.7937	745.5376	702.9808	(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	25.2673	25.3256	25.3830	25.6560	25.7078	25.9515	25.9515	25.9971	25.8571	25.7078	25.6033	25.4950	
alpha	2.6845	2.6884	2.6922	2.7104	2.7139	2.7301	2.7301	2.7331	2.7238	2.7139	2.7069	2.6997	
util living area	0.9410	0.9064	0.8505	0.7419	0.5993	0.4476	0.3369	0.3834	0.5866	0.8072	0.9125	0.9480	(86)
MIT	18.6965	19.0864	19.6108	20.2311	20.6628	20.8902	20.9627	20.9464	20.7656	20.1637	19.3283	18.6295	(87)
Th 2	20.0395	20.0415	20.0434	20.0527	20.0544	20.0624	20.0624	20.0639	20.0593	20.0544	20.0509	20.0472	(88)
util rest of house	0.9332	0.8946	0.8321	0.7119	0.5561	0.3910	0.2695	0.3121	0.5277	0.7765	0.8994	0.9410	(89)

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MIT 2	17.3488	17.8370	18.4869	19.2391	19.7324	19.9764	20.0409	20.0311	19.8602	19.1817	18.1544	17.2694 (90)
Living area fraction									FLA = Living area / (4) =			0.2945 (91)
MIT	17.7457	18.2050	18.8179	19.5312	20.0064	20.2455	20.3124	20.3007	20.1269	19.4709	18.5002	17.6700 (92)
Temperature adjustment												-0.1500
adjusted MIT	17.5957	18.0550	18.6679	19.3812	19.8564	20.0955	20.1624	20.1507	19.9769	19.3209	18.3502	17.5200 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9061	0.8634	0.8003	0.6883	0.5465	0.3931	0.2769	0.3189	0.5221	0.7487	0.8690	0.9155	(94)
Useful gains	673.0091	774.5415	832.0483	841.0969	740.2787	534.8153	358.5251	373.0819	539.1681	645.9954	647.8984	643.5985	(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	1406.9074	1388.8067	1281.7008	1092.2820	848.2971	566.1863	367.0191	385.7464	607.6834	907.0042	1174.8287	1396.8827	(97)
Space heating kWh	546.0204	412.7862	334.5415	180.8533	80.3657	0.0000	0.0000	0.0000	0.0000	194.1906	379.3898	560.4435	(98a)
Space heating requirement - total per year (kWh/year)												2688.5909	
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	546.0204	412.7862	334.5415	180.8533	80.3657	0.0000	0.0000	0.0000	0.0000	194.1906	379.3898	560.4435	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2688.5909	
Space heating per m2										(98c) / (4) =		26.7521	(99)

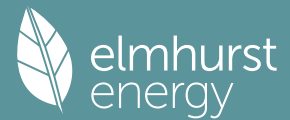
9a. Energy requirements - Individual heating systems, including micro-CHP

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 %)													89.8000 (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	546.0204	412.7862	334.5415	180.8533	80.3657	0.0000	0.0000	0.0000	0.0000	194.1906	379.3898	560.4435	(98)
Space heating efficiency (main heating system 1)	89.8000	89.8000	89.8000	89.8000	89.8000	0.0000	0.0000	0.0000	0.0000	89.8000	89.8000	89.8000	(210)
Space heating fuel (main heating system)	608.0405	459.6729	372.5406	201.3957	89.4941	0.0000	0.0000	0.0000	0.0000	216.2479	422.4831	624.1018	(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	228.5776	202.0965	215.0875	190.6066	185.6518	168.2950	167.0791	173.3185	174.7284	193.5727	204.1867	226.3302	(64)
Efficiency of water heater													82.0000 (216)
(217)m	87.3482	87.0776	86.5772	85.6209	84.2097	82.0000	82.0000	82.0000	82.0000	85.7291	86.9075	87.4082	(217)
Fuel for water heating, kWh/month	261.6856	232.0878	248.4343	222.6170	220.4635	205.2379	203.7550	211.3640	213.0835	225.7957	234.9471	258.9347	(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	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822	(231)
Lighting	23.8267	19.1147	17.2106	12.6093	9.7398	7.9575	8.8849	11.5490	15.0010	19.6821	22.2309	24.4889	(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													2993.9765 (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													2738.4060 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
central heating pump													41.0000 (230c)
Total electricity for the above, kWh/year													41.0000 (231)
Electricity for lighting (calculated in Appendix L)													192.2952 (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													5965.6777 (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	2993.9765	0.2100	628.7351 (261)	

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Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2738.4060	0.2100	575.0653 (264)
Space and water heating			1203.8003 (265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872 (267)
Energy for lighting	192.2952	0.1443	27.7541 (268)
Total CO2, kg/year			1237.2417 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.3100 (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	2993.9765	1.1300	3383.1934 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2738.4060	1.1300	3094.3988 (278)
Space and water heating			6477.5922 (279)
Pumps, fans and electric keep-hot	41.0000	1.5128	62.0248 (281)
Energy for lighting	192.2952	1.5338	294.9488 (282)
Total Primary energy kWh/year			6834.5659 (286)
Dwelling Primary energy Rate (DPER)			68.0100 (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	43.4000 (1b)	x 2.5000 (2b)	= 108.5000 (1b) - (3b)
First floor	37.6000 (1c)	x 2.6000 (2c)	= 97.7600 (1c) - (3c)
Second floor	19.5000 (1d)	x 2.1000 (2d)	= 40.9500 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.5000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	247.2100 (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	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1618 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4118 (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) = 0.3500 (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	0.4463	0.4375	0.4288	0.3850	0.3763	0.3325	0.3325	0.3238	0.3500	0.3763	0.3938	0.4113 (22b)
Effective ac	0.5996	0.5957	0.5919	0.5741	0.5708	0.5553	0.5553	0.5524	0.5613	0.5708	0.5775	0.5846 (25)

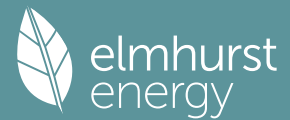
3. Heat losses and heat loss parameter

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 Semi-glazed door			3.1000	1.0000	3.1000		(26a)
TER Opening Type (Uw = 1.20)			21.4900	1.1450	24.6069		(27)
RL			0.5300	2.0221	1.0717		(27a)
Heatloss Floor 1			43.9000	0.1300	5.7070		(28a)
External Wall 1	116.6000	24.5900	92.0100	0.1800	16.5618		(29a)
Flat Roof	17.9000		17.9000	0.1100	1.9690		(30)
Slope	23.0000	0.5300	22.4700	0.1100	2.4717		(30)
Total net area of external elements Aum(A, m2)			201.4000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	55.4881		(33)

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

List of Thermal Bridges	Length	Psi-value	Total
K1 Element			
E5 Ground floor (normal)	19.9000	0.1600	3.1840
E6 Intermediate floor within a dwelling	27.5000	0.0000	0.0000
E16 Corner (normal)	24.6000	0.0900	2.2140
E18 Party wall between dwellings	14.2000	0.0600	0.8520
E1 Steel lintel with perforated steel base plate	19.0000	0.0500	0.9500

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E3 Sill	4.9500	0.0500	0.2475
E4 Jamb	33.0000	0.0500	1.6500
E11 Eaves (insulation at rafter level)	5.9000	0.0400	0.2360
E13 Gable (insulation at rafter level)	3.3000	0.0800	0.2640
E15 Flat roof with parapet	14.3000	0.5600	8.0080
E14 Flat roof	8.2000	0.0800	0.6560
P1 Party wall - Ground floor	6.4000	0.0800	0.5120
P2 Party wall - Intermediate floor within a dwelling	6.4000	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	5.4000	0.0800	0.4320
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			19.2055 (36)
Point Thermal Bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	74.6936 (37)

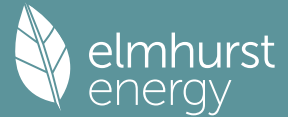
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	48.9141	48.5986	48.2894	46.8369	46.5651	45.3001	45.3001	45.0658	45.7874	46.5651	47.1149	47.6896 (38)
Average = Sum(39)m / 12 =	123.6076	123.2922	122.9829	121.5305	121.2587	119.9937	119.9937	119.7594	120.4809	121.2587	121.8085	122.3832 (39)
												121.5292
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2299	1.2268	1.2237	1.2093	1.2066	1.1940	1.1940	1.1916	1.1988	1.2066	1.2120	1.2177 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.7441 (42)
Hot water usage for mixer showers	70.2294	69.1740	67.6361	64.6935	62.5220	60.1003	58.7238	60.2501	61.9232	64.5234	67.5291	69.9604 (42a)
Hot water usage for baths	30.3242	29.8738	29.2396	28.0703	27.1947	26.2238	25.6994	26.3291	27.0148	28.0537	29.2471	30.2217 (42b)
Hot water usage for other uses	42.7324	41.1785	39.6246	38.0707	36.5168	34.9629	34.9629	36.5168	38.0707	39.6246	41.1785	42.7324 (42c)
Average daily hot water use (litres/day)												131.7121 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	143.2860	140.2263	136.5003	130.8345	126.2334	121.2869	119.3860	123.0960	127.0087	132.2016	137.9548	142.9144 (44)
Energy content (annual)	226.9300	199.6804	209.7959	179.1058	169.9344	149.1364	144.3870	152.4185	156.6144	179.3964	196.5418	223.7694 (45)
Distribution loss (46)m = 0.15 x (45)m												
	34.0395	29.9521	31.4694	26.8659	25.4902	22.3705	21.6581	22.8628	23.4922	26.9095	29.4813	33.5654 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month												
WWHRS	277.8889	245.7078	260.7548	228.4209	220.8934	198.4515	195.3459	203.3775	205.9295	230.3553	245.8569	274.7283 (62)
PV diverter	-32.1060	-28.3948	-29.7334	-24.6204	-22.9453	-19.6345	-18.4042	-19.5710	-20.3146	-23.9487	-27.1309	-31.5114 (63a)
Solar input	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
Output from w/h	245.7829	217.3130	231.0214	203.8005	197.9480	178.8170	176.9417	183.8064	185.6149	206.4066	218.7260	243.2169 (64)
12Total per year (kWh/year)												2489.3955 (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)
Heat gains from water heating, kWh/month	88.1940	77.9006	82.4968	71.8815	69.2429	61.9166	60.7484	63.4189	64.4031	72.3890	77.6789	87.1431 (65)

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	129.7356	143.6358	129.7356	134.0601	129.7356	134.0601	129.7356	129.7356	134.0601	129.7356	134.0601	129.7356 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	257.1336	259.8018	253.0779	238.7636	220.6943	203.7117	192.3663	189.6980	196.4219	210.7363	228.8056	245.7881 (68)
Pumps, fans	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205 (69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Water heating gains (Table 5)	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643 (71)
Total internal gains	118.5403	115.9235	110.8829	99.8354	93.0685	85.9953	81.6511	85.2404	89.4487	97.2971	107.8874	117.1278 (72)
	572.5710	586.5227	560.8580	539.8207	510.6599	487.9287	467.9146	468.8357	484.0923	504.9305	537.9147	559.8131 (73)

6. Solar gains												
[Jan]	Area	Solar flux	g	FF	Access	Gains						
	m2	Table 6a	Specific data	Specific data	factor	W						
		W/m2	or Table 6b	or Table 6c	Table 6d							
Northeast	13.7200	11.2829	0.6300	0.7000	0.7700	47.3095 (75)						
Southwest	7.7700	36.7938	0.6300	0.7000	0.7700	87.3711 (79)						
Southwest	0.5300	37.0308	0.6300	0.7000	1.0000	7.7897 (82)						
Solar gains	142.4703	259.9098	400.6638	570.7613	706.2810	730.4080	692.0420	586.6198	458.9674	299.4705	173.8019	119.8737 (83)
Total gains	715.0413	846.4326	961.5218	1110.5820	1216.9410	1218.3367	1159.9566	1055.4555	943.0597	804.4011	711.7166	679.6868 (84)

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7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	21.6305	21.6858	21.7404	22.0002	22.0495	22.2820	22.2820	22.3256	22.1918	22.0495	21.9500	21.8469	21.0000 (85)
alpha	2.4420	2.4457	2.4494	2.4667	2.4700	2.4855	2.4855	2.4884	2.4795	2.4700	2.4633	2.4565	
util living area	0.9496	0.9247	0.8848	0.8031	0.6842	0.5378	0.4177	0.4668	0.6664	0.8490	0.9279	0.9549	(86)
MIT	18.1956	18.5633	19.1082	19.8203	20.3979	20.7689	20.9109	20.8805	20.5849	19.8200	18.8962	18.1395	(87)
Th 2	19.8961	19.8986	19.9011	19.9126	19.9148	19.9248	19.9248	19.9267	19.9209	19.9148	19.9104	19.9058	(88)
util rest of house	0.9423	0.9140	0.8681	0.7745	0.6377	0.4684	0.3276	0.3745	0.6014	0.8202	0.9158	0.9483	(89)
MIT 2	16.6384	17.1015	17.7836	18.6612	19.3383	19.7452	19.8751	19.8555	19.5688	18.6845	17.5353	16.5729	(90)
Living area fraction									fLA = Living area / (4) =			0.2945	(91)
MIT	17.0971	17.5320	18.1737	19.0026	19.6504	20.0467	20.1802	20.1574	19.8680	19.0189	17.9361	17.0343	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.0971	17.5320	18.1737	19.0026	19.6504	20.0467	20.1802	20.1574	19.8680	19.0189	17.9361	17.0343	(93)

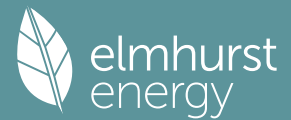
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	654.7562	747.3373	802.7214	828.8090	760.7923	580.8341	405.9493	417.3737	563.8667	636.1133	630.5365	627.5464	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(95)
Heat loss rate W	1581.8146	1557.4266	1435.6681	1227.7726	964.0552	653.5704	429.5987	449.9817	694.9386	1020.8690	1319.9301	1570.7029	(97)
Space heating kWh	689.7314	544.3800	470.9123	287.2538	151.2276	0.0000	0.0000	0.0000	0.0000	286.2582	496.3634	701.7084	(98a)
Space heating requirement - total per year (kWh/year)												3627.8352	
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	689.7314	544.3800	470.9123	287.2538	151.2276	0.0000	0.0000	0.0000	0.0000	286.2582	496.3634	701.7084	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3627.8352	
Space heating per m2										(98c) / (4) =		36.0979	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													92.4000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement	689.7314	544.3800	470.9123	287.2538	151.2276	0.0000	0.0000	0.0000	0.0000	286.2582	496.3634	701.7084	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	746.4626	589.1559	509.6453	310.8807	163.6662	0.0000	0.0000	0.0000	0.0000	309.8033	537.1898	759.4247	(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	245.7829	217.3130	231.0214	203.8005	197.9480	178.8170	176.9417	183.8064	185.6149	206.4066	218.7260	243.2169	(64)
Efficiency of water heater (217)m	86.4670	86.2642	85.8731	85.1167	83.8115	80.3000	80.3000	80.3000	80.3000	85.0824	86.0802	86.5151	(216)
Fuel for water heating, kWh/month	284.2504	251.9158	269.0264	239.4366	236.1825	222.6862	220.3509	228.8997	231.1518	242.5962	254.0957	281.1266	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	26.9565	21.6255	19.4714	14.2656	11.0191	9.0027	10.0520	13.0660	16.9714	22.2674	25.1510	27.7057	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-41.0390	-58.0864	-83.8153	-94.5986	-102.2823	-95.5282	-94.2998	-88.8573	-79.3450	-66.5283	-45.1794	-35.4498	(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	-22.5072	-47.4210	-94.4020	-142.0195	-188.0353	-189.0600	-186.8839	-158.1660	-115.8068	-67.9543	-30.0917	-17.7968	(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												3926.2286	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2961.7189	(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)												217.5544	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2145.1537	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)

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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	5046.3481 (238)

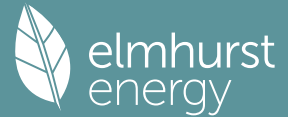
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3926.2286	0.2100	824.5080 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2961.7189	0.2100	621.9610 (264)
Space and water heating			1446.4690 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	217.5544	0.1443	31.3998 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-885.0093	0.1345	-119.0468
PV Unit electricity exported	-1260.1444	0.1258	-158.5783
Total			-277.6251 (269)
Total CO2, kg/year			1212.1730 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.0600 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	3926.2286	1.1300	4436.6383 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2961.7189	1.1300	3346.7424 (278)
Space and water heating			7783.3807 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	217.5544	1.5338	333.6921 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-885.0093	1.4971	-1324.9827
PV Unit electricity exported	-1260.1444	0.4619	-582.0876
Total			-1907.0703 (283)
Total Primary energy kWh/year			6340.1033 (286)
Target Primary Energy Rate (TPER)			63.0900 (287)

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Property Reference	Westcott Court				Issued on Date	14/03/2024	
Assessment Reference	Westcott Court - Be Lean			Prop Type Ref			
Property							
SAP Rating	87 B	DER	12.31	TER	12.06		
Environmental	89 B	% DER < TER				-2.07	
CO ₂ Emissions (t/year)	1.12	DFEE	33.85	TFEE	42.38		
Compliance Check	See BREL	% DFEE < TFEE				20.12	
% DPER < TPER	-7.79	DPER	68.01	TPER	63.09		
Assessor Details	Mr. Samuel Westover				Assessor ID	AX13-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)		Storey height (m)		Volume (m ³)	
Ground floor	43.4000 (1b)	x	2.5000 (2b)	=	108.5000 (1b)	- (3b)
First floor	37.6000 (1c)	x	2.6000 (2c)	=	97.7600 (1c)	- (3c)
Second floor	19.5000 (1d)	x	2.1000 (2d)	=	40.9500 (1d)	- (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.5000					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	247.2100	(5)

2. Ventilation rate

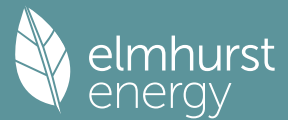
	m ³ per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1618 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	4.0000	(17)
Infiltration rate	0.3618	(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) =	0.3075 (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	0.3921	0.3844	0.3767	0.3383	0.3306	0.2922	0.2922	0.2845	0.3075	0.3306	0.3460	0.3614	(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	0.5769	0.5739	0.5710	0.5572	0.5546	0.5427	0.5427	0.5405	0.5473	0.5546	0.5598	0.5653	(25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K	
Windows (Uw = 1.00)			28.2000	0.9615	27.1154			(27)
Half-Glazed			3.1000	1.2000	3.7200			(26a)
RL			0.7000	0.9615	0.6731			(27a)
Heatloss Floor 1			43.9000	0.1000	4.3900	75.0000	3292.5000	(28a)
External Wall 1	116.6000	31.3000	85.3000	0.1500	12.7950	70.0000	5971.0000	(29a)
Flat Roof	17.9000		17.9000	0.1000	1.7900	9.0000	161.1000	(30)
Slope	23.0000	0.7000	22.3000	0.1000	2.2300	9.0000	200.7000	(30)
Total net area of external elements Aum(A, m ²)			201.4000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	52.7135			(33)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			9625.3000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							95.7741	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							6.0420	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss				(33) + (36) + (36a) =			58.7555	(37)

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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	47.0610	46.8174	46.5787	45.4576	45.2478	44.2713	44.2713	44.0905	44.6474	45.2478	45.6722	46.1158	(38)
Heat transfer coeff	105.8164	105.5729	105.3342	104.2130	104.0033	103.0268	103.0268	102.8459	103.4029	104.0033	104.4276	104.8713	(39)
Average = Sum(39)m / 12 =												104.2120	
HLP	1.0529	1.0505	1.0481	1.0369	1.0349	1.0251	1.0251	1.0233	1.0289	1.0349	1.0391	1.0435	(40)
HLP (average)												1.0369	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.7441 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	30.3242	29.8738	29.2396	28.0703	27.1947	26.2238	25.6994	26.3291	27.0148	28.0537	29.2471	30.2217	(42b)
Hot water usage for other uses	42.7324	41.1785	39.6246	38.0707	36.5168	34.9629	34.9629	36.5168	38.0707	39.6246	41.1785	42.7324	(42c)
Average daily hot water use (litres/day)												66.9629	(43)
Daily hot water use	73.0566	71.0523	68.8642	66.1410	63.7115	61.1867	60.6622	62.8459	65.0855	67.6783	70.4256	72.9541	(44)
Energy conte	115.7038	101.1775	105.8417	90.5437	85.7679	75.2361	73.3657	77.8164	80.2569	91.8388	100.3342	114.2284	(45)
Energy content (annual)										Total = Sum(45)m =		1112.1111	
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													
WWHRS	98.3482	86.0009	89.9655	76.9621	72.9027	63.9507	62.3609	66.1439	68.2184	78.0630	85.2841	97.0942	(62)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
Output from w/h	98.3482	86.0009	89.9655	76.9621	72.9027	63.9507	62.3609	66.1439	68.2184	78.0630	85.2841	97.0942	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		945.2945	(64)
Electric shower(s)	56.2421	50.1122	54.7205	52.2191	53.1990	50.7467	52.4383	53.1990	52.2191	54.7205	53.6916	56.2421	(64a)
												639.7503	(64a)
Heat gains from water heating, kWh/month	38.6476	34.0283	36.1715	32.2953	31.5254	28.6744	28.6998	29.8357	30.1094	33.1959	34.7439	38.3341	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	129.6944	143.5902	129.6944	134.0175	129.6944	134.0175	129.6944	129.6944	134.0175	129.6944	134.0175	129.6944	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	257.1336	259.8018	253.0779	238.7636	220.6943	203.7117	192.3663	189.6980	196.4219	210.7363	228.8056	245.7881	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	(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)	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	(71)
Water heating gains (Table 5)	51.9457	50.6373	48.6176	44.8546	42.3729	39.8255	38.5750	40.1018	41.8186	44.6181	48.2554	51.5243	(72)
Total internal gains	502.9352	518.1909	495.5515	481.7973	456.9231	441.7163	424.7972	423.6558	436.4196	449.2103	475.2401	491.1684	(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				18.0000	11.2829	0.5700	0.7000	0.7700	56.1566 (75)				
Southwest				10.2000	36.7938	0.5700	0.7000	0.7700	103.7723 (79)				
Southwest				0.7000	37.0308	0.6300	0.7000	1.0000	10.2883 (82)				
Solar gains	170.2172	310.5979	478.8827	682.1593	843.9994	872.7505	826.9420	701.0728	548.5740	357.9044	207.6656	143.2089	(83)
Total gains	673.1523	828.7888	974.4342	1163.9566	1300.9225	1314.4668	1251.7392	1124.7286	984.9935	807.1147	682.9057	634.3773	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	25.2673	25.3256	25.3830	25.6560	25.7078	25.9515	25.9515	25.9971	25.8571	25.7078	25.6033	25.4950	
alpha	2.6845	2.6884	2.6922	2.7104	2.7139	2.7301	2.7301	2.7331	2.7238	2.7139	2.7069	2.6997	
util living area	0.9522	0.9200	0.8667	0.7590	0.6157	0.4605	0.3474	0.3968	0.6057	0.8270	0.9267	0.9585	(86)
MIT	18.5716	18.9772	19.5249	20.1811	20.6390	20.8821	20.9597	20.9417	20.7457	20.1010	19.2256	18.5032	(87)
Th 2	20.0395	20.0415	20.0434	20.0527	20.0544	20.0624	20.0624	20.0639	20.0593	20.0544	20.0509	20.0472	(88)

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util rest of house	0.9457	0.9096	0.8496	0.7300	0.5724	0.4029	0.2783	0.3236	0.5465	0.7982	0.9154	0.9527 (89)
MIT 2	17.8208	18.2184	18.7501	19.3745	19.7847	19.9902	20.0442	20.0359	19.8899	19.3184	18.4745	17.7588 (90)
Living area fraction									FLA = Living area / (4) =			0.2945 (91)
MIT	18.0419	18.4419	18.9783	19.6121	20.0363	20.2529	20.3139	20.3027	20.1419	19.5489	18.6957	17.9781 (92)
Temperature adjustment												0.0000
adjusted MIT	18.0419	18.4419	18.9783	19.6121	20.0363	20.2529	20.3139	20.3027	20.1419	19.5489	18.6957	17.9781 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9278	0.8880	0.8272	0.7151	0.5715	0.4150	0.2972	0.3428	0.5521	0.7805	0.8949	0.9362	(94)
Useful gains	624.5755	735.9293	806.0668	832.2937	743.4936	545.4833	372.0514	385.5955	543.7769	629.9187	611.1450	593.8893	(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	1454.1171	1429.6585	1314.3917	1116.3393	866.9994	582.3999	382.6270	401.3776	624.7550	930.7148	1210.9129	1444.9236	(97)
Space heating kWh	617.1790	466.1860	378.1937	204.5128	91.8883	0.0000	0.0000	0.0000	0.0000	223.7923	431.8329	633.1695	(98a)
Space heating requirement - total per year (kWh/year)												3046.7546	
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	617.1790	466.1860	378.1937	204.5128	91.8883	0.0000	0.0000	0.0000	0.0000	223.7923	431.8329	633.1695	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3046.7546	
Space heating per m2											(98c) / (4) =	30.3160	(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	968.4516	762.3981	781.6291	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8625	0.9040	0.8762	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	835.2905	689.1822	684.8977	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1475.1527	1404.7749	1260.0702	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	460.7008	532.4010	427.9283	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	115.1752	133.1002	106.9821	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement													355.2575 (107)
Energy for space heating													30.3160 (99)
Energy for space cooling													3.5349 (108)
Total													33.8509 (109)
Fabric Energy Efficiency (DFEE)													33.9 (109)

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

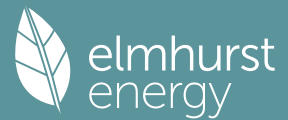
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	43.4000 (1b)	x 2.5000 (2b)	= 108.5000 (1b) - (3b)	
First floor	37.6000 (1c)	x 2.6000 (2c)	= 97.7600 (1c) - (3c)	
Second floor	19.5000 (1d)	x 2.1000 (2d)	= 40.9500 (1d) - (3d)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.5000		(4)	
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	247.2100 (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	4 * 10 =	40.0000 (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) =	40.0000 / (5) =	0.1618 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.4118	(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) =	0.3500 (21)

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Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4463	0.4375	0.4288	0.3850	0.3763	0.3325	0.3325	0.3238	0.3500	0.3763	0.3938	0.4113	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													(23c)
Effective ac	0.5996	0.5957	0.5919	0.5741	0.5708	0.5553	0.5553	0.5524	0.5613	0.5708	0.5775	0.5846	(25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K	
TER Semi-glazed door			3.1000	1.0000	3.1000			(26a)
TER Opening Type (Uw = 1.20)			21.4900	1.1450	24.6069			(27)
RL			0.5300	2.0221	1.0717			(27a)
Heatloss Floor 1			43.9000	0.1300	5.7070			(28a)
External Wall 1	116.6000	24.5900	92.0100	0.1800	16.5618			(29a)
Flat Roof	17.9000		17.9000	0.1100	1.9690			(30)
Slope	23.0000	0.5300	22.4700	0.1100	2.4717			(30)
Total net area of external elements Aum(A, m ²)			201.4000					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	55.4881		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							95.7741	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E5 Ground floor (normal)	19.9000	0.1600	3.1840	
E6 Intermediate floor within a dwelling	27.5000	0.0000	0.0000	
E16 Corner (normal)	24.6000	0.0900	2.2140	
E18 Party wall between dwellings	14.2000	0.0600	0.8520	
E1 Steel lintel with perforated steel base plate	19.0000	0.0500	0.9500	
E3 Sill	4.9500	0.0500	0.2475	
E4 Jamb	33.0000	0.0500	1.6500	
E11 Eaves (insulation at rafter level)	5.9000	0.0400	0.2360	
E13 Gable (insulation at rafter level)	3.3000	0.0800	0.2640	
E15 Flat roof with parapet	14.3000	0.5600	8.0080	
E14 Flat roof	8.2000	0.0800	0.6560	
P1 Party wall - Ground floor	6.4000	0.0800	0.5120	
P2 Party wall - Intermediate floor within a dwelling	6.4000	0.0000	0.0000	
P5 Party wall - Roof (insulation at rafter level)	5.4000	0.0800	0.4320	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				19.2055 (36)
Point Thermal bridges				0.0000 (36a)
Total fabric heat loss				(33) + (36) + (36a) = 74.6936 (37)

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

(38)m	Jan 48.9141	Feb 48.5986	Mar 48.2894	Apr 46.8369	May 46.5651	Jun 45.3001	Jul 45.3001	Aug 45.0658	Sep 45.7874	Oct 46.5651	Nov 47.1149	Dec 47.6896	(38)
Heat transfer coeff	123.6076	123.2922	122.9829	121.5305	121.2587	119.9937	119.9937	119.7594	120.4809	121.2587	121.8085	122.3832	(39)
Average = Sum(39)m / 12 =												121.5292	
HLP	Jan 1.2299	Feb 1.2268	Mar 1.2237	Apr 1.2093	May 1.2066	Jun 1.1940	Jul 1.1940	Aug 1.1916	Sep 1.1988	Oct 1.2066	Nov 1.2120	Dec 1.2177	(40)
HLP (average)												1.2092	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

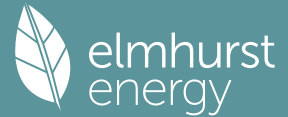
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.7441 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	30.3242	29.8738	29.2396	28.0703	27.1947	26.2238	25.6994	26.3291	27.0148	28.0537	29.2471	30.2217	(42b)
Hot water usage for other uses	42.7324	41.1785	39.6246	38.0707	36.5168	34.9629	34.9629	36.5168	38.0707	39.6246	41.1785	42.7324	(42c)
Average daily hot water use (litres/day)												66.9629	(43)
Daily hot water use	Jan 73.0566	Feb 71.0523	Mar 68.8642	Apr 66.1410	May 63.7115	Jun 61.1867	Jul 60.6622	Aug 62.8459	Sep 65.0855	Oct 67.6783	Nov 70.4256	Dec 72.9541	(44)
Energy conte	115.7038	101.1775	105.8417	90.5437	85.7679	75.2361	73.3657	77.8164	80.2569	91.8388	100.3342	114.2284	(45)
Energy content (annual)										Total = Sum(45)m =		1112.1111	
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	98.3482	86.0009	89.9655	76.9621	72.9027	63.9507	62.3609	66.1439	68.2184	78.0630	85.2841	97.0942	(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	98.3482	86.0009	89.9655	76.9621	72.9027	63.9507	62.3609	66.1439	68.2184	78.0630	85.2841	97.0942	(64)
Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				945.2945	(64)
Electric shower(s)	56.2421	50.1122	54.7205	52.2191	53.1990	50.7467	52.4383	53.1990	52.2191	54.7205	53.6916	56.2421	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												639.7503	(64a)
Heat gains from water heating, kWh/month	38.6476	34.0283	36.1715	32.2953	31.5254	28.6744	28.6998	29.8357	30.1094	33.1959	34.7439	38.3341	(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
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(66)m	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	129.7356	143.6358	129.7356	134.0601	129.7356	134.0601	129.7356	129.7356	134.0601	129.7356	134.0601	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	257.1336	259.8018	253.0779	238.7636	220.6943	203.7117	192.3663	189.6980	196.4219	210.7363	228.8056	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	(71)
Water heating gains (Table 5)	51.9457	50.6373	48.6176	44.8546	42.3729	39.8255	38.5750	40.1018	41.8186	44.6181	48.2554	(72)
Total internal gains	502.9764	518.2365	495.5927	481.8399	456.9644	441.7589	424.8384	423.6970	436.4622	449.2516	475.2827	(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					13.7200	11.2829	0.6300	0.7000	0.7700	47.3095 (75)		
Southwest					7.7700	36.7938	0.6300	0.7000	0.7700	87.3711 (79)		
Southwest					0.5300	37.0308	0.6300	0.7000	1.0000	7.7897 (82)		
Solar gains	142.4703	259.9098	400.6638	570.7613	706.2810	730.4080	692.0420	586.6198	458.9674	299.4705	173.8019	119.8737 (83)
Total gains	645.4467	778.1464	896.2565	1052.6012	1163.2454	1172.1668	1116.8805	1010.3168	895.4296	748.7221	649.0846	611.0833 (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	21.6305	21.6858	21.7404	22.0002	22.0495	22.2820	22.2820	22.3256	22.1918	22.0495	21.9500	21.8469
alpha	2.4420	2.4457	2.4494	2.4667	2.4700	2.4855	2.4855	2.4884	2.4795	2.4700	2.4633	2.4565
util living area	0.9591	0.9359	0.8983	0.8185	0.7007	0.5527	0.4309	0.4829	0.6857	0.8660	0.9397	0.9638 (86)
MIT	18.0742	18.4530	19.0155	19.7582	20.3619	20.7538	20.9043	20.8708	20.5552	19.7494	18.7935	18.0173 (87)
Th 2	19.8961	19.8986	19.9011	19.9126	19.9148	19.9248	19.9248	19.9267	19.9209	19.9148	19.9104	19.9058 (88)
util rest of house	0.9529	0.9265	0.8831	0.7911	0.6548	0.4827	0.3389	0.3889	0.6214	0.8393	0.9293	0.9583 (89)
MIT 2	17.2385	17.6121	18.1631	18.8815	19.4363	19.7749	19.8830	19.8663	19.6245	18.8921	17.9605	17.1887 (90)
Living area fraction	17.4847	17.8598	18.4142	19.1397	19.7089	20.0632	20.1838	20.1621	19.8986	19.1446	18.2058	17.4327 (92)
MIT	17.4847	17.8598	18.4142	19.1397	19.7089	20.0632	20.1838	20.1621	19.8986	19.1446	18.2058	17.4327 (93)
Temperature adjustment												0.0000
adjusted MIT	17.4847	17.8598	18.4142	19.1397	19.7089	20.0632	20.1838	20.1621	19.8986	19.1446	18.2058	17.4327 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9344	0.9036	0.8573	0.7683	0.6452	0.4923	0.3621	0.4107	0.6200	0.8161	0.9075	0.9412 (94)
Ext temp.	603.0979	703.1610	768.3807	808.7616	750.5179	577.0378	404.4467	414.9566	555.1391	611.0288	589.0513	575.1231 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Space heating kWh	1629.7251	1597.8378	1465.2403	1244.4358	971.1530	655.5500	430.0326	450.5487	698.6243	1036.1055	1352.7807	1619.4656 (97)
Space heating requirement - total per year (kWh/year)	763.8107	601.2228	518.4635	313.6855	164.1525	0.0000	0.0000	0.0000	0.0000	316.2570	549.8852	776.9909 (98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)	763.8107	601.2228	518.4635	313.6855	164.1525	0.0000	0.0000	0.0000	0.0000	316.2570	549.8852	776.9909 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4004.4681 (99)
Space heating per m2												39.8455 (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	1127.9404	887.9531	910.1714	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7645	0.8221	0.7852	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	862.3032	729.9491	714.6394	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1311.0299	1249.2460	1128.1515	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	323.0833	386.3569	307.6530	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	80.7708	96.5892	76.9132	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												254.2733 (107)
Energy for space heating												39.8455 (99)
Energy for space cooling												2.5301 (108)
Total												42.3755 (109)
Fabric Energy Efficiency (TFEE)												42.4 (109)

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Property Reference	Westcott Court			Issued on Date	14/03/2024
Assessment Reference	Westcott Court - Be Lean	Prop Type Ref			
Property					
SAP Rating	87 B	DER	12.31	TER	12.06
Environmental	89 B	% DER < TER			-2.07
CO ₂ Emissions (t/year)	1.12	DFEE	33.85	TFEE	42.38
Compliance Check	See BREL	% DFEE < TFEE			20.12
% DPER < TPER	-7.79	DPER	68.01	TPER	63.09
Assessor Details	Mr. Samuel Westover			Assessor ID	AX13-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)		Storey height (m)		Volume (m ³)	
Ground floor	43.4000 (1b)	x	2.5000 (2b)	=	108.5000 (1b)	- (3b)
First floor	37.6000 (1c)	x	2.6000 (2c)	=	97.7600 (1c)	- (3c)
Second floor	19.5000 (1d)	x	2.1000 (2d)	=	40.9500 (1d)	- (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.5000					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	247.2100	(5)

2. Ventilation rate

	m ³ per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1618 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	4.0000	(17)
Infiltration rate	0.3618	(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) =	0.3075 (21)

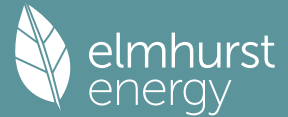
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3921	0.3844	0.3767	0.3383	0.3306	0.2922	0.2922	0.2845	0.3075	0.3306	0.3460	0.3614	(22b)
Effective ac	0.5769	0.5739	0.5710	0.5572	0.5546	0.5427	0.5427	0.5405	0.5473	0.5546	0.5598	0.5653	(25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K	
Windows (Uw = 1.00)			28.2000	0.9615	27.1154			(27)
Half-Glazed			3.1000	1.2000	3.7200			(26a)
RL			0.7000	0.9615	0.6731			(27a)
Heatloss Floor 1			43.9000	0.1000	4.3900	75.0000	3292.5000	(28a)
External Wall 1	116.6000	31.3000	85.3000	0.1500	12.7950	70.0000	5971.0000	(29a)
Flat Roof	17.9000		17.9000	0.1000	1.7900	9.0000	161.1000	(30)
Slope	23.0000	0.7000	22.3000	0.1000	2.2300	9.0000	200.7000	(30)
Total net area of external elements Aum(A, m ²)			201.4000					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	52.7135		(33)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) =	9625.3000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K								95.7741 (35)
Thermal bridges (User defined value 0.030 * total exposed area)								6.0420 (36)
Point Thermal bridges						(36a) =		0.0000
Total fabric heat loss						(33) + (36) + (36a) =		58.7555 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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(38)m	47.0610	46.8174	46.5787	45.4576	45.2478	44.2713	44.2713	44.0905	44.6474	45.2478	45.6722	46.1158 (38)
Heat transfer coeff	105.8164	105.5729	105.3342	104.2130	104.0033	103.0268	103.0268	102.8459	103.4029	104.0033	104.4276	104.8713 (39)
Average = Sum(39)m / 12 =												104.2120

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0529	1.0505	1.0481	1.0369	1.0349	1.0251	1.0251	1.0233	1.0289	1.0349	1.0391	1.0435 (40)
HLP (average)												1.0369
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.7441 (42)
Hot water usage for mixer showers													
70.2294	69.1740	67.6361	64.6935	62.5220	60.1003	58.7238	60.2501	61.9232	64.5234	67.5291	69.9604	(42a)	
Hot water usage for baths													
30.3242	29.8738	29.2396	28.0703	27.1947	26.2238	25.6994	26.3291	27.0148	28.0537	29.2471	30.2217	(42b)	
Hot water usage for other uses													
42.7324	41.1785	39.6246	38.0707	36.5168	34.9629	34.9629	36.5168	38.0707	39.6246	41.1785	42.7324	(42c)	
Average daily hot water use (litres/day)												131.7121 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	143.2860	140.2263	136.5003	130.8345	126.2334	121.2869	119.3860	123.0960	127.0087	132.2016	137.9548	142.9144	(44)
Energy conte	226.9300	199.6804	209.7959	179.1058	169.9344	149.1364	144.3870	152.4185	156.6144	179.3964	196.5418	223.7694	(45)
Energy content (annual)										Total = Sum(45)m =		2187.7107	
Distribution loss (46)m = 0.15 x (45)m													
34.0395	29.9521	31.4694	26.8659	25.4902	22.3705	21.6581	22.8628	23.4922	26.9095	29.4813	33.5654	(46)	
Water storage loss:													
Total storage loss													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
277.8889	245.7078	260.7548	228.4209	220.8934	198.4515	195.3459	203.3775	205.9295	230.3553	245.8569	274.7283	(62)	
WWHRS	-49.3113	-43.6113	-45.6673	-37.8143	-35.2416	-30.1565	-28.2669	-30.0590	-31.2010	-36.7826	-41.6702	-48.3981	(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													
228.5776	202.0965	215.0875	190.6066	185.6518	168.2950	167.0791	173.3185	174.7284	193.5727	204.1867	226.3302	(64)	
12Total per year (kWh/year)									Total per year (kWh/year) = Sum(64)m =		2329.5305	(64)	
Electric shower(s)											2330	(64)	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)	
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											0.0000	(64a)	
Heat gains from water heating, kWh/month													
88.1940	77.9006	82.4968	71.8815	69.2429	61.9166	60.7484	63.4189	64.4031	72.3890	77.6789	87.1431	(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	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	129.6944	143.5902	129.6944	134.0175	129.6944	134.0175	129.6944	129.6944	134.0175	129.6944	134.0175	129.6944	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	257.1336	259.8018	253.0779	238.7636	220.6943	203.7117	192.3663	189.6980	196.4219	210.7363	228.8056	245.7881	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	(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)	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	(71)
Water heating gains (Table 5)	118.5403	115.9235	110.8829	99.8354	93.0685	85.9953	81.6511	85.2404	89.4487	97.2971	107.8874	117.1278	(72)
Total internal gains	572.5298	586.4771	560.8167	539.7780	510.6187	487.8861	467.8733	468.7944	484.0497	504.8893	537.8721	559.7719	(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					18.0000	11.2829		0.5700		0.7000		0.7700		56.1566 (75)
Southwest					10.2000	36.7938		0.5700		0.7000		0.7700		103.7723 (79)
Southwest					0.7000	37.0308		0.6300		0.7000		1.0000		10.2883 (82)
Solar gains	170.2172	310.5979	478.8827	682.1593	843.9994	872.7505	826.9420	701.0728	548.5740	357.9044	207.6656	143.2089	(83)	
Total gains	742.7469	897.0750	1039.6995	1221.9373	1354.6181	1360.6366	1294.8153	1169.8672	1032.6237	862.7937	745.5376	702.9808	(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	25.2673	25.3256	25.3830	25.6560	25.7078	25.9515	25.9515	25.9971	25.8571	25.7078	25.6033	25.4950
alpha	2.6845	2.6884	2.6922	2.7104	2.7139	2.7301	2.7301	2.7331	2.7238	2.7139	2.7069	2.6997
util living area	0.9410	0.9064	0.8505	0.7419	0.5993	0.4476	0.3369	0.3834	0.5866	0.8072	0.9125	0.9480 (86)
MIT	18.6965	19.0864	19.6108	20.2311	20.6628	20.8902	20.9627	20.9464	20.7656	20.1637	19.3283	18.6295 (87)
Th 2	20.0395	20.0415	20.0434	20.0527	20.0544	20.0624	20.0624	20.0639	20.0593	20.0544	20.0509	20.0472 (88)
util rest of house	0.9332	0.8946	0.8321	0.7119	0.5561	0.3910	0.2695	0.3121	0.5277	0.7765	0.8994	0.9410 (89)

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MIT 2	17.3488	17.8370	18.4869	19.2391	19.7324	19.9764	20.0409	20.0311	19.8602	19.1817	18.1544	17.2694 (90)
Living area fraction									FLA = Living area / (4) =			0.2945 (91)
MIT	17.7457	18.2050	18.8179	19.5312	20.0064	20.2455	20.3124	20.3007	20.1269	19.4709	18.5002	17.6700 (92)
Temperature adjustment												-0.1500
adjusted MIT	17.5957	18.0550	18.6679	19.3812	19.8564	20.0955	20.1624	20.1507	19.9769	19.3209	18.3502	17.5200 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9061	0.8634	0.8003	0.6883	0.5465	0.3931	0.2769	0.3189	0.5221	0.7487	0.8690	0.9155	(94)
Useful gains	673.0091	774.5415	832.0483	841.0969	740.2787	534.8153	358.5251	373.0819	539.1681	645.9954	647.8984	643.5985	(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	1406.9074	1388.8067	1281.7008	1092.2820	848.2971	566.1863	367.0191	385.7464	607.6834	907.0042	1174.8287	1396.8827	(97)
Space heating kWh	546.0204	412.7862	334.5415	180.8533	80.3657	0.0000	0.0000	0.0000	0.0000	194.1906	379.3898	560.4435	(98a)
Space heating requirement - total per year (kWh/year)												2688.5909	
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	546.0204	412.7862	334.5415	180.8533	80.3657	0.0000	0.0000	0.0000	0.0000	194.1906	379.3898	560.4435	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2688.5909	
Space heating per m2										(98c) / (4) =		26.7521	(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 %)													89.8000 (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	546.0204	412.7862	334.5415	180.8533	80.3657	0.0000	0.0000	0.0000	0.0000	194.1906	379.3898	560.4435	(98)
Space heating efficiency (main heating system 1)	89.8000	89.8000	89.8000	89.8000	89.8000	0.0000	0.0000	0.0000	0.0000	89.8000	89.8000	89.8000	(210)
Space heating fuel (main heating system)	608.0405	459.6729	372.5406	201.3957	89.4941	0.0000	0.0000	0.0000	0.0000	216.2479	422.4831	624.1018	(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	228.5776	202.0965	215.0875	190.6066	185.6518	168.2950	167.0791	173.3185	174.7284	193.5727	204.1867	226.3302	(64)
Efficiency of water heater													82.0000 (216)
(217)m	87.3482	87.0776	86.5772	85.6209	84.2097	82.0000	82.0000	82.0000	82.0000	85.7291	86.9075	87.4082	(217)
Fuel for water heating, kWh/month	261.6856	232.0878	248.4343	222.6170	220.4635	205.2379	203.7550	211.3640	213.0835	225.7957	234.9471	258.9347	(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	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822	(231)
Lighting	23.8267	19.1147	17.2106	12.6093	9.7398	7.9575	8.8849	11.5490	15.0010	19.6821	22.2309	24.4889	(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													2993.9765 (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													2738.4060 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
central heating pump													41.0000 (230c)
Total electricity for the above, kWh/year													41.0000 (231)
Electricity for lighting (calculated in Appendix L)													192.2952 (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													5965.6777 (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	2993.9765	0.2100	628.7351 (261)	

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Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2738.4060	0.2100	575.0653 (264)
Space and water heating			1203.8003 (265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872 (267)
Energy for lighting	192.2952	0.1443	27.7541 (268)
Total CO2, kg/year			1237.2417 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.3100 (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	2993.9765	1.1300	3383.1934 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2738.4060	1.1300	3094.3988 (278)
Space and water heating			6477.5922 (279)
Pumps, fans and electric keep-hot	41.0000	1.5128	62.0248 (281)
Energy for lighting	192.2952	1.5338	294.9488 (282)
Total Primary energy kWh/year			6834.5659 (286)
Dwelling Primary energy Rate (DPER)			68.0100 (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	43.4000 (1b)	x 2.5000 (2b)	= 108.5000 (1b) - (3b)
First floor	37.6000 (1c)	x 2.6000 (2c)	= 97.7600 (1c) - (3c)
Second floor	19.5000 (1d)	x 2.1000 (2d)	= 40.9500 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.5000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	247.2100 (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	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1618 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4118 (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) = 0.3500 (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	0.4463	0.4375	0.4288	0.3850	0.3763	0.3325	0.3325	0.3238	0.3500	0.3763	0.3938	0.4113 (22b)
Effective ac	0.5996	0.5957	0.5919	0.5741	0.5708	0.5553	0.5553	0.5524	0.5613	0.5708	0.5775	0.5846 (25)

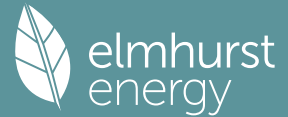
3. Heat losses and heat loss parameter

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 Semi-glazed door			3.1000	1.0000	3.1000		(26a)
TER Opening Type (Uw = 1.20)			21.4900	1.1450	24.6069		(27)
RL			0.5300	2.0221	1.0717		(27a)
Heatloss Floor 1			43.9000	0.1300	5.7070		(28a)
External Wall 1	116.6000	24.5900	92.0100	0.1800	16.5618		(29a)
Flat Roof	17.9000		17.9000	0.1100	1.9690		(30)
Slope	23.0000	0.5300	22.4700	0.1100	2.4717		(30)
Total net area of external elements Aum(A, m2)			201.4000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	55.4881		(33)

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

List of Thermal Bridges	Length	Psi-value	Total
K1 Element	19.9000	0.1600	3.1840
E5 Ground floor (normal)	27.5000	0.0000	0.0000
E6 Intermediate floor within a dwelling	24.6000	0.0900	2.2140
E16 Corner (normal)	14.2000	0.0600	0.8520
E18 Party wall between dwellings	19.0000	0.0500	0.9500
E1 Steel lintel with perforated steel base plate			

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E3 Sill	4.9500	0.0500	0.2475
E4 Jamb	33.0000	0.0500	1.6500
E11 Eaves (insulation at rafter level)	5.9000	0.0400	0.2360
E13 Gable (insulation at rafter level)	3.3000	0.0800	0.2640
E15 Flat roof with parapet	14.3000	0.5600	8.0080
E14 Flat roof	8.2000	0.0800	0.6560
P1 Party wall - Ground floor	6.4000	0.0800	0.5120
P2 Party wall - Intermediate floor within a dwelling	6.4000	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	5.4000	0.0800	0.4320
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			19.2055 (36)
Point Thermal Bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	74.6936 (37)

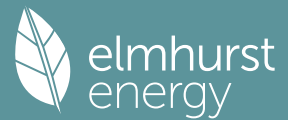
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	48.9141	48.5986	48.2894	46.8369	46.5651	45.3001	45.3001	45.0658	45.7874	46.5651	47.1149	47.6896	(38)
Average = Sum(39)m / 12 =	123.6076	123.2922	122.9829	121.5305	121.2587	119.9937	119.9937	119.7594	120.4809	121.2587	121.8085	122.3832	(39)
												121.5292	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.2299	1.2268	1.2237	1.2093	1.2066	1.1940	1.1940	1.1916	1.1988	1.2066	1.2120	1.2177	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)													
Assumed occupancy													2.7441 (42)
Hot water usage for mixer showers													
	70.2294	69.1740	67.6361	64.6935	62.5220	60.1003	58.7238	60.2501	61.9232	64.5234	67.5291	69.9604	(42a)
Hot water usage for baths													
	30.3242	29.8738	29.2396	28.0703	27.1947	26.2238	25.6994	26.3291	27.0148	28.0537	29.2471	30.2217	(42b)
Hot water usage for other uses													
	42.7324	41.1785	39.6246	38.0707	36.5168	34.9629	34.9629	36.5168	38.0707	39.6246	41.1785	42.7324	(42c)
Average daily hot water use (litres/day)													131.7121 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	143.2860	140.2263	136.5003	130.8345	126.2334	121.2869	119.3860	123.0960	127.0087	132.2016	137.9548	142.9144	(44)
Energy conte	226.9300	199.6804	209.7959	179.1058	169.9344	149.1364	144.3870	152.4185	156.6144	179.3964	196.5418	223.7694	(45)
Energy content (annual)										Total = Sum(45)m =			2187.7107
Distribution loss (46)m = 0.15 x (45)m													
	34.0395	29.9521	31.4694	26.8659	25.4902	22.3705	21.6581	22.8628	23.4922	26.9095	29.4813	33.5654	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
	277.8889	245.7078	260.7548	228.4209	220.8934	198.4515	195.3459	203.3775	205.9295	230.3553	245.8569	274.7283	(62)
WWHRS	-32.1060	-28.3948	-29.7334	-24.6204	-22.9453	-19.6345	-18.4042	-19.5710	-20.3146	-23.9487	-27.1309	-31.5114	(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	245.7829	217.3130	231.0214	203.8005	197.9480	178.8170	176.9417	183.8064	185.6149	206.4066	218.7260	243.2169	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =			2489.3955 (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													
	88.1940	77.9006	82.4968	71.8815	69.2429	61.9166	60.7484	63.4189	64.4031	72.3890	77.6789	87.1431	(65)

5. Internal gains (see Table 5 and 5a)													
Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	129.7356	143.6358	129.7356	134.0601	129.7356	134.0601	129.7356	129.7356	134.0601	129.7356	134.0601	129.7356	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	257.1336	259.8018	253.0779	238.7636	220.6943	203.7117	192.3663	189.6980	196.4219	210.7363	228.8056	245.7881	(68)
Pumps, fans	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	(69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Water heating gains (Table 5)	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	(71)
Total internal gains	118.5403	115.9235	110.8829	99.8354	93.0685	85.9953	81.6511	85.2404	89.4487	97.2971	107.8874	117.1278	(72)
	572.5710	586.5227	560.8580	539.8207	510.6599	487.9287	467.9146	468.8357	484.0923	504.9305	537.9147	559.8131	(73)

6. Solar gains													
[Jan]													
	Area												
	m2												
	Solar flux												
	Table 6a												
	W/m2												
	Specific data												
	or Table 6b												
	Specific data												
	or Table 6c												
	Access												
	factor												
	Table 6d												
	Gains												
	W												
Northeast	13.7200				11.2829		0.6300		0.7000		0.7700		47.3095 (75)
Southwest	7.7700				36.7938		0.6300		0.7000		0.7700		87.3711 (79)
Southwest	0.5300				37.0308		0.6300		0.7000		1.0000		7.7897 (82)
Solar gains	142.4703	259.9098	400.6638	570.7613	706.2810	730.4080	692.0420	586.6198	458.9674	299.4705	173.8019	119.8737	(83)
Total gains	715.0413	846.4326	961.5218	1110.5820	1216.9410	1218.3367	1159.9566	1055.4555	943.0597	804.4011	711.7166	679.6868	(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	21.6305	21.6858	21.7404	22.0002	22.0495	22.2820	22.2820	22.3256	22.1918	22.0495	21.9500	21.8469
alpha	2.4420	2.4457	2.4494	2.4667	2.4700	2.4855	2.4855	2.4884	2.4795	2.4700	2.4633	2.4565
util living area	0.9496	0.9247	0.8848	0.8031	0.6842	0.5378	0.4177	0.4668	0.6664	0.8490	0.9279	0.9549 (86)
MIT	18.1956	18.5633	19.1082	19.8203	20.3979	20.7689	20.9109	20.8805	20.5849	19.8200	18.8962	18.1395 (87)
Th 2	19.8961	19.8986	19.9011	19.9126	19.9148	19.9248	19.9248	19.9267	19.9209	19.9148	19.9104	19.9058 (88)
util rest of house	0.9423	0.9140	0.8681	0.7745	0.6377	0.4684	0.3276	0.3745	0.6014	0.8202	0.9158	0.9483 (89)
MIT 2	16.6384	17.1015	17.7836	18.6612	19.3383	19.7452	19.8751	19.8555	19.5688	18.6845	17.5353	16.5729 (90)
Living area fraction									fLA = Living area / (4) =			0.2945 (91)
MIT	17.0971	17.5320	18.1737	19.0026	19.6504	20.0467	20.1802	20.1574	19.8680	19.0189	17.9361	17.0343 (92)
Temperature adjustment												0.0000
adjusted MIT	17.0971	17.5320	18.1737	19.0026	19.6504	20.0467	20.1802	20.1574	19.8680	19.0189	17.9361	17.0343 (93)

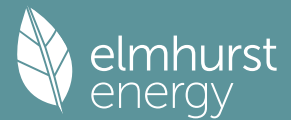
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9157	0.8829	0.8348	0.7463	0.6252	0.4767	0.3500	0.3954	0.5979	0.7908	0.8859	0.9233	(94)
Useful gains	654.7562	747.3373	802.7214	828.8090	760.7923	580.8341	405.9493	417.3737	563.8667	636.1133	630.5365	627.5464	(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													
Space heating kWh	1581.8146	1557.4266	1435.6681	1227.7726	964.0552	653.5704	429.5987	449.9817	694.9386	1020.8690	1319.9301	1570.7029	(97)
Space heating requirement - total per year (kWh/year)	689.7314	544.3800	470.9123	287.2538	151.2276	0.0000	0.0000	0.0000	0.0000	286.2582	496.3634	701.7084	(98a)
Solar heating kWh												3627.8352	
Solar heating contribution - total per year (kWh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Space heating kWh	689.7314	544.3800	470.9123	287.2538	151.2276	0.0000	0.0000	0.0000	0.0000	286.2582	496.3634	701.7084	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3627.8352	
Space heating per m2											(98c) / (4) =	36.0979	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													92.4000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	689.7314	544.3800	470.9123	287.2538	151.2276	0.0000	0.0000	0.0000	0.0000	286.2582	496.3634	701.7084	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	746.4626	589.1559	509.6453	310.8807	163.6662	0.0000	0.0000	0.0000	0.0000	309.8033	537.1898	759.4247	(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	245.7829	217.3130	231.0214	203.8005	197.9480	178.8170	176.9417	183.8064	185.6149	206.4066	218.7260	243.2169	(64)
Efficiency of water heater	86.4670	86.2642	85.8731	85.1167	83.8115	80.3000	80.3000	80.3000	80.3000	85.0824	86.0802	86.5151	(216)
Fuel for water heating, kWh/month	284.2504	251.9158	269.0264	239.4366	236.1825	222.6862	220.3509	228.8997	231.1518	242.5962	254.0957	281.1266	(217)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(219)
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	(221)
Lighting	26.9565	21.6255	19.4714	14.2656	11.0191	9.0027	10.0520	13.0660	16.9714	22.2674	25.1510	27.7057	(222)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-41.0390	-58.0864	-83.8153	-94.5986	-102.2823	-95.5282	-94.2998	-88.8573	-79.3450	-66.5283	-45.1794	-35.4498	(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	-22.5072	-47.4210	-94.4020	-142.0195	-188.0353	-189.0600	-186.8839	-158.1660	-115.8068	-67.9543	-30.0917	-17.7968	(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													3926.2286 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													80.3000
Water heating fuel used													2961.7189 (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)													217.5544 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-2145.1537 (233)
Wind generation													0.0000 (234)
Hydro-electric generation (Appendix N)													0.0000 (235a)

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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	5046.3481 (238)

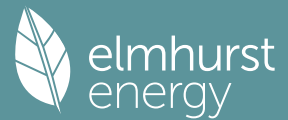
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3926.2286	0.2100	824.5080 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2961.7189	0.2100	621.9610 (264)
Space and water heating			1446.4690 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	217.5544	0.1443	31.3998 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-885.0093	0.1345	-119.0468
PV Unit electricity exported	-1260.1444	0.1258	-158.5783
Total			-277.6251 (269)
Total CO2, kg/year			1212.1730 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.0600 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	3926.2286	1.1300	4436.6383 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2961.7189	1.1300	3346.7424 (278)
Space and water heating			7783.3807 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	217.5544	1.5338	333.6921 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-885.0093	1.4971	-1324.9827
PV Unit electricity exported	-1260.1444	0.4619	-582.0876
Total			-1907.0703 (283)
Total Primary energy kWh/year			6340.1033 (286)
Target Primary Energy Rate (TPER)			63.0900 (287)

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Property Reference	Westcott Court				Issued on Date	14/03/2024
Assessment Reference	Westcott Court - Be Lean		Prop Type Ref			
Property						
SAP Rating	87 B	DER	12.31	TER	12.06	
Environmental	89 B	% DER < TER				-2.07
CO ₂ Emissions (t/year)	1.12	DFEE	33.85	TFEE	42.38	
Compliance Check	See BREL	% DFEE < TFEE				20.12
% DPER < TPER	-7.79	DPER	68.01	TPER	63.09	
Assessor Details	Mr. Samuel Westover				Assessor ID	AX13-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)		Storey height (m)		Volume (m ³)
Ground floor	43.4000 (1b)	x	2.5000 (2b)	=	108.5000 (1b) - (3b)
First floor	37.6000 (1c)	x	2.6000 (2c)	=	97.7600 (1c) - (3c)
Second floor	19.5000 (1d)	x	2.1000 (2d)	=	40.9500 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.5000				(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	247.2100 (5)

2. Ventilation rate

		m ³ per hour
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1618 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	4.0000	(17)
Infiltration rate	0.3618	(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) =	0.3075 (21)

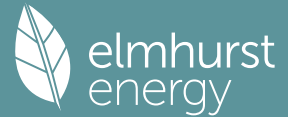
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3921	0.3844	0.3767	0.3383	0.3306	0.2922	0.2922	0.2845	0.3075	0.3306	0.3460	0.3614 (22b)
Effective ac	0.5769	0.5739	0.5710	0.5572	0.5546	0.5427	0.5427	0.5405	0.5473	0.5546	0.5598	0.5653 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Windows (Uw = 1.00)			28.2000	0.9615	27.1154		(27)
Half-Glazed			3.1000	1.2000	3.7200		(26a)
RL			0.7000	0.9615	0.6731		(27a)
Heatloss Floor 1			43.9000	0.1000	4.3900	75.0000	3292.5000 (28a)
External Wall 1	116.6000	31.3000	85.3000	0.1500	12.7950	70.0000	5971.0000 (29a)
Flat Roof	17.9000		17.9000	0.1000	1.7900	9.0000	161.1000 (30)
Slope	23.0000	0.7000	22.3000	0.1000	2.2300	9.0000	200.7000 (30)
Total net area of external elements Aum(A, m2)			201.4000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	52.7135		(33)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =		9625.3000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K						95.7741	(35)
Thermal bridges (User defined value 0.030 * total exposed area)						6.0420	(36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss				(33) + (36) + (36a) =		58.7555	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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(38)m 47.0610 46.8174 46.5787 45.4576 45.2478 44.2713 44.2713 44.0905 44.6474 45.2478 45.6722 46.1158 (38)
 Heat transfer coeff 105.8164 105.5729 105.3342 104.2130 104.0033 103.0268 103.0268 102.8459 103.4029 104.0033 104.4276 104.8713 (39)
 Average = Sum(39)m / 12 = 104.2120

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0529	1.0505	1.0481	1.0369	1.0349	1.0251	1.0251	1.0233	1.0289	1.0349	1.0391	1.0435	(40)
HLP (average)												1.0369	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.7441 (42)
 Hot water usage for mixer showers 70.2294 69.1740 67.6361 64.6935 62.5220 60.1003 58.7238 60.2501 61.9232 64.5234 67.5291 69.9604 (42a)
 Hot water usage for baths 30.3242 29.8738 29.2396 28.0703 27.1947 26.2238 25.6994 26.3291 27.0148 28.0537 29.2471 30.2217 (42b)
 Hot water usage for other uses 42.7324 41.1785 39.6246 38.0707 36.5168 34.9629 34.9629 36.5168 38.0707 39.6246 41.1785 42.7324 (42c)
 Average daily hot water use (litres/day) 131.7121 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	143.2860	140.2263	136.5003	130.8345	126.2334	121.2869	119.3860	123.0960	127.0087	132.2016	137.9548	142.9144	(44)
Energy conte	226.9300	199.6804	209.7959	179.1058	169.9344	149.1364	144.3870	152.4185	156.6144	179.3964	196.5418	223.7694	(45)
Energy content (annual)										Total = Sum(45)m =		2187.7107	
Distribution loss (46)m = 0.15 x (45)m	34.0395	29.9521	31.4694	26.8659	25.4902	22.3705	21.6581	22.8628	23.4922	26.9095	29.4813	33.5654	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
WWHRS	277.8889	245.7078	260.7548	228.4209	220.8934	198.4515	195.3459	203.3775	205.9295	230.3553	245.8569	274.7283	(62)
PV diverter	-49.3113	-43.6113	-45.6673	-37.8143	-35.2416	-30.1565	-28.2669	-30.0590	-31.2010	-36.7826	-41.6702	-48.3981	(63a)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
Output from w/h	228.5776	202.0965	215.0875	190.6066	185.6518	168.2950	167.0791	173.3185	174.7284	193.5727	204.1867	226.3302	(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	88.1940	77.9006	82.4968	71.8815	69.2429	61.9166	60.7484	63.4189	64.4031	72.3890	77.6789	87.1431	(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	164.6464	164.6464	164.6464	164.6464	164.6464	164.6464	164.6464	164.6464	164.6464	164.6464	164.6464	164.6464	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.2214	24.1778	19.6627	14.8859	11.1274	9.3942	10.1508	13.1944	17.7095	22.4862	26.2448	27.9779	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	383.7814	387.7639	377.7282	356.3635	329.3944	304.0473	287.1138	283.1314	293.1670	314.5317	341.5008	366.8480	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.2087	54.2087	54.2087	54.2087	54.2087	54.2087	54.2087	54.2087	54.2087	54.2087	54.2087	54.2087	(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)	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	(71)
Water heating gains (Table 5)	118.5403	115.9235	110.8829	99.8354	93.0685	85.9953	81.6511	85.2404	89.4487	97.2971	107.8874	117.1278	(72)
Total internal gains	641.6340	639.9560	620.3647	583.1757	545.6812	508.5277	488.0066	490.6571	509.4161	546.4059	587.7239	624.0446	(73)

6. Solar gains

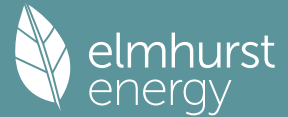
[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W							
Northeast	18.0000	11.2829	0.5700	0.7000	0.7700	56.1566	(75)						
Southwest	10.2000	36.7938	0.5700	0.7000	0.7700	103.7723	(79)						
Southwest	0.7000	37.0308	0.6300	0.7000	1.0000	10.2883	(82)						
Solar gains	170.2172	310.5979	478.8827	682.1593	843.9994	872.7505	826.9420	701.0728	548.5740	357.9044	207.6656	143.2089	(83)
Total gains	811.8511	950.5540	1099.2474	1265.3350	1389.6805	1381.2782	1314.9486	1191.7299	1057.9900	904.3103	795.3894	767.2535	(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	25.2673	25.3256	25.3830	25.6560	25.7078	25.9515	25.9515	25.9971	25.8571	25.7078	25.6033	25.4950	
alpha	2.6845	2.6884	2.6922	2.7104	2.7139	2.7301	2.7301	2.7331	2.7238	2.7139	2.7069	2.6997	
util living area	0.9290	0.8953	0.8356	0.7292	0.5890	0.4420	0.3322	0.3772	0.5768	0.7924	0.9006	0.9373	(86)
MIT	18.8156	19.1683	19.6847	20.2662	20.6773	20.8935	20.9640	20.9486	20.7754	20.2075	19.4064	18.7436	(87)
Th 2	20.0395	20.0415	20.0434	20.0527	20.0544	20.0624	20.0624	20.0639	20.0593	20.0544	20.0509	20.0472	(88)
util rest of house	0.9199	0.8825	0.8160	0.6988	0.5459	0.3859	0.2656	0.3068	0.5180	0.7606	0.8862	0.9291	(89)
MIT 2	17.4973	17.9375	18.5752	19.2786	19.7471	19.9792	20.0416	20.0325	19.8691	19.2312	18.2499	17.4120	(90)

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Living area fraction									fLA = Living area / (4) =	0.2945 (91)		
MIT	17.8856	18.3000	18.9020	19.5695	20.0210	20.2485	20.3133	20.3023	20.1360	19.5187	18.5905	17.8042 (92)
Temperature adjustment												-0.1500
adjusted MIT	17.7356	18.1500	18.7520	19.4195	19.8710	20.0985	20.1633	20.1523	19.9860	19.3687	18.4405	17.6542 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8908	0.8507	0.7847	0.6762	0.5370	0.3881	0.2730	0.3136	0.5132	0.7338	0.8551	0.9016	(94)
Useful gains	723.2168	808.5986	862.5754	855.6419	746.2371	536.0751	358.9187	373.7586	542.9147	663.5965	680.1075	691.7410	(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	1421.7045	1398.8433	1290.5547	1096.2664	849.8147	566.4896	367.1147	385.9108	608.6336	911.9775	1184.2624	1410.9589	(97)
Space heating kWh	519.6749	396.6445	318.4166	173.2496	77.0617	0.0000	0.0000	0.0000	0.0000	184.7954	362.9915	535.0982	(98a)
Space heating requirement - total per year (kWh/year)												2567.9323	
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	519.6749	396.6445	318.4166	173.2496	77.0617	0.0000	0.0000	0.0000	0.0000	184.7954	362.9915	535.0982	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2567.9323	
Space heating per m2										(98c) / (4) =		25.5516	(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 %)													89.8000 (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	519.6749	396.6445	318.4166	173.2496	77.0617	0.0000	0.0000	0.0000	0.0000	184.7954	362.9915	535.0982	(98)
Space heating efficiency (main heating system 1)	89.8000	89.8000	89.8000	89.8000	89.8000	0.0000	0.0000	0.0000	0.0000	89.8000	89.8000	89.8000	(210)
Space heating fuel (main heating system)	578.7025	441.6976	354.5841	192.9283	85.8149	0.0000	0.0000	0.0000	0.0000	205.7855	404.2222	595.8777	(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	228.5776	202.0965	215.0875	190.6066	185.6518	168.2950	167.0791	173.3185	174.7284	193.5727	204.1867	226.3302	(64)
Efficiency of water heater													82.0000 (216)
(217)m	87.2643	87.0065	86.4834	85.5377	84.1439	82.0000	82.0000	82.0000	82.0000	85.6327	86.8267	87.3308	(217)
Fuel for water heating, kWh/month	261.9372	232.2775	248.7037	222.8335	220.6361	205.2379	203.7550	211.3640	213.0835	226.0499	235.1659	259.1643	(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	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822	(231)
Lighting	23.8267	19.1147	17.2106	12.6093	9.7398	7.9575	8.8849	11.5490	15.0010	19.6821	22.2309	24.4889	(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												2859.6128	(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												2740.2084	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
Total electricity for the above, kWh/year												41.0000	(231)
Electricity for lighting (calculated in Appendix L)												192.2952	(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												5833.1164	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2859.6128	3.6400	104.0899	(240)
Total CO2 associated with community systems			0.0000	(473)

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Water heating (other fuel)	2740.2084	3.6400	99.7436 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	41.0000	16.4900	6.7609 (249)
Energy for lighting	192.2952	16.4900	31.7095 (250)
Additional standing charges			92.0000 (251)
Total energy cost			334.3039 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.8271 (257)
SAP value		86.5920
SAP rating (Section 12)		87 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2859.6128	0.2100	600.5187 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2740.2084	0.2100	575.4438 (264)
Space and water heating			1175.9624 (265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872 (267)
Energy for lighting	192.2952	0.1443	27.7541 (268)
Total CO2, kg/year			1209.4038 (272)
CO2 emissions per m2			12.0300 (273)
EI value			88.8618
EI rating			89 (274)
EI band			B

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	43.4000 (1b)	x 2.5000 (2b)	= 108.5000 (1b) - (3b)
First floor	37.6000 (1c)	x 2.6000 (2c)	= 97.7600 (1c) - (3c)
Second floor	19.5000 (1d)	x 2.1000 (2d)	= 40.9500 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.5000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	247.2100 (5)

2. Ventilation rate

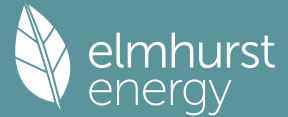
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1618 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3618 (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) = 0.3075 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate	0.3229	0.3075	0.3075	0.2845	0.2845	0.2537	0.2614	0.2460	0.2537	0.2691	0.2691	0.2922 (22b)
Effective ac	0.5521	0.5473	0.5473	0.5405	0.5405	0.5322	0.5342	0.5303	0.5322	0.5362	0.5362	0.5427 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Windows (Uw = 1.00)			28.2000	0.9615	27.1154		(27)
Half-Glazed			3.1000	1.2000	3.7200		(26a)
RL			0.7000	0.9615	0.6731		(27a)
Heatloss Floor 1			43.9000	0.1000	4.3900	75.0000	3292.5000 (28a)

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External Wall 1	116.6000	31.3000	85.3000	0.1500	12.7950	70.0000	5971.0000 (29a)
Flat Roof	17.9000		17.9000	0.1000	1.7900	9.0000	161.1000 (30)
Slope	23.0000	0.7000	22.3000	0.1000	2.2300	9.0000	200.7000 (30)
Total net area of external elements Aum(A, m2)			201.4000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		52.7135		(33)

Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =	9625.3000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K						95.7741 (35)
Thermal bridges (User defined value 0.030 * total exposed area)						6.0420 (36)
Point Thermal Bridges						0.0000
Total fabric heat loss					(33) + (36) + (36a) =	58.7555 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	45.0429	44.6474	44.6474	44.0905	44.0905	43.4154	43.5769	43.2586	43.4154	43.7433	43.7433	44.2713 (38)	
Average = Sum(39)m / 12 =	103.7983	103.4029	103.4029	102.8459	102.8459	102.1708	102.3324	102.0141	102.1708	102.4987	102.4987	103.0268 (39)	
												102.7507	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0328	1.0289	1.0289	1.0233	1.0233	1.0166	1.0182	1.0151	1.0166	1.0199	1.0199	1.0251 (40)	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

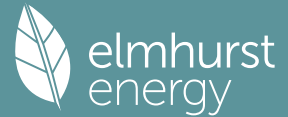
4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.7441 (42)
Hot water usage for mixer showers												
	70.2294	69.1740	67.6361	64.6935	62.5220	60.1003	58.7238	60.2501	61.9232	64.5234	67.5291	69.9604 (42a)
Hot water usage for baths												
	30.3242	29.8738	29.2396	28.0703	27.1947	26.2238	25.6994	26.3291	27.0148	28.0537	29.2471	30.2217 (42b)
Hot water usage for other uses												
	42.7324	41.1785	39.6246	38.0707	36.5168	34.9629	34.9629	36.5168	38.0707	39.6246	41.1785	42.7324 (42c)
Average daily hot water use (litres/day)												131.7121 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	143.2860	140.2263	136.5003	130.8345	126.2334	121.2869	119.3860	123.0960	127.0087	132.2016	137.9548	142.9144 (44)
Energy content (annual)	226.9300	199.6804	209.7959	179.1058	169.9344	149.1364	144.3870	152.4185	156.6144	179.3964	196.5418	223.7694 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 2187.7107
Water storage loss:												
Total storage loss												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month												
WWHRS	277.8889	245.7078	260.7548	228.4209	220.8934	198.4515	195.3459	203.3775	205.9295	230.3553	245.8569	274.7283 (62)
PV diverter	-49.3113	-43.6113	-45.6673	-37.8143	-35.2416	-30.1565	-28.2669	-30.0590	-31.2010	-36.7826	-41.6702	-48.3981 (63a)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
Output from w/h												
	228.5776	202.0965	215.0875	190.6066	185.6518	168.2950	167.0791	173.3185	174.7284	193.5727	204.1867	226.3302 (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)
Heat gains from water heating, kWh/month												
	88.1940	77.9006	82.4968	71.8815	69.2429	61.9166	60.7484	63.4189	64.4031	72.3890	77.6789	87.1431 (65)

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	164.6464	164.6464	164.6464	164.6464	164.6464	164.6464	164.6464	164.6464	164.6464	164.6464	164.6464	164.6464 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	27.2214	24.1778	19.6627	14.8859	11.1274	9.3942	10.1508	13.1944	17.7095	22.4862	26.2448	27.9779 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	383.7814	387.7639	377.7282	356.3635	329.3944	304.0473	287.1138	283.1314	293.1670	314.5317	341.5008	366.8480 (68)
Pumps, fans	54.2087	54.2087	54.2087	54.2087	54.2087	54.2087	54.2087	54.2087	54.2087	54.2087	54.2087	54.2087 (69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Water heating gains (Table 5)												
	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643 (71)
Total internal gains												
	118.5403	115.9235	110.8829	99.8354	93.0685	85.9953	81.6511	85.2404	89.4487	97.2971	107.8874	117.1278 (72)
	641.6340	639.9560	620.3647	583.1757	545.6812	508.5277	488.0066	490.6571	509.4161	546.4059	587.7239	624.0446 (73)

6. Solar gains												
[Jan]												
	Area											
	m2											
	Solar flux											
	Table 6a											
	W/m2											
	Specific data											
	or Table 6b											
	Specific data											
	or Table 6c											
	Access											
	factor											
	Table 6d											
	Gains											
	W											
Northeast	18.0000											64.3222 (75)
Southwest	10.2000											114.1402 (79)
Southwest	0.7000											11.6091 (82)
Solar gains	190.0714	313.1784	479.5210	707.1500	853.9160	945.1821	885.8418	767.2412	596.6569	386.0760	237.7893	158.2292 (83)
Total gains	831.7054	953.1344	1099.8856	1290.3257	1399.5971	1453.7098	1373.8484	1257.8983	1106.0730	932.4819	825.5131	782.2738 (84)

7. Mean internal temperature (heating season)

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Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	25.7586	25.8571	25.8571	25.9971	25.9971	26.1689	26.1276	26.2091	26.1689	26.0851	26.0851	25.9515	
alpha	2.7172	2.7238	2.7238	2.7331	2.7331	2.7446	2.7418	2.7473	2.7446	2.7390	2.7390	2.7301	
util living area	0.9164	0.8836	0.8139	0.6859	0.5221	0.3382	0.2277	0.2548	0.4861	0.7444	0.8769	0.9258 (86)	
MIT	19.0703	19.3677	19.8881	20.4406	20.7993	20.9581	20.9904	20.9869	20.8800	20.4120	19.6715	19.0089 (87)	
Th 2	20.0561	20.0593	20.0593	20.0639	20.0639	20.0695	20.0682	20.0708	20.0695	20.0668	20.0668	20.0624 (88)	
util rest of house	0.9055	0.8692	0.7915	0.6512	0.4735	0.2794	0.1606	0.1827	0.4207	0.7057	0.8590	0.9160 (89)	
MIT 2	17.8279	18.1981	18.8354	19.4903	19.8857	20.0424	20.0646	20.0657	19.9793	19.4792	18.5886	17.7561 (90)	
Living area fraction									fLA = Living area / (4) =				0.2945 (91)
MIT	18.1939	18.5426	19.1454	19.7702	20.1548	20.3121	20.3373	20.3370	20.2446	19.7539	18.9076	18.1251 (92)	
Temperature adjustment												-0.1500	
adjusted MIT	18.0439	18.3926	18.9954	19.6202	20.0048	20.1621	20.1873	20.1870	20.0946	19.6039	18.7576	17.9751 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8756	0.8376	0.7622	0.6333	0.4703	0.2854	0.1693	0.1919	0.4226	0.6841	0.8280	0.8872 (94)
Useful gains	728.2238	798.3828	838.3107	817.2087	658.2843	414.8352	232.5464	241.3489	467.3954	637.8987	683.4993	694.0596 (95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate W	1343.5504	1322.7885	1199.0004	999.6787	720.4112	425.2480	234.0649	243.5109	500.0812	820.3947	1102.6383	1326.4797 (97)
Space heating kWh	457.8030	352.4006	268.3531	131.3784	46.2224	0.0000	0.0000	0.0000	0.0000	135.7770	301.7800	470.5206 (98a)
Space heating requirement - total per year (kWh/year)												2164.2352
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	457.8030	352.4006	268.3531	131.3784	46.2224	0.0000	0.0000	0.0000	0.0000	135.7770	301.7800	470.5206 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2164.2352
Space heating per m2										(98c) / (4) =		21.5347 (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 %)												89.8000 (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	457.8030	352.4006	268.3531	131.3784	46.2224	0.0000	0.0000	0.0000	0.0000	135.7770	301.7800	470.5206 (98)
Space heating efficiency (main heating system 1)	89.8000	89.8000	89.8000	89.8000	89.8000	0.0000	0.0000	0.0000	0.0000	89.8000	89.8000	89.8000 (210)
Space heating fuel (main heating system)	509.8029	392.4283	298.8342	146.3011	51.4727	0.0000	0.0000	0.0000	0.0000	151.1994	336.0580	523.9650 (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	228.5776	202.0965	215.0875	190.6066	185.6518	168.2950	167.0791	173.3185	174.7284	193.5727	204.1867	226.3302 (64)
Efficiency of water heater (217)m	87.0427	86.7910	86.1539	85.0129	83.4448	82.0000	82.0000	82.0000	82.0000	85.0454	86.4803	82.0000 (216)
Fuel for water heating, kWh/month	262.6039	232.8541	249.6549	224.2089	222.4844	205.2379	203.7550	211.3640	213.0835	227.6111	236.1079	259.8247 (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	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822 (231)
Lighting	23.8267	19.1147	17.2106	12.6093	9.7398	7.9575	8.8849	11.5490	15.0010	19.6821	22.2309	24.4889 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												2410.0615 (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												2748.7902 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
central heating pump												41.0000 (230c)
Total electricity for the above, kWh/year												41.0000 (231)
Electricity for lighting (calculated in Appendix L)												192.2952 (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)

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

-0.0000 (236)
0.0000 (237)
5392.1469 (238)

10a. Fuel costs - using BEDF prices (538)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2410.0615	6.1900	149.1828 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2748.7902	6.1900	170.1501 (247)
Energy for instantaneous electric shower(s)	0.0000	25.1600	0.0000 (247a)
Pumps, fans and electric keep-hot	41.0000	25.1600	10.3156 (249)
Energy for lighting	192.2952	25.1600	48.3815 (250)
Additional standing charges			102.0000 (251)
Total energy cost			480.0300 (255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2410.0615	0.2100	506.1129 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2748.7902	0.2100	577.2459 (264)
Space and water heating			1083.3589 (265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872 (267)
Energy for lighting	192.2952	0.1443	27.7541 (268)
Total CO2, kg/year			1116.8002 (272)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2410.0615	1.1300	2723.3694 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2748.7902	1.1300	3106.1329 (278)
Space and water heating			5829.5024 (279)
Pumps, fans and electric keep-hot	41.0000	1.5128	62.0248 (281)
Energy for lighting	192.2952	1.5338	294.9488 (282)
Total Primary energy kWh/year			6186.4760 (286)

SAP 10 EPC IMPROVEMENTS

Westcott Court - Be Lean

Current energy efficiency rating: B 87
Current environmental impact rating: B 89

N Solar water heating			SAP increase too small
U Solar photovoltaic panels			Recommended
V2 Wind turbine			Not applicable
Recommended measures:	SAP change	Cost change	CO2 change
U Solar photovoltaic panels	+ 5.1	-£ 201	-107 kg (9.6%)
Measures omitted - SAP change or cost saving too small:			
N Solar water heating	+ 0.5	-£ 30	-158 kg (14.1%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar photovoltaic panels	£201	1.07 kg/m²	A 92 B 90
Total Savings	£201	1.07 kg/m²	
Potential energy efficiency rating:		A 92	
Potential environmental impact rating:			B 90

Fuel prices for cost data on this page from database revision number 538 TEST (29 Feb 2024)
Recommendation texts revision number 6.1 (11 Jun 2019)

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

	Current	Potential	Saving
Electricity	£59	£59	£0
Mains gas	£421	£421	£0
Space heating	£261	£261	£0
Water heating	£170	£170	£0
Lighting	£48	£48	£0
Generated (PV)	-£0	-£201	£201
Total cost of fuels	£480	£279	£201
Total cost of uses	£479	£278	£201
Delivered energy	54 kWh/m²	46 kWh/m²	8 kWh/m²
Carbon dioxide emissions	1.1 tonnes	1.0 tonnes	0.1 tonnes
CO2 emissions per m²	11 kg/m²	10 kg/m²	1 kg/m²
Primary energy	62 kWh/m²	50 kWh/m²	12 kWh/m²

Full SAP Calculation Printout



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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	43.4000 (1b)	x 2.5000 (2b)	= 108.5000 (1b) - (3b)
First floor	37.6000 (1c)	x 2.6000 (2c)	= 97.7600 (1c) - (3c)
Second floor	19.5000 (1d)	x 2.1000 (2d)	= 40.9500 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.5000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	247.2100 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1618 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3618 (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) = 0.3075 (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	0.3921	0.3844	0.3767	0.3383	0.3306	0.2922	0.2922	0.2845	0.3075	0.3306	0.3460	0.3614 (22b)
Effective ac	0.5769	0.5739	0.5710	0.5572	0.5546	0.5427	0.5427	0.5405	0.5473	0.5546	0.5598	0.5653 (25)

3. Heat losses and heat loss parameter

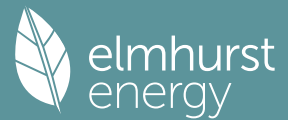
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (Uw = 1.00)			28.2000	0.9615	27.1154		(27)
Half-Glazed			3.1000	1.2000	3.7200		(26a)
RL			0.7000	0.9615	0.6731		(27a)
Heatloss Floor 1			43.9000	0.1000	4.3900	75.0000	3292.5000 (28a)
External Wall 1	116.6000	31.3000	85.3000	0.1500	12.7950	70.0000	5971.0000 (29a)
Flat Roof	17.9000		17.9000	0.1000	1.7900	9.0000	161.1000 (30)
Slope	23.0000	0.7000	22.3000	0.1000	2.2300	9.0000	200.7000 (30)
Total net area of external elements Aum(A, m ²)			201.4000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	52.7135		(33)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	9625.3000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							95.7741 (35)
Thermal bridges (User defined value 0.030 * total exposed area)							6.0420 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	58.7555 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	47.0610	46.8174	46.5787	45.4576	45.2478	44.2713	44.2713	44.0905	44.6474	45.2478	45.6722	46.1158 (38)
Average = Sum(39)m / 12 =	105.8164	105.5729	105.3342	104.2130	104.0033	103.0268	103.0268	102.8459	103.4029	104.0033	104.4276	104.8713 (39)
												104.2120
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0529	1.0505	1.0481	1.0369	1.0349	1.0251	1.0251	1.0233	1.0289	1.0349	1.0391	1.0435 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7441 (42)
Hot water usage for mixer showers												69.9604 (42a)
Hot water usage for baths												30.2217 (42b)
Hot water usage for other uses												42.7324 (42c)
Average daily hot water use (litres/day)												131.7121 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	143.2860	140.2263	136.5003	130.8345	126.2334	121.2869	119.3860	123.0960	127.0087	132.2016	137.9548	142.9144 (44)
	226.9300	199.6804	209.7959	179.1058	169.9344	149.1364	144.3870	152.4185	156.6144	179.3964	196.5418	223.7694 (45)

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Energy content (annual)												Total = Sum(45)m =	2187.7107
Distribution loss (46)m = 0.15 x (45)m													
	34.0395	29.9521	31.4694	26.8659	25.4902	22.3705	21.6581	22.8628	23.4922	26.9095	29.4813	33.5654 (46)	
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)	
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)	
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)	
Total heat required for water heating calculated for each month	277.8889	245.7078	260.7548	228.4209	220.8934	198.4515	195.3459	203.3775	205.9295	230.3553	245.8569	274.7283 (62)	
WWHRS	-49.3113	-43.6113	-45.6673	-37.8143	-35.2416	-30.1565	-28.2669	-30.0590	-31.2010	-36.7826	-41.6702	-48.3981 (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	228.5776	202.0965	215.0875	190.6066	185.6518	168.2950	167.0791	173.3185	174.7284	193.5727	204.1867	226.3302 (64)	
	Total per year (kWh/year) = Sum(64)m =											2329.5305 (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	88.1940	77.9006	82.4968	71.8815	69.2429	61.9166	60.7484	63.4189	64.4031	72.3890	77.6789	87.1431 (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	164.6464	164.6464	164.6464	164.6464	164.6464	164.6464	164.6464	164.6464	164.6464	164.6464	164.6464	164.6464	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.2214	24.1778	19.6627	14.8859	11.1274	9.3942	10.1508	13.1944	17.7095	22.4862	26.2448	27.9779	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	383.7814	387.7639	377.7282	356.3635	329.3944	304.0473	287.1138	283.1314	293.1670	314.5317	341.5008	366.8480	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.2087	54.2087	54.2087	54.2087	54.2087	54.2087	54.2087	54.2087	54.2087	54.2087	54.2087	54.2087	(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)	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	(71)
Water heating gains (Table 5)	118.5403	115.9235	110.8829	99.8354	93.0685	85.9953	81.6511	85.2404	89.4487	97.2971	107.8874	117.1278	(72)
Total internal gains	641.6340	639.9560	620.3647	583.1757	545.6812	508.5277	488.0066	490.6571	509.4161	546.4059	587.7239	624.0446	(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				18.0000	11.2829		0.5700		0.7000		0.7700		56.1566 (75)
Southwest				10.2000	36.7938		0.5700		0.7000		0.7700		103.7723 (79)
Southwest				0.7000	37.0308		0.6300		0.7000		1.0000		10.2883 (82)
Solar gains	170.2172	310.5979	478.8827	682.1593	843.9994	872.7505	826.9420	701.0728	548.5740	357.9044	207.6656	143.2089	(83)
Total gains	811.8511	950.5540	1099.2474	1265.3350	1389.6805	1381.2782	1314.9486	1191.7299	1057.9900	904.3103	795.3894	767.2535	(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	25.2673	25.3256	25.3830	25.6560	25.7078	25.9515	25.9515	25.9971	25.8571	25.7078	25.6033	25.4950
alpha	2.6845	2.6884	2.6922	2.7104	2.7139	2.7301	2.7301	2.7331	2.7238	2.7139	2.7069	2.6997
util living area	0.9290	0.8953	0.8356	0.7292	0.5890	0.4420	0.3322	0.3772	0.5768	0.7924	0.9006	0.9373 (86)
MIT	18.8156	19.1683	19.6847	20.2662	20.6773	20.8935	20.9640	20.9486	20.7754	20.2075	19.4064	18.7436 (87)
Th 2	20.0395	20.0415	20.0434	20.0527	20.0544	20.0624	20.0624	20.0639	20.0593	20.0544	20.0509	20.0472 (88)
util rest of house	0.9199	0.8825	0.8160	0.6988	0.5459	0.3859	0.2656	0.3068	0.5180	0.7606	0.8862	0.9291 (89)
MIT 2	17.4973	17.9375	18.5752	19.2786	19.7471	19.9792	20.0416	20.0325	19.8691	19.2312	18.2499	17.4120 (90)
Living area fraction	17.8856	18.3000	18.9020	19.5695	20.0210	20.2485	20.3133	20.3023	20.1360	19.5187	18.5905	17.8042 (91)
MIT	17.8856	18.3000	18.9020	19.5695	20.0210	20.2485	20.3133	20.3023	20.1360	19.5187	18.5905	17.8042 (92)
Temperature adjustment	17.7356	18.1500	18.7520	19.4195	19.8710	20.0985	20.1633	20.1523	19.9860	19.3687	18.4405	-0.1500
adjusted MIT	17.7356	18.1500	18.7520	19.4195	19.8710	20.0985	20.1633	20.1523	19.9860	19.3687	18.4405	17.6542 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8908	0.8507	0.7847	0.6762	0.5370	0.3881	0.2730	0.3136	0.5132	0.7338	0.8551	0.9016	(94)
Useful gains	723.2168	808.5986	862.5754	855.6419	746.2371	536.0751	358.9187	373.7586	542.9147	663.5965	680.1075	691.7410	(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	1421.7045	1398.8433	1290.5547	1096.2664	849.8147	566.4896	367.1147	385.9108	608.6336	911.9775	1184.2624	1410.9589	(97)
Space heating kWh	519.6749	396.6445	318.4166	173.2496	77.0617	0.0000	0.0000	0.0000	0.0000	184.7954	362.9915	535.0982	(98a)
Space heating requirement - total per year (kWh/year)												2567.9323	
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	519.6749	396.6445	318.4166	173.2496	77.0617	0.0000	0.0000	0.0000	0.0000	184.7954	362.9915	535.0982	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2567.9323	
Space heating per m2											(98c) / (4) =	25.5516	(99)

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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 %)												89.8000	(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	519.6749	396.6445	318.4166	173.2496	77.0617	0.0000	0.0000	0.0000	0.0000	184.7954	362.9915	535.0982	(98)
Space heating efficiency (main heating system 1)	89.8000	89.8000	89.8000	89.8000	89.8000	0.0000	0.0000	0.0000	0.0000	89.8000	89.8000	89.8000	(210)
Space heating fuel (main heating system)	578.7025	441.6976	354.5841	192.9283	85.8149	0.0000	0.0000	0.0000	0.0000	205.7855	404.2222	595.8777	(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	228.5776	202.0965	215.0875	190.6066	185.6518	168.2950	167.0791	173.3185	174.7284	193.5727	204.1867	226.3302	(64)
Efficiency of water heater (217)m	87.2643	87.0065	86.4834	85.5377	84.1439	82.0000	82.0000	82.0000	82.0000	85.6327	86.8267	87.3308	(216)
Fuel for water heating, kWh/month	261.9372	232.2775	248.7037	222.8335	220.6361	205.2379	203.7550	211.3640	213.0835	226.0499	235.1659	259.1643	(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	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.3699	3.3699	3.4822	3.3699	3.4822	(231)
Lighting	23.8267	19.1147	17.2106	12.6093	9.7398	7.9575	8.8849	11.5490	15.0010	19.6821	22.2309	24.4889	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-33.8672	-48.9390	-72.1840	-83.2717	-91.4576	-85.8974	-84.6925	-79.0155	-69.3776	-56.7265	-37.5954	-29.1249	(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												2859.6128	(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												2740.2084	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans: central heating pump												41.0000	(230c)
Total electricity for the above, kWh/year												41.0000	(231)
Electricity for lighting (calculated in Appendix L)												192.2952	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-772.1493	(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												5060.9671	(238)

10a. Fuel costs - using Table 12 prices

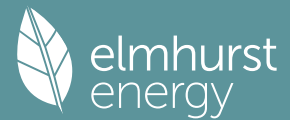
	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2859.6128	3.6400	104.0899	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)			99.7436	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	41.0000	16.4900	6.7609	(249)
Energy for lighting	192.2952	16.4900	31.7095	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-772.1493	16.4900	-127.3274	
PV Unit electricity exported	0.0000	5.5900	0.0000	
Total			-127.3274	(252)
Total energy cost			206.9764	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)		0.5121	(257)
SAP value	$[(255) \times (256)] / [(4) + 45.0] =$	91.6988	
SAP rating (Section 12)		92	(258)
SAP band		A	

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

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	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2859.6128	0.2100	600.5187 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2740.2084	0.2100	575.4438 (264)
Space and water heating			1175.9624 (265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872 (267)
Energy for lighting	192.2952	0.1443	27.7541 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-772.1493	0.1341	-103.5364
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-103.5364 (269)
Total CO2, kg/year			1105.8674 (272)
CO2 emissions per m2			11.0000 (273)
EI value			89.8154
EI rating			90 (274)
EI band			B

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	43.4000 (1b)	x 2.5000 (2b)	= 108.5000 (1b) - (3b)
First floor	37.6000 (1c)	x 2.6000 (2c)	= 97.7600 (1c) - (3c)
Second floor	19.5000 (1d)	x 2.1000 (2d)	= 40.9500 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.5000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 247.2100 (5)

2. Ventilation rate

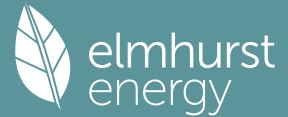
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1618 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3618 (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) = 0.3075 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate	0.3229	0.3075	0.3075	0.2845	0.2845	0.2537	0.2614	0.2460	0.2537	0.2691	0.2691	0.2922 (22b)
Effective ac	0.5521	0.5473	0.5473	0.5405	0.5405	0.5322	0.5342	0.5303	0.5322	0.5362	0.5362	0.5427 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
Windows (Uw = 1.00)			28.2000	0.9615	27.1154			(27)					
Half-Glazed			3.1000	1.2000	3.7200			(26a)					
RL			0.7000	0.9615	0.6731			(27a)					
Heatloss Floor 1			43.9000	0.1000	4.3900	75.0000	3292.5000	(28a)					
External Wall 1	116.6000	31.3000	85.3000	0.1500	12.7950	70.0000	5971.0000	(29a)					
Flat Roof	17.9000		17.9000	0.1000	1.7900	9.0000	161.1000	(30)					
Slope	23.0000	0.7000	22.3000	0.1000	2.2300	9.0000	200.7000	(30)					
Total net area of external elements Aum(A, m2)			201.4000					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		52.7135			(33)					
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		9625.3000	(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							95.7741	(35)					
Thermal bridges (User defined value 0.030 * total exposed area)							6.0420	(36)					
Point Thermal bridges						(36a) =	0.0000						
Total fabric heat loss					(33) + (36) + (36a) =		58.7555	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 45.0429	Feb 44.6474	Mar 44.6474	Apr 44.0905	May 44.0905	Jun 43.4154	Jul 43.5769	Aug 43.2586	Sep 43.4154	Oct 43.7433	Nov 43.7433	Dec 44.2713	(38)
Heat transfer coeff	103.7983	103.4029	103.4029	102.8459	102.8459	102.1708	102.3324	102.0141	102.1708	102.4987	102.4987	103.0268	(39)
Average = Sum(39)m / 12 =												102.7507	

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HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0328	1.0289	1.0289	1.0233	1.0233	1.0166	1.0182	1.0151	1.0166	1.0199	1.0199	1.0251	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.7441 (42)												
Hot water usage for mixer showers	69.9604 (42a)												
Hot water usage for baths	30.2217 (42b)												
Hot water usage for other uses	42.7324 (42c)												
Average daily hot water use (litres/day)	131.7121 (43)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	143.2860	140.2263	136.5003	130.8345	126.2334	121.2869	119.3860	123.0960	127.0087	132.2016	137.9548	142.9144	(44)
Energy content (annual)	226.9300	199.6804	209.7959	179.1058	169.9344	149.1364	144.3870	152.4185	156.6144	179.3964	196.5418	223.7694	(45)
Distribution loss (46)m = 0.15 x (45)m	34.0395	29.9521	31.4694	26.8659	25.4902	22.3705	21.6581	22.8628	23.4922	26.9095	29.4813	33.5654	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	277.8889	245.7078	260.7548	228.4209	220.8934	198.4515	195.3459	203.3775	205.9295	230.3553	245.8569	274.7283	(62)
WWHRS	-49.3113	-43.6113	-45.6673	-37.8143	-35.2416	-30.1565	-28.2669	-30.0590	-31.2010	-36.7826	-41.6702	-48.3981	(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	228.5776	202.0965	215.0875	190.6066	185.6518	168.2950	167.0791	173.3185	174.7284	193.5727	204.1867	226.3302	(64)
Electric shower(s)	Total per year (kWh/year) = Sum(64)m = 2329.5305 (64)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)												
Heat gains from water heating, kWh/month	88.1940	77.9006	82.4968	71.8815	69.2429	61.9166	60.7484	63.4189	64.4031	72.3890	77.6789	87.1431	(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	164.6464	164.6464	164.6464	164.6464	164.6464	164.6464	164.6464	164.6464	164.6464	164.6464	164.6464	164.6464	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.2214	24.1778	19.6627	14.8859	11.1274	9.3942	10.1508	13.1944	17.7095	22.4862	26.2448	27.9779	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	383.7814	387.7639	377.7282	356.3635	329.3944	304.0473	287.1138	283.1314	293.1670	314.5317	341.5008	366.8480	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.2087	54.2087	54.2087	54.2087	54.2087	54.2087	54.2087	54.2087	54.2087	54.2087	54.2087	54.2087	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	(71)
Water heating gains (Table 5)	118.5403	115.9235	110.8829	99.8354	93.0685	85.9953	81.6511	85.2404	89.4487	97.2971	107.8874	117.1278	(72)
Total internal gains	641.6340	639.9560	620.3647	583.1757	545.6812	508.5277	488.0066	490.6571	509.4161	546.4059	587.7239	624.0446	(73)

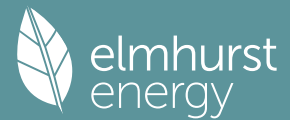
6. Solar gains

[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				18.0000	12.9236	0.5700	0.7000	0.7700	64.3222 (75)			
Southwest				10.2000	40.4699	0.5700	0.7000	0.7700	114.1402 (79)			
Southwest				0.7000	41.7848	0.6300	0.7000	1.0000	11.6091 (82)			
Solar gains	190.0714	313.1784	479.5210	707.1500	853.9160	945.1821	885.8418	767.2412	596.6569	386.0760	237.7893	158.2292 (83)
Total gains	831.7054	953.1344	1099.8856	1290.3257	1399.5971	1453.7098	1373.8484	1257.8983	1106.0730	932.4819	825.5131	782.2738 (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	25.7586	25.8571	25.8571	25.9971	25.9971	26.1689	26.1276	26.2091	26.1689	26.0851	26.0851	25.9515	
alpha	2.7172	2.7238	2.7238	2.7331	2.7331	2.7446	2.7418	2.7473	2.7446	2.7390	2.7390	2.7301	
util living area	0.9164	0.8836	0.8139	0.6859	0.5221	0.3382	0.2277	0.2548	0.4861	0.7444	0.8769	0.9258 (86)	
MIT	19.0703	19.3677	19.8881	20.4406	20.7993	20.9581	20.9904	20.9869	20.8800	20.4120	19.6715	19.0089 (87)	
Th 2	20.0561	20.0593	20.0593	20.0639	20.0639	20.0695	20.0682	20.0708	20.0695	20.0668	20.0668	20.0624 (88)	
util rest of house	0.9055	0.8692	0.7915	0.6512	0.4735	0.2794	0.1606	0.1827	0.4207	0.7057	0.8590	0.9160 (89)	
MIT 2	17.8279	18.1981	18.8354	19.4903	19.8857	20.0424	20.0646	20.0657	19.9793	19.4792	18.5886	17.7561 (90)	
Living area fraction	18.1939	18.5426	19.1454	19.7702	20.1548	20.3121	20.3373	20.3370	fLA = Living area / (4) =				0.2945 (91)
MIT	18.1939	18.5426	19.1454	19.7702	20.1548	20.3121	20.3373	20.3370	20.2446	19.7539	18.9076	18.1251 (92)	
Temperature adjustment												-0.1500	
adjusted MIT	18.0439	18.3926	18.9954	19.6202	20.0048	20.1621	20.1873	20.1870	20.0946	19.6039	18.7576	17.9751 (93)	

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8756	0.8376	0.7622	0.6333	0.4703	0.2854	0.1693	0.1919	0.4226	0.6841	0.8280	0.8872	(94)
Useful gains	728.2238	798.3828	838.3107	817.2087	658.2843	414.8352	232.5464	241.3489	467.3954	637.8987	683.4993	694.0596	(95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000	(96)
Heat loss rate W	1343.5504	1322.7885	1199.0004	999.6787	720.4112	425.2480	234.0649	243.5109	500.0812	820.3947	1102.6383	1326.4797	(97)
Space heating kWh	457.8030	352.4006	268.3531	131.3784	46.2224	0.0000	0.0000	0.0000	0.0000	135.7770	301.7800	470.5206	(98a)
Space heating requirement - total per year (kWh/year)												2164.2352	
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	457.8030	352.4006	268.3531	131.3784	46.2224	0.0000	0.0000	0.0000	0.0000	135.7770	301.7800	470.5206	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2164.2352	
Space heating per m2										(98c) / (4) =		21.5347	(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 %)												89.8000	(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	457.8030	352.4006	268.3531	131.3784	46.2224	0.0000	0.0000	0.0000	0.0000	135.7770	301.7800	470.5206	(98)
Space heating efficiency (main heating system 1)	89.8000	89.8000	89.8000	89.8000	89.8000	0.0000	0.0000	0.0000	0.0000	89.8000	89.8000	89.8000	(210)
Space heating fuel (main heating system)	509.8029	392.4283	298.8342	146.3011	51.4727	0.0000	0.0000	0.0000	0.0000	151.1994	336.0580	523.9650	(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	228.5776	202.0965	215.0875	190.6066	185.6518	168.2950	167.0791	173.3185	174.7284	193.5727	204.1867	226.3302	(64)
Efficiency of water heater (217)m	87.0427	86.7910	86.1539	85.0129	83.4448	82.0000	82.0000	82.0000	82.0000	85.0454	86.4803	87.1088	(216)
Fuel for water heating, kWh/month	262.6039	232.8541	249.6549	224.2089	222.4844	205.2379	203.7550	211.3640	213.0835	227.6111	236.1079	259.8247	(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	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822	(231)
Lighting	23.8267	19.1147	17.2106	12.6093	9.7398	7.9575	8.8849	11.5490	15.0010	19.6821	22.2309	24.4889	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-37.0825	-49.2822	-72.1093	-84.6846	-91.6405	-88.9394	-87.2321	-82.4649	-72.6229	-59.6731	-41.7610	-31.6868	(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												2410.0615	(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												2748.7902	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
Total electricity for the above, kWh/year												41.0000	(231)
Electricity for lighting (calculated in Appendix L)												192.2952	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-799.1793	(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												4592.9676	(238)

10a. Fuel costs - using BEDF prices (538)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2410.0615	6.1900	149.1828	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2748.7902	6.1900	170.1501	(247)
Energy for instantaneous electric shower(s)	0.0000	25.1600	0.0000	(247a)
Pumps, fans and electric keep-hot	41.0000	25.1600	10.3156	(249)
Energy for lighting	192.2952	25.1600	48.3815	(250)
Additional standing charges			102.0000	(251)

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Energy saving/generation technologies			
PV Unit electricity used in dwelling	-799.1793	25.1600	-201.0735
PV Unit electricity exported	0.0000	5.8100	0.0000
Total			-201.0735 (252)
Total energy cost			278.9565 (255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2410.0615	0.2100	506.1129 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2748.7902	0.2100	577.2459 (264)
Space and water heating			1083.3589 (265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872 (267)
Energy for lighting	192.2952	0.1443	27.7541 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-799.1793	0.1341	-107.2067
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-107.2067 (269)
Total CO2, kg/year			1009.5935 (272)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2410.0615	1.1300	2723.3694 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2748.7902	1.1300	3106.1329 (278)
Space and water heating			5829.5024 (279)
Pumps, fans and electric keep-hot	41.0000	1.5128	62.0248 (281)
Energy for lighting	192.2952	1.5338	294.9488 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-799.1793	1.4957	-1195.3669
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-1195.3669 (283)
Total Primary energy kWh/year			4991.1091 (286)

Summary for Input Data



Property Reference	Westcott Court		Issued on Date	14/03/2024
Assessment Reference	Westcott Court - Be Green	Prop Type Ref		
Property				

SAP Rating	84 B	DER	3.55	TER	11.79
Environmental	97 A	% DER < TER			69.89
CO ₂ Emissions (t/year)	0.33	DFEE	33.85	TFEE	42.38
Compliance Check	See BREL	% DFEE < TFEE			20.12
% DPER < TPER	39.34	DPER	37.38	TPER	61.62

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	House, Semi-Detached	
Which Floor	0	
2.0 Number of Storeys	3	
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 m ²	0.00 m
Ground floor:	19.90 m	43.40 m ²	2.50 m
1st Storey:	18.20 m	37.60 m ²	2.60 m
2nd Storey:	9.30 m	19.50 m ²	2.10 m
3rd Storey:	0.00 m	0.00 m ²	0.00 m
4th Storey:	0.00 m	0.00 m ²	0.00 m
5th Storey:	0.00 m	0.00 m ²	0.00 m
6th Storey:	0.00 m	0.00 m ²	0.00 m
7th Storey:	0.00 m	0.00 m ²	0.00 m

8.0 Living Area	29.60	m ²
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9.0 External Walls											
Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area(m ²)	Nett Area (m ²)	Shelter Res	Shelter	Openings	Area Calculation Type	
External Wall 1	Cavity Wall	Cavity wall : dense plaster, AAC block, filled cavity, any outside structure	0.15	70.00	116.60	85.30	0.00	None	31.30	Calculate Wall Area	

10.0 External Roofs											
Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area(m ²)	Nett Area (m ²)	Shelter Code	Shelter Factor	Calculation Type	Openings	
Flat Roof	External Flat Roof	Plasterboard, insulated flat roof	0.10	9.00	17.90	17.90	None	0.00	Enter Gross Area	0.00	
Slope	External Slope Roof	Plasterboard, insulated slope	0.10	9.00	23.00	22.30	None	0.00	Enter Gross Area	0.70	

11.0 Heat Loss Floors									
Description	Type	Storey Index	Construction	U-Value (W/m ² K)	Shelter Code	Shelter Factor	Kappa (kJ/m ² K)	Area (m ²)	
Heatloss Floor 1	Ground Floor - Solid	Lowest occupied	Suspended concrete floor, carpeted	0.10	None	0.00	75.00	43.90	

12.0 Opening Types

Summary for Input Data

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Windows	Manufacturer	Window	Triple Low-E Soft 0.05		Air Filled	0.57	Wood	0.70	1.00
RL	Manufacturer	Roof Light	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.00
Half-Glazed	Manufacturer	Half Glazed Door	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	10.20	0
Front	Half-Glazed	External Wall 1	South West	3.10	0
RL	RL	Slope	South West	0.70	30
NE	Windows	External Wall 1	North East	18.00	0

14.0 Conservatory

15.0 Draught Proofing

 %

16.0 Draught Lobby

17.0 Thermal Bridging

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E5 Ground floor (normal)		19.90	0.00	0.00	Yes
E6 Intermediate floor within a dwelling		27.50	0.00	0.00	No
E16 Corner (normal)		24.60	0.00	0.00	No
E18 Party wall between dwellings		14.20	0.00	0.00	No
E1 Steel lintel with perforated steel base plate		19.00	0.00	0.00	No
E3 Sill		4.95	0.00	0.00	No
E4 Jamb		33.00	0.00	0.00	No
E11 Eaves (insulation at rafter level)		5.90	0.00	0.00	No
E13 Gable (insulation at rafter level)		3.30	0.00	0.00	No
E15 Flat roof with parapet		14.30	0.00	0.00	No
E14 Flat roof		8.20	0.00	0.00	No
P1 Party wall - Ground floor		6.40	0.00	0.00	No
P2 Party wall - Intermediate floor within a dwelling		6.40	0.00	0.00	No
P5 Party wall - Roof (insulation at rafter level)		5.40	0.00	0.00	No

Y-value W/m²K

Description

18.0 Pressure Testing

Designed AP₅₀ m³/(h.m²) @ 50 Pa

Property Tested?

Test Method

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System

22.0 Lighting

No Fixed Lighting

Name	Efficacy	Power	Capacity	Count
Lighting 1	120.00	5	600	35

24.0 Main Heating 1

Percentage of Heat %

Database Ref. No.

Fuel Type

SAP Code

In Winter

In Summer

Model Name

Manufacturer

System Type

Controls SAP Code

Delayed Start Stat

Summary for Input Data

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	Standard Combi
Combi keep hot type	None

25.0 Main Heating 2	None
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26.0 Heat Networks	None
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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	1
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
S2	Vented hot water system	7.00		Yes	Instantaneous System 1
S3	Vented hot water system	7.00		Yes	Instantaneous System 1

28.3 Waste Water Heat Recovery System Instantaneous System 1	
Database ID	80194
Brand Model	Zypho, Slim DW50
Details	Year: 2022 + current Efficiency: 54.9 Utilisation factor: 0.987

29.0 Hot Water Cylinder	
Hot Water Cylinder	
Cylinder Stat	Yes
Cylinder In Heated Space	Yes
Independent Time Control	Yes
Insulation Type	Measured Loss
Cylinder Volume	150.00
Loss	1.80
Pipes insulation	Fully insulated primary pipework

Summary for Input Data

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

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Property Reference	Westcott Court			Issued on Date	14/03/2024
Assessment Reference	Westcott Court - Be Green	Prop Type Ref			
Property					
SAP Rating	84 B	DER	3.55	TER	11.79
Environmental	97 A	% DER < TER			69.89
CO ₂ Emissions (t/year)	0.33	DFEE	33.85	TFEE	42.38
Compliance Check	See BREL	% DFEE < TFEE			20.12
% DPER < TPER	39.34	DPER	37.38	TPER	61.62
Assessor Details	Mr. Samuel Westover			Assessor ID	AX13-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)		Storey height (m)		Volume (m ³)	
Ground floor	43.4000 (1b)	x	2.5000 (2b)	=	108.5000 (1b)	- (3b)
First floor	37.6000 (1c)	x	2.6000 (2c)	=	97.7600 (1c)	- (3c)
Second floor	19.5000 (1d)	x	2.1000 (2d)	=	40.9500 (1d)	- (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.5000					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	247.2100	(5)

2. Ventilation rate

	m ³ per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1618 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	4.0000	(17)
Infiltration rate	0.3618	(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) =	0.3075 (21)

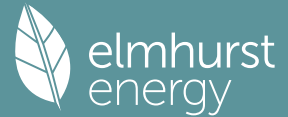
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3921	0.3844	0.3767	0.3383	0.3306	0.2922	0.2922	0.2845	0.3075	0.3306	0.3460	0.3614	(22b)
Effective ac	0.5769	0.5739	0.5710	0.5572	0.5546	0.5427	0.5427	0.5405	0.5473	0.5546	0.5598	0.5653	(25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K	
Windows (U _w = 1.00)			28.2000	0.9615	27.1154			(27)
Half-Glazed			3.1000	1.2000	3.7200			(26a)
RL			0.7000	0.9615	0.6731			(27a)
Heatloss Floor 1			43.9000	0.1000	4.3900	75.0000	3292.5000	(28a)
External Wall 1	116.6000	31.3000	85.3000	0.1500	12.7950	70.0000	5971.0000	(29a)
Flat Roof	17.9000		17.9000	0.1000	1.7900	9.0000	161.1000	(30)
Slope	23.0000	0.7000	22.3000	0.1000	2.2300	9.0000	200.7000	(30)
Total net area of external elements A _{um} (A, m ²)			201.4000					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	52.7135		(33)
Heat capacity C _m = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		9625.3000	(34)
Thermal mass parameter (TMP = C _m / TFA) in kJ/m ² K							95.7741	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							6.0420	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss					(33) + (36) + (36a) =		58.7555	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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(38)m	47.0610	46.8174	46.5787	45.4576	45.2478	44.2713	44.2713	44.0905	44.6474	45.2478	45.6722	46.1158	(38)
Heat transfer coeff	105.8164	105.5729	105.3342	104.2130	104.0033	103.0268	103.0268	102.8459	103.4029	104.0033	104.4276	104.8713	(39)
Average = Sum(39)m / 12 =												104.2120	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0529	1.0505	1.0481	1.0369	1.0349	1.0251	1.0251	1.0233	1.0289	1.0349	1.0391	1.0435	(40)
HLP (average)												1.0369	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.7441	(42)
Hot water usage for mixer showers														
70.2294	69.1740	67.6361	64.6935	62.5220	60.1003	58.7238	60.2501	61.9232	64.5234	67.5291	69.9604	(42a)		
Hot water usage for baths														
30.3242	29.8738	29.2396	28.0703	27.1947	26.2238	25.6994	26.3291	27.0148	28.0537	29.2471	30.2217	(42b)		
Hot water usage for other uses														
42.7324	41.1785	39.6246	38.0707	36.5168	34.9629	34.9629	36.5168	38.0707	39.6246	41.1785	42.7324	(42c)		
Average daily hot water use (litres/day)												131.7121	(43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Daily hot water use	143.2860	140.2263	136.5003	130.8345	126.2334	121.2869	119.3860	123.0960	127.0087	132.2016	137.9548	142.9144	(44)	
Energy content	226.9300	199.6804	209.7959	179.1058	169.9344	149.1364	144.3870	152.4185	156.6144	179.3964	196.5418	223.7694	(45)	
Energy content (annual)										Total = Sum(45)m =		2187.7107		
Distribution loss (46)m = 0.15 x (45)m														
34.0395	29.9521	31.4694	26.8659	25.4902	22.3705	21.6581	22.8628	23.4922	26.9095	29.4813	33.5654	(46)		
Water storage loss:														
Store volume												150.0000	(47)	
a) If manufacturer declared loss factor is known (kWh/day):												1.8000	(48)	
Temperature factor from Table 2b												0.5400	(49)	
Enter (49) or (54) in (55)												0.9720	(55)	
Total storage loss														
30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)		
If cylinder contains dedicated solar storage														
30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(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														
280.3244	247.9076	263.1903	230.7778	223.3288	200.8084	197.7814	205.8129	208.2864	232.7908	248.2138	277.1638	(62)		
WWHRS	-49.3113	-43.6113	-45.6673	-37.8143	-35.2416	-30.1565	-28.2669	-30.0590	-31.2010	-36.7826	-41.6702	-48.3981	(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														
231.0131	204.2963	217.5230	192.9635	188.0873	170.6520	169.5146	175.7540	177.0854	196.0082	206.5436	228.7657	(64)		
12Total per year (kWh/year)												2358.2065	(64)	
Electric shower(s)												2358	(64)	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)		
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)	
Heat gains from water heating, kWh/month														
118.1697	104.9755	112.4726	100.8903	99.2187	90.9255	90.7242	93.3947	93.4119	102.3648	106.6878	117.1189	(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	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	129.6944	143.5902	129.6944	134.0175	129.6944	134.0175	129.6944	129.6944	134.0175	129.6944	134.0175	129.6944	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	257.1336	259.8018	253.0779	238.7636	220.6943	203.7117	192.3663	189.6980	196.4219	210.7363	228.8056	245.7881	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	(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)	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	(71)
Water heating gains (Table 5)	158.8303	156.2135	151.1729	140.1254	133.3585	126.2854	121.9411	125.5305	129.7387	137.5871	148.1774	157.4178	(72)
Total internal gains	609.8198	623.7671	598.1068	577.0681	547.9087	528.1761	508.1634	509.0845	524.3398	542.1793	575.1621	597.0619	(73)

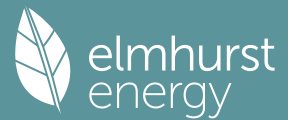
6. Solar gains

[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				18.0000	11.2829	0.5700	0.7000	0.7700	56.1566 (75)			
Southwest				10.2000	36.7938	0.5700	0.7000	0.7700	103.7723 (79)			
Southwest				0.7000	37.0308	0.6300	0.7000	1.0000	10.2883 (82)			
Solar gains	170.2172	310.5979	478.8827	682.1593	843.9994	872.7505	826.9420	701.0728	548.5740	357.9044	207.6656	143.2089 (83)
Total gains	780.0370	934.3650	1076.9895	1259.2274	1391.9081	1400.9267	1335.1054	1210.1573	1072.9137	900.0837	782.8277	740.2709 (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 from living area, nil,m (see Table 9a)														
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
tau	25.2673	25.3256	25.3830	25.6560	25.7078	25.9515	25.9515	25.9971	25.8571	25.7078	25.6033	25.4950		
alpha	2.6845	2.6884	2.6922	2.7104	2.7139	2.7301	2.7301	2.7331	2.7238	2.7139	2.7069	2.6997		
util living area														
0.9346	0.8987	0.8412	0.7310	0.5884	0.4368	0.3276	0.3721	0.5711	0.7939	0.9036	0.9418	(86)		

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Living	18.7614	19.1438	19.6575	20.2614	20.6782	20.8966	20.9652	20.9503	20.7809	20.2031	19.3871	18.6962
Non living	17.4298	17.9075	18.5429	19.2732	19.7480	19.9817	20.0424	20.0336	19.8742	19.2263	18.2262	17.3528
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	19.8548	19.1438	19.6575	20.2614	20.6782	20.8966	20.9652	20.9503	20.7809	20.2031	19.3871	19.0185 (87)
Th 2	20.0395	20.0415	20.0434	20.0527	20.0544	20.0624	20.0624	20.0639	20.0593	20.0544	20.0509	20.0472 (88)
util rest of house	0.9261	0.8862	0.8220	0.7006	0.5452	0.3811	0.2618	0.3024	0.5125	0.7622	0.8896	0.9342 (89)
MIT 2	18.9991	17.9075	18.5429	19.2732	19.7480	19.9817	20.0424	20.0336	19.8742	19.2263	18.2262	17.8384 (90)
Living area fraction									FLA = Living area / (4) =			0.2945 (91)
MIT	19.2511	18.2717	18.8712	19.5642	20.0219	20.2512	20.3142	20.3036	20.1412	19.5140	18.5681	18.1859 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2511	18.2717	18.8712	19.5642	20.0219	20.2512	20.3142	20.3036	20.1412	19.5140	18.5681	18.1859 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9180	0.8574	0.7944	0.6834	0.5437	0.3926	0.2798	0.3207	0.5179	0.7414	0.8619	0.9150	(94)
Useful gains	716.0675	801.1019	855.5550	860.5624	756.7184	550.0487	373.5685	388.1028	555.6624	667.3620	674.6918	677.3747	(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	1582.0744	1411.6859	1303.1074	1111.3514	865.5087	582.2207	382.6599	401.4693	624.6782	927.0860	1197.5903	1466.7241	(97)
Space heating kWh	644.3091	410.3124	332.9790	180.5681	80.9400	0.0000	0.0000	0.0000	0.0000	193.2347	376.4869	587.2760	(98a)
Space heating requirement - total per year (kWh/year)												2806.1062	
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	644.3091	410.3124	332.9790	180.5681	80.9400	0.0000	0.0000	0.0000	0.0000	193.2347	376.4869	587.2760	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2806.1062	
Space heating per m2										(98c) / (4) =		27.9215	(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 %)													302.4811	(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	644.3091	410.3124	332.9790	180.5681	80.9400	0.0000	0.0000	0.0000	0.0000	193.2347	376.4869	587.2760	(98)	
Space heating efficiency (main heating system 1)	302.4811	302.4811	302.4811	302.4811	302.4811	0.0000	0.0000	0.0000	0.0000	302.4811	302.4811	302.4811	(210)	
Space heating fuel (main heating system)	213.0081	135.6489	110.0826	59.6957	26.7587	0.0000	0.0000	0.0000	0.0000	63.8832	124.4663	194.1530	(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	231.0131	204.2963	217.5230	192.9635	188.0873	170.6520	169.5146	175.7540	177.0854	196.0082	206.5436	228.7657	(64)	
Efficiency of water heater (217)m	179.3127	179.3127	179.3127	179.3127	179.3127	179.3127	179.3127	179.3127	179.3127	179.3127	179.3127	179.3127	(216)	
Fuel for water heating, kWh/month	128.8325	113.9329	121.3093	107.6128	104.8934	95.1700	94.5357	98.0153	98.7578	109.3108	115.1863	127.5792	(219)	
Space cooling fuel requirement														
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)	
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)	
Lighting	23.8267	19.1147	17.2106	12.6093	9.7398	7.9575	8.8849	11.5490	15.0010	19.6821	22.2309	24.4889	(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													927.6964	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													179.3127	
Water heating fuel used													1315.1360	(219)
Space cooling fuel													0.0000	(221)
Electricity for pumps and fans:														
Total electricity for the above, kWh/year													0.0000	(231)
Electricity for lighting (calculated in Appendix L)													192.2952	(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													2435.1277	(238)

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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	927.6964	0.1557	144.4649	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1315.1360	0.1407	185.0187	(264)
Space and water heating			329.4836	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	192.2952	0.1443	27.7541	(268)
Total CO2, kg/year			357.2377	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.5500	(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	927.6964	1.5765	1462.4820	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1315.1360	1.5202	1999.2536	(278)
Space and water heating			3461.7355	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	192.2952	1.5338	294.9488	(282)
Total Primary energy kWh/year			3756.6843	(286)
Dwelling Primary energy Rate (DPER)			37.3800	(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	43.4000 (1b)	x	2.5000 (2b)	=	108.5000 (1b)	- (3b)
First floor	37.6000 (1c)	x	2.6000 (2c)	=	97.7600 (1c)	- (3c)
Second floor	19.5000 (1d)	x	2.1000 (2d)	=	40.9500 (1d)	- (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	100.5000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)... (3n)	=	247.2100	(5)

2. Ventilation rate

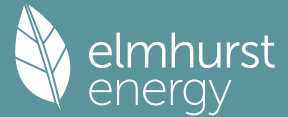
	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	(6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1618 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.4118	(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) =	0.3500 (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	0.4463	0.4375	0.4288	0.3850	0.3763	0.3325	0.3325	0.3238	0.3500	0.3763	0.3938	0.4113	(22b)
Effective ac	0.5996	0.5957	0.5919	0.5741	0.5708	0.5553	0.5553	0.5524	0.5613	0.5708	0.5775	0.5846	(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 Semi-glazed door			3.1000	1.0000	3.1000			(26a)
TER Opening Type (Uw = 1.20)			21.4900	1.1450	24.6069			(27)
RL			0.5300	2.0221	1.0717			(27a)
Heatloss Floor 1			43.9000	0.1300	5.7070			(28a)
External Wall 1	116.6000	24.5900	92.0100	0.1800	16.5618			(29a)
Flat Roof	17.9000		17.9000	0.1100	1.9690			(30)
Slope	23.0000	0.5300	22.4700	0.1100	2.4717			(30)
Total net area of external elements Aum(A, m2)			201.4000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	55.4881			(33)

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

95.7741 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	19.9000	0.1600	3.1840
E6 Intermediate floor within a dwelling	27.5000	0.0000	0.0000
E16 Corner (normal)	24.6000	0.0900	2.2140
E18 Party wall between dwellings	14.2000	0.0600	0.8520
E1 Steel lintel with perforated steel base plate	19.0000	0.0500	0.9500
E3 Sill	4.9500	0.0500	0.2475
E4 Jamb	33.0000	0.0500	1.6500
E11 Eaves (insulation at rafter level)	5.9000	0.0400	0.2360
E13 Gable (insulation at rafter level)	3.3000	0.0800	0.2640
E15 Flat roof with parapet	14.3000	0.5600	8.0080
E14 Flat roof	8.2000	0.0800	0.6560
P1 Party wall - Ground floor	6.4000	0.0800	0.5120
P2 Party wall - Intermediate floor within a dwelling	6.4000	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	5.4000	0.0800	0.4320
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			19.2055 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	74.6936 (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	48.9141	48.5986	48.2894	46.8369	46.5651	45.3001	45.3001	45.0658	45.7874	46.5651	47.1149	47.6896 (38)
Heat transfer coeff	123.6076	123.2922	122.9829	121.5305	121.2587	119.9937	119.9937	119.7594	120.4809	121.2587	121.8085	122.3832 (39)
Average = Sum(39)m / 12 =												121.5292
HLP	1.2299	1.2268	1.2237	1.2093	1.2066	1.1940	1.1940	1.1916	1.1988	1.2066	1.2120	1.2177 (40)
HLP (average)												1.2092
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy

2.7441 (42)

Hot water usage for mixer showers

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot water usage for mixer showers	70.2294	69.1740	67.6361	64.6935	62.5220	60.1003	58.7238	60.2501	61.9232	64.5234	67.5291	69.9604 (42a)
Hot water usage for baths	30.3242	29.8738	29.2396	28.0703	27.1947	26.2238	25.6994	26.3291	27.0148	28.0537	29.2471	30.2217 (42b)
Hot water usage for other uses	42.7324	41.1785	39.6246	38.0707	36.5168	34.9629	34.9629	36.5168	38.0707	39.6246	41.1785	42.7324 (42c)
Average daily hot water use (litres/day)												131.7121 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	143.2860	140.2263	136.5003	130.8345	126.2334	121.2869	119.3860	123.0960	127.0087	132.2016	137.9548	142.9144 (44)
Energy content (annual)	226.9300	199.6804	209.7959	179.1058	169.9344	149.1364	144.3870	152.4185	156.6144	179.3964	196.5418	223.7694 (45)
Distribution loss (46)m = 0.15 x (45)m	34.0395	29.9521	31.4694	26.8659	25.4902	22.3705	21.6581	22.8628	23.4922	26.9095	29.4813	33.5654 (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	273.5249	241.7661	256.3908	224.1977	216.5293	194.2283	190.9819	199.0134	201.7063	225.9913	241.6337	270.3643 (62)
WWHRS	-32.1060	-28.3948	-29.7334	-24.6204	-22.9453	-19.6345	-18.4042	-19.5710	-20.3146	-23.9487	-27.1309	-31.5114 (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	241.4189	213.3714	226.6574	199.5773	193.5840	174.5938	172.5777	179.4424	181.3917	202.0426	214.5027	238.8529 (64)
Total per year (kWh/year)												2438.0129 (64)

12Total per year (kWh/year)

Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	112.7301	100.0623	107.0330	95.6262	93.7791	85.6613	85.2846	87.9551	88.1478	96.9252	101.4236	111.6793 (65)

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

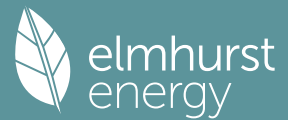
Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	129.7356	143.6358	129.7356	134.0601	129.7356	134.0601	129.7356	129.7356	134.0601	129.7356	134.0601	129.7356 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	257.1336	259.8018	253.0779	238.7636	220.6943	203.7117	192.3663	189.6980	196.4219	210.7363	228.8056	245.7881 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205 (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)	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643 (71)
Water heating gains (Table 5)	151.5190	148.9023	143.8616	132.8141	126.0472	118.9741	114.6299	118.2192	122.4275	130.2758	140.8662	150.1065 (72)
Total internal gains	605.5498	619.5015	593.8367	572.7994	543.6387	520.9075	500.8933	501.8144	517.0711	537.9093	570.8934	592.7919 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W
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		W/m2	or Table 6b	or Table 6c	Table 6d	
Northeast	13.7200	11.2829	0.6300	0.7000	0.7700	47.3095 (75)
Southwest	7.7700	36.7938	0.6300	0.7000	0.7700	87.3711 (79)
Southwest	0.5300	37.0308	0.6300	0.7000	1.0000	7.7897 (82)

Solar gains	142.4703	259.9098	400.6638	570.7613	706.2810	730.4080	692.0420	586.6198	458.9674	299.4705	173.8019	119.8737 (83)
Total gains	748.0201	879.4113	994.5005	1143.5607	1249.9197	1251.3154	1192.9353	1088.4342	976.0385	837.3798	744.6953	712.6655 (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	21.6305	21.6858	21.7404	22.0002	22.0495	22.2820	22.2820	22.3256	22.1918	22.0495	21.9500	21.8469
alpha	2.4420	2.4457	2.4494	2.4667	2.4700	2.4855	2.4855	2.4884	2.4795	2.4700	2.4633	2.4565
util living area	0.9449	0.9191	0.8779	0.7945	0.6744	0.5276	0.4080	0.4555	0.6535	0.8389	0.9214	0.9503 (86)
MIT	18.2518	18.6151	19.1534	19.8541	20.4187	20.7790	20.9155	20.8870	20.6040	19.8599	18.9487	18.1969 (87)
Th 2	19.8961	19.8986	19.9011	19.9126	19.9148	19.9248	19.9248	19.9267	19.9209	19.9148	19.9104	19.9058 (88)
util rest of house	0.9369	0.9077	0.8605	0.7651	0.6275	0.4586	0.3195	0.3647	0.5881	0.8088	0.9084	0.9432 (89)
MIT 2	16.7088	17.1655	17.8383	18.7000	19.3600	19.7536	19.8779	19.8597	19.5867	18.7305	17.5999	16.6450 (90)
Living area fraction	17.1633	17.5924	18.2256	19.0399	19.6718	20.0556	20.1835	20.1623	19.8863	19.0631	17.9971	0.2945 (91)
MIT	17.1633	17.5924	18.2256	19.0399	19.6718	20.0556	20.1835	20.1623	19.8863	19.0631	17.9971	17.1020 (92)
Temperature adjustment												0.0000
adjusted MIT	17.1633	17.5924	18.2256	19.0399	19.6718	20.0556	20.1835	20.1623	19.8863	19.0631	17.9971	17.1020 (93)

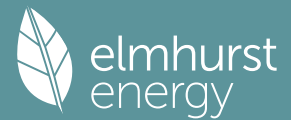
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9092	0.8760	0.8271	0.7376	0.6159	0.4675	0.3417	0.3856	0.5858	0.7800	0.8778	0.9170 (94)
Useful gains	680.1361	770.3460	822.5526	843.5079	769.8599	584.9758	407.5858	419.7312	571.7873	653.1761	653.6784	653.4831 (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	1589.9982	1564.8785	1442.0540	1232.3087	966.6487	654.6403	429.9975	450.5654	697.1444	1026.2233	1327.3621	1578.9938 (97)
Space heating kWh	676.9374	533.9258	460.9090	279.9366	146.4109	0.0000	0.0000	0.0000	0.0000	277.5472	485.0523	688.5799 (98a)
Space heating requirement - total per year (kWh/year)												3549.2991
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	676.9374	533.9258	460.9090	279.9366	146.4109	0.0000	0.0000	0.0000	0.0000	277.5472	485.0523	688.5799 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3549.2991
Space heating per m2										(98c) / (4) =		35.3164 (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	676.9374	533.9258	460.9090	279.9366	146.4109	0.0000	0.0000	0.0000	0.0000	277.5472	485.0523	688.5799 (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)	733.4099	578.4678	499.3597	303.2899	158.6250	0.0000	0.0000	0.0000	0.0000	300.7011	525.5171	746.0237 (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	241.4189	213.3714	226.6574	199.5773	193.5840	174.5938	172.5777	179.4424	181.3917	202.0426	214.5027	238.8529 (64)
Efficiency of water heater (217)m	86.2430	86.0297	85.6169	84.8186	83.4418	79.8000	79.8000	79.8000	79.8000	84.7722	85.8318	79.8000 (216)
Fuel for water heating, kWh/month	279.9286	248.0207	264.7345	235.2991	231.9989	218.7892	216.2628	224.8652	227.3079	238.3359	249.9107	276.7913 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	26.9565	21.6255	19.4714	14.2656	11.0191	9.0027	10.0520	13.0660	16.9714	22.2674	25.1510	27.7057 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-41.0390	-58.0864	-83.8153	-94.5986	-102.2823	-95.5282	-94.2998	-88.8573	-79.3450	-66.5283	-45.1794	-35.4498 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-22.5072	-47.4210	-94.4020	-142.0195	-188.0353	-189.0600	-186.8839	-158.1660	-115.8068	-67.9543	-30.0917	-17.7968 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												3845.3944 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)

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Efficiency of water heater	79.8000	
Water heating fuel used	2912.2447	(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)	217.5544	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2145.1537	(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	4916.0397	(238)

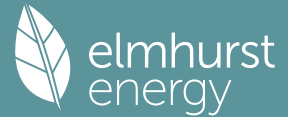
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3845.3944	0.2100	807.5328 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2912.2447	0.2100	611.5714 (264)
Space and water heating			1419.1042 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	217.5544	0.1443	31.3998 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-885.0093	0.1345	-119.0468
PV Unit electricity exported	-1260.1444	0.1258	-158.5783
Total			-277.6251 (269)
Total CO2, kg/year			1184.8082 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.7900 (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	3845.3944	1.1300	4345.2957 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2912.2447	1.1300	3290.8365 (278)
Space and water heating			7636.1322 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	217.5544	1.5338	333.6921 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-885.0093	1.4971	-1324.9827
PV Unit electricity exported	-1260.1444	0.4619	-582.0876
Total			-1907.0703 (283)
Total Primary energy kWh/year			6192.8548 (286)
Target Primary Energy Rate (TPER)			61.6200 (287)

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Property Reference	Westcott Court				Issued on Date	14/03/2024	
Assessment Reference	Westcott Court - Be Green			Prop Type Ref			
Property							
SAP Rating	84 B	DER	3.55	TER	11.79		
Environmental	97 A	% DER < TER				69.89	
CO ₂ Emissions (t/year)	0.33	DFEE	33.85	TFEE	42.38		
Compliance Check	See BREL	% DFEE < TFEE				20.12	
% DPER < TPER	39.34	DPER	37.38	TPER	61.62		
Assessor Details	Mr. Samuel Westover				Assessor ID	AX13-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)		Storey height (m)		Volume (m ³)	
Ground floor	43.4000 (1b)	x	2.5000 (2b)	=	108.5000 (1b)	- (3b)
First floor	37.6000 (1c)	x	2.6000 (2c)	=	97.7600 (1c)	- (3c)
Second floor	19.5000 (1d)	x	2.1000 (2d)	=	40.9500 (1d)	- (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.5000					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	247.2100	(5)

2. Ventilation rate

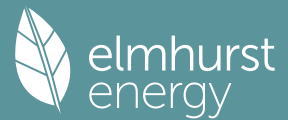
	m ³ per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1618 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	4.0000	(17)
Infiltration rate	0.3618	(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) =	0.3075 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	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	0.3921	0.3844	0.3767	0.3383	0.3306	0.2922	0.2922	0.2845	0.3075	0.3306	0.3460	0.3614	(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	0.5769	0.5739	0.5710	0.5572	0.5546	0.5427	0.5427	0.5405	0.5473	0.5546	0.5598	0.5653	(25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K	
Windows (Uw = 1.00)			28.2000	0.9615	27.1154			(27)
Half-Glazed			3.1000	1.2000	3.7200			(26a)
RL			0.7000	0.9615	0.6731			(27a)
Heatloss Floor 1			43.9000	0.1000	4.3900	75.0000	3292.5000	(28a)
External Wall 1	116.6000	31.3000	85.3000	0.1500	12.7950	70.0000	5971.0000	(29a)
Flat Roof	17.9000		17.9000	0.1000	1.7900	9.0000	161.1000	(30)
Slope	23.0000	0.7000	22.3000	0.1000	2.2300	9.0000	200.7000	(30)
Total net area of external elements Aum(A, m ²)			201.4000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	52.7135			(33)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			9625.3000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							95.7741	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							6.0420	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss				(33) + (36) + (36a) =			58.7555	(37)

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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	47.0610	46.8174	46.5787	45.4576	45.2478	44.2713	44.2713	44.0905	44.6474	45.2478	45.6722	46.1158	(38)
Heat transfer coeff	105.8164	105.5729	105.3342	104.2130	104.0033	103.0268	103.0268	102.8459	103.4029	104.0033	104.4276	104.8713	(39)
Average = Sum(39)m / 12 =												104.2120	
HLP	1.0529	1.0505	1.0481	1.0369	1.0349	1.0251	1.0251	1.0233	1.0289	1.0349	1.0391	1.0435	(40)
HLP (average)												1.0369	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.7441 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	30.3242	29.8738	29.2396	28.0703	27.1947	26.2238	25.6994	26.3291	27.0148	28.0537	29.2471	30.2217	(42b)
Hot water usage for other uses	42.7324	41.1785	39.6246	38.0707	36.5168	34.9629	34.9629	36.5168	38.0707	39.6246	41.1785	42.7324	(42c)
Average daily hot water use (litres/day)												66.9629	(43)
Daily hot water use	73.0566	71.0523	68.8642	66.1410	63.7115	61.1867	60.6622	62.8459	65.0855	67.6783	70.4256	72.9541	(44)
Energy conte	115.7038	101.1775	105.8417	90.5437	85.7679	75.2361	73.3657	77.8164	80.2569	91.8388	100.3342	114.2284	(45)
Energy content (annual)										Total = Sum(45)m =		1112.1111	
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													
WWHRS	98.3482	86.0009	89.9655	76.9621	72.9027	63.9507	62.3609	66.1439	68.2184	78.0630	85.2841	97.0942	(62)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
Output from w/h	98.3482	86.0009	89.9655	76.9621	72.9027	63.9507	62.3609	66.1439	68.2184	78.0630	85.2841	97.0942	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		945.2945	(64)
Electric shower(s)	56.2421	50.1122	54.7205	52.2191	53.1990	50.7467	52.4383	53.1990	52.2191	54.7205	53.6916	56.2421	(64a)
												639.7503	(64a)
Heat gains from water heating, kWh/month	38.6476	34.0283	36.1715	32.2953	31.5254	28.6744	28.6998	29.8357	30.1094	33.1959	34.7439	38.3341	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	129.6944	143.5902	129.6944	134.0175	129.6944	134.0175	129.6944	129.6944	134.0175	129.6944	134.0175	129.6944	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	257.1336	259.8018	253.0779	238.7636	220.6943	203.7117	192.3663	189.6980	196.4219	210.7363	228.8056	245.7881	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	(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)	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	(71)
Water heating gains (Table 5)	51.9457	50.6373	48.6176	44.8546	42.3729	39.8255	38.5750	40.1018	41.8186	44.6181	48.2554	51.5243	(72)
Total internal gains	502.9352	518.1909	495.5515	481.7973	456.9231	441.7163	424.7972	423.6558	436.4196	449.2103	475.2401	491.1684	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
Northeast				18.0000	11.2829		0.5700	0.7000	0.7700		56.1566 (75)	
Southwest				10.2000	36.7938		0.5700	0.7000	0.7700		103.7723 (79)	
Southwest				0.7000	37.0308		0.6300	0.7000	1.0000		10.2883 (82)	
Solar gains	170.2172	310.5979	478.8827	682.1593	843.9994	872.7505	826.9420	701.0728	548.5740	357.9044	207.6656	143.2089 (83)
Total gains	673.1523	828.7888	974.4342	1163.9566	1300.9225	1314.4668	1251.7392	1124.7286	984.9935	807.1147	682.9057	634.3773 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	25.2673	25.3256	25.3830	25.6560	25.7078	25.9515	25.9515	25.9971	25.8571	25.7078	25.6033	25.4950	
alpha	2.6845	2.6884	2.6922	2.7104	2.7139	2.7301	2.7301	2.7331	2.7238	2.7139	2.7069	2.6997	
util living area	0.9522	0.9200	0.8667	0.7590	0.6157	0.4605	0.3474	0.3968	0.6057	0.8270	0.9267	0.9585	(86)
MIT	18.5716	18.9772	19.5249	20.1811	20.6390	20.8821	20.9597	20.9417	20.7457	20.1010	19.2256	18.5032	(87)
Th 2	20.0395	20.0415	20.0434	20.0527	20.0544	20.0624	20.0624	20.0639	20.0593	20.0544	20.0509	20.0472	(88)

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util rest of house	0.9457	0.9096	0.8496	0.7300	0.5724	0.4029	0.2783	0.3236	0.5465	0.7982	0.9154	0.9527 (89)
MIT 2	17.8208	18.2184	18.7501	19.3745	19.7847	19.9902	20.0442	20.0359	19.8899	19.3184	18.4745	17.7588 (90)
Living area fraction									FLA = Living area /	(4) =		0.2945 (91)
MIT	18.0419	18.4419	18.9783	19.6121	20.0363	20.2529	20.3139	20.3027	20.1419	19.5489	18.6957	17.9781 (92)
Temperature adjustment												0.0000
adjusted MIT	18.0419	18.4419	18.9783	19.6121	20.0363	20.2529	20.3139	20.3027	20.1419	19.5489	18.6957	17.9781 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9278	0.8880	0.8272	0.7151	0.5715	0.4150	0.2972	0.3428	0.5521	0.7805	0.8949	0.9362	(94)
Useful gains	624.5755	735.9293	806.0668	832.2937	743.4936	545.4833	372.0514	385.5955	543.7769	629.9187	611.1450	593.8893	(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	1454.1171	1429.6585	1314.3917	1116.3393	866.9994	582.3999	382.6270	401.3776	624.7550	930.7148	1210.9129	1444.9236	(97)
Space heating kWh	617.1790	466.1860	378.1937	204.5128	91.8883	0.0000	0.0000	0.0000	0.0000	223.7923	431.8329	633.1695	(98a)
Space heating requirement - total per year (kWh/year)												3046.7546	
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	617.1790	466.1860	378.1937	204.5128	91.8883	0.0000	0.0000	0.0000	0.0000	223.7923	431.8329	633.1695	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3046.7546	
Space heating per m2											(98c) / (4) =	30.3160	(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	968.4516	762.3981	781.6291	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8625	0.9040	0.8762	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	835.2905	689.1822	684.8977	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1475.1527	1404.7749	1260.0702	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	460.7008	532.4010	427.9283	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	115.1752	133.1002	106.9821	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement													355.2575 (107)
Energy for space heating													30.3160 (99)
Energy for space cooling													3.5349 (108)
Total													33.8509 (109)
Fabric Energy Efficiency (DFEE)													33.9 (109)

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

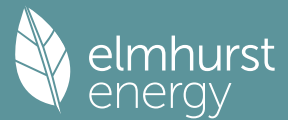
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	43.4000 (1b)	x 2.5000 (2b)	= 108.5000 (1b) - (3b)	
First floor	37.6000 (1c)	x 2.6000 (2c)	= 97.7600 (1c) - (3c)	
Second floor	19.5000 (1d)	x 2.1000 (2d)	= 40.9500 (1d) - (3d)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.5000		(4)	
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	247.2100 (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	4 * 10 =	40.0000 (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) =	40.0000 / (5) =	0.1618 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.4118	(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) =	0.3500 (21)

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Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4463	0.4375	0.4288	0.3850	0.3763	0.3325	0.3325	0.3238	0.3500	0.3763	0.3938	0.4113	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													(23c)
Effective ac	0.5996	0.5957	0.5919	0.5741	0.5708	0.5553	0.5553	0.5524	0.5613	0.5708	0.5775	0.5846	(25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K	
TER Semi-glazed door			3.1000	1.0000	3.1000			(26a)
TER Opening Type (Uw = 1.20)			21.4900	1.1450	24.6069			(27)
RL			0.5300	2.0221	1.0717			(27a)
Heatloss Floor 1			43.9000	0.1300	5.7070			(28a)
External Wall 1	116.6000	24.5900	92.0100	0.1800	16.5618			(29a)
Flat Roof	17.9000		17.9000	0.1100	1.9690			(30)
Slope	23.0000	0.5300	22.4700	0.1100	2.4717			(30)
Total net area of external elements Aum(A, m ²)			201.4000					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	55.4881		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							95.7741	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E5 Ground floor (normal)	19.9000	0.1600	3.1840	
E6 Intermediate floor within a dwelling	27.5000	0.0000	0.0000	
E16 Corner (normal)	24.6000	0.0900	2.2140	
E18 Party wall between dwellings	14.2000	0.0600	0.8520	
E1 Steel lintel with perforated steel base plate	19.0000	0.0500	0.9500	
E3 Sill	4.9500	0.0500	0.2475	
E4 Jamb	33.0000	0.0500	1.6500	
E11 Eaves (insulation at rafter level)	5.9000	0.0400	0.2360	
E13 Gable (insulation at rafter level)	3.3000	0.0800	0.2640	
E15 Flat roof with parapet	14.3000	0.5600	8.0080	
E14 Flat roof	8.2000	0.0800	0.6560	
P1 Party wall - Ground floor	6.4000	0.0800	0.5120	
P2 Party wall - Intermediate floor within a dwelling	6.4000	0.0000	0.0000	
P5 Party wall - Roof (insulation at rafter level)	5.4000	0.0800	0.4320	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			19.2055	(36)
Point Thermal bridges			0.0000	(36a) =
Total fabric heat loss			74.6936	(33) + (36) + (36a) =

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

(38)m	Jan 48.9141	Feb 48.5986	Mar 48.2894	Apr 46.8369	May 46.5651	Jun 45.3001	Jul 45.3001	Aug 45.0658	Sep 45.7874	Oct 46.5651	Nov 47.1149	Dec 47.6896	(38)
Heat transfer coeff	123.6076	123.2922	122.9829	121.5305	121.2587	119.9937	119.9937	119.7594	120.4809	121.2587	121.8085	122.3832	(39)
Average = Sum(39)m / 12 =												121.5292	
HLP	Jan 1.2299	Feb 1.2268	Mar 1.2237	Apr 1.2093	May 1.2066	Jun 1.1940	Jul 1.1940	Aug 1.1916	Sep 1.1988	Oct 1.2066	Nov 1.2120	Dec 1.2177	(40)
HLP (average)												1.2092	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

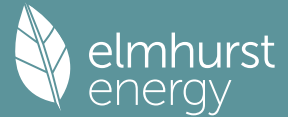
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.7441 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	30.3242	29.8738	29.2396	28.0703	27.1947	26.2238	25.6994	26.3291	27.0148	28.0537	29.2471	30.2217	(42b)
Hot water usage for other uses	42.7324	41.1785	39.6246	38.0707	36.5168	34.9629	34.9629	36.5168	38.0707	39.6246	41.1785	42.7324	(42c)
Average daily hot water use (litres/day)												66.9629	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	73.0566	71.0523	68.8642	66.1410	63.7115	61.1867	60.6622	62.8459	65.0855	67.6783	70.4256	72.9541	(44)
Energy content (annual)	115.7038	101.1775	105.8417	90.5437	85.7679	75.2361	73.3657	77.8164	80.2569	91.8388	100.3342	114.2284	(45)
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	98.3482	86.0009	89.9655	76.9621	72.9027	63.9507	62.3609	66.1439	68.2184	78.0630	85.2841	97.0942	(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	98.3482	86.0009	89.9655	76.9621	72.9027	63.9507	62.3609	66.1439	68.2184	78.0630	85.2841	97.0942	(64)
12Total per year (kWh/year)													(64)
Electric shower(s)	56.2421	50.1122	54.7205	52.2191	53.1990	50.7467	52.4383	53.1990	52.2191	54.7205	53.6916	56.2421	(64a)
												945.2945	(64)
												945	(64)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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(66)m	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	129.7356	143.6358	129.7356	134.0601	129.7356	134.0601	129.7356	129.7356	134.0601	129.7356	134.0601	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	257.1336	259.8018	253.0779	238.7636	220.6943	203.7117	192.3663	189.6980	196.4219	210.7363	228.8056	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	(71)
Water heating gains (Table 5)	51.9457	50.6373	48.6176	44.8546	42.3729	39.8255	38.5750	40.1018	41.8186	44.6181	48.2554	(72)
Total internal gains	502.9764	518.2365	495.5927	481.8399	456.9644	441.7589	424.8384	423.6970	436.4622	449.2516	475.2827	(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					13.7200	11.2829	0.6300	0.7000			0.7700	47.3095 (75)	
Southwest					7.7700	36.7938	0.6300	0.7000			0.7700	87.3711 (79)	
Southwest					0.5300	37.0308	0.6300	0.7000			1.0000	7.7897 (82)	
Solar gains	142.4703	259.9098	400.6638	570.7613	706.2810	730.4080	692.0420	586.6198	458.9674	299.4705	173.8019	119.8737	(83)
Total gains	645.4467	778.1464	896.2565	1052.6012	1163.2454	1172.1668	1116.8805	1010.3168	895.4296	748.7221	649.0846	611.0833	(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	21.6305	21.6858	21.7404	22.0002	22.0495	22.2820	22.2820	22.3256	22.1918	22.0495	21.9500	21.8469
alpha	2.4420	2.4457	2.4494	2.4667	2.4700	2.4855	2.4855	2.4884	2.4795	2.4700	2.4633	2.4565
util living area	0.9591	0.9359	0.8983	0.8185	0.7007	0.5527	0.4309	0.4829	0.6857	0.8660	0.9397	0.9638 (86)
MIT	18.0742	18.4530	19.0155	19.7582	20.3619	20.7538	20.9043	20.8708	20.5552	19.7494	18.7935	18.0173 (87)
Th 2	19.8961	19.8986	19.9011	19.9126	19.9148	19.9248	19.9248	19.9267	19.9209	19.9148	19.9104	19.9058 (88)
util rest of house	0.9529	0.9265	0.8831	0.7911	0.6548	0.4827	0.3389	0.3889	0.6214	0.8393	0.9293	0.9583 (89)
MIT 2	17.2385	17.6121	18.1631	18.8815	19.4363	19.7749	19.8830	19.8663	19.6245	18.8921	17.9605	17.1887 (90)
Living area fraction	17.4847	17.8598	18.4142	19.1397	19.7089	20.0632	20.1838	20.1621	19.8986	19.1446	18.2058	17.4327 (92)
MIT	17.4847	17.8598	18.4142	19.1397	19.7089	20.0632	20.1838	20.1621	19.8986	19.1446	18.2058	17.4327 (93)
Temperature adjustment												0.0000
adjusted MIT	17.4847	17.8598	18.4142	19.1397	19.7089	20.0632	20.1838	20.1621	19.8986	19.1446	18.2058	17.4327 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9344	0.9036	0.8573	0.7683	0.6452	0.4923	0.3621	0.4107	0.6200	0.8161	0.9075	0.9412 (94)
Ext temp.	603.0979	703.1610	768.3807	808.7616	750.5179	577.0378	404.4467	414.9566	555.1391	611.0288	589.0513	575.1231 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Space heating kWh	1629.7251	1597.8378	1465.2403	1244.4358	971.1530	655.5500	430.0326	450.5487	698.6243	1036.1055	1352.7807	1619.4656 (97)
Space heating requirement - total per year (kWh/year)	763.8107	601.2228	518.4635	313.6855	164.1525	0.0000	0.0000	0.0000	0.0000	316.2570	549.8852	776.9909 (98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)	763.8107	601.2228	518.4635	313.6855	164.1525	0.0000	0.0000	0.0000	0.0000	316.2570	549.8852	776.9909 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4004.4681
Space heating per m2										(98c) / (4) =		39.8455 (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	1127.9404	887.9531	910.1714	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7645	0.8221	0.7852	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	862.3032	729.9491	714.6394	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1311.0299	1249.2460	1128.1515	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	323.0833	386.3569	307.6530	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	80.7708	96.5892	76.9132	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												254.2733 (107)
Energy for space heating												39.8455 (99)
Energy for space cooling												2.5301 (108)
Total												42.3755 (109)
Fabric Energy Efficiency (TFEE)												42.4 (109)

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Property Reference	Westcott Court			Issued on Date	14/03/2024
Assessment Reference	Westcott Court - Be Green	Prop Type Ref			
Property					
SAP Rating	84 B	DER	3.55	TER	11.79
Environmental	97 A	% DER < TER			69.89
CO ₂ Emissions (t/year)	0.33	DFEE	33.85	TFEE	42.38
Compliance Check	See BREL	% DFEE < TFEE			20.12
% DPER < TPER	39.34	DPER	37.38	TPER	61.62
Assessor Details	Mr. Samuel Westover			Assessor ID	AX13-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)		Storey height (m)		Volume (m ³)	
Ground floor	43.4000 (1b)	x	2.5000 (2b)	=	108.5000 (1b)	- (3b)
First floor	37.6000 (1c)	x	2.6000 (2c)	=	97.7600 (1c)	- (3c)
Second floor	19.5000 (1d)	x	2.1000 (2d)	=	40.9500 (1d)	- (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.5000					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	247.2100	(5)

2. Ventilation rate

	m ³ per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1618 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	4.0000	(17)
Infiltration rate	0.3618	(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) =	0.3075 (21)

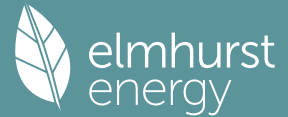
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3921	0.3844	0.3767	0.3383	0.3306	0.2922	0.2922	0.2845	0.3075	0.3306	0.3460	0.3614	(22b)
Effective ac	0.5769	0.5739	0.5710	0.5572	0.5546	0.5427	0.5427	0.5405	0.5473	0.5546	0.5598	0.5653	(25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K	
Windows (Uw = 1.00)			28.2000	0.9615	27.1154			(27)
Half-Glazed			3.1000	1.2000	3.7200			(26a)
RL			0.7000	0.9615	0.6731			(27a)
Heatloss Floor 1			43.9000	0.1000	4.3900	75.0000	3292.5000	(28a)
External Wall 1	116.6000	31.3000	85.3000	0.1500	12.7950	70.0000	5971.0000	(29a)
Flat Roof	17.9000		17.9000	0.1000	1.7900	9.0000	161.1000	(30)
Slope	23.0000	0.7000	22.3000	0.1000	2.2300	9.0000	200.7000	(30)
Total net area of external elements Aum(A, m ²)			201.4000					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	52.7135		(33)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		9625.3000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							95.7741	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							6.0420	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss					(33) + (36) + (36a) =		58.7555	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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(38)m	47.0610	46.8174	46.5787	45.4576	45.2478	44.2713	44.2713	44.0905	44.6474	45.2478	45.6722	46.1158 (38)
Heat transfer coeff	105.8164	105.5729	105.3342	104.2130	104.0033	103.0268	103.0268	102.8459	103.4029	104.0033	104.4276	104.8713 (39)
Average = Sum(39)m / 12 =												104.2120
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0529	1.0505	1.0481	1.0369	1.0349	1.0251	1.0251	1.0233	1.0289	1.0349	1.0391	1.0435 (40)
HLP (average)												1.0369
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.7441 (42)
Hot water usage for mixer showers													
70.2294	69.1740	67.6361	64.6935	62.5220	60.1003	58.7238	60.2501	61.9232	64.5234	67.5291	69.9604	(42a)	
Hot water usage for baths													
30.3242	29.8738	29.2396	28.0703	27.1947	26.2238	25.6994	26.3291	27.0148	28.0537	29.2471	30.2217	(42b)	
Hot water usage for other uses													
42.7324	41.1785	39.6246	38.0707	36.5168	34.9629	34.9629	36.5168	38.0707	39.6246	41.1785	42.7324	(42c)	
Average daily hot water use (litres/day)												131.7121 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	143.2860	140.2263	136.5003	130.8345	126.2334	121.2869	119.3860	123.0960	127.0087	132.2016	137.9548	142.9144 (44)	
Energy content	226.9300	199.6804	209.7959	179.1058	169.9344	149.1364	144.3870	152.4185	156.6144	179.3964	196.5418	223.7694 (45)	
Energy content (annual)										Total = Sum(45)m =		2187.7107	
Distribution loss (46)m = 0.15 x (45)m													
34.0395	29.9521	31.4694	26.8659	25.4902	22.3705	21.6581	22.8628	23.4922	26.9095	29.4813	33.5654	(46)	
Water storage loss:													
Store volume												150.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):												1.8000 (48)	
Temperature factor from Table 2b												0.5400 (49)	
Enter (49) or (54) in (55)												0.9720 (55)	
Total storage loss													
30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)	
If cylinder contains dedicated solar storage													
30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(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	(61)	
Total heat required for water heating calculated for each month													
280.3244	247.9076	263.1903	230.7778	223.3288	200.8084	197.7814	205.8129	208.2864	232.7908	248.2138	277.1638	(62)	
WWHRS	-49.3113	-43.6113	-45.6673	-37.8143	-35.2416	-30.1565	-28.2669	-30.0590	-31.2010	-36.7826	-41.6702	-48.3981 (63a)	
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)	
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)	
Output from w/h													
231.0131	204.2963	217.5230	192.9635	188.0873	170.6520	169.5146	175.7540	177.0854	196.0082	206.5436	228.7657 (64)		
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =	2358.2065 (64)		
Electric shower(s)												2358 (64)	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)	
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											0.0000	(64a)	
Heat gains from water heating, kWh/month													
118.1697	104.9755	112.4726	100.8903	99.2187	90.9255	90.7242	93.3947	93.4119	102.3648	106.6878	117.1189	(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	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	129.6944	143.5902	129.6944	134.0175	129.6944	134.0175	129.6944	129.6944	134.0175	129.6944	134.0175	129.6944 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	257.1336	259.8018	253.0779	238.7636	220.6943	203.7117	192.3663	189.6980	196.4219	210.7363	228.8056	245.7881 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205 (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)	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643 (71)
Water heating gains (Table 5)	158.8303	156.2135	151.1729	140.1254	133.3585	126.2854	121.9411	125.5305	129.7387	137.5871	148.1774	157.4178 (72)
Total internal gains	609.8198	623.7671	598.1068	577.0681	547.9087	528.1761	508.1634	509.0845	524.3398	542.1793	575.1621	597.0619 (73)

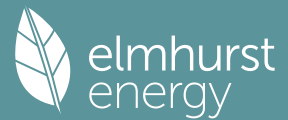
6. Solar gains

[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				18.0000	11.2829	0.5700	0.7000	0.7700	56.1566 (75)			
Southwest				10.2000	36.7938	0.5700	0.7000	0.7700	103.7723 (79)			
Southwest				0.7000	37.0308	0.6300	0.7000	1.0000	10.2883 (82)			
Solar gains	170.2172	310.5979	478.8827	682.1593	843.9994	872.7505	826.9420	701.0728	548.5740	357.9044	207.6656	143.2089 (83)
Total gains	780.0370	934.3650	1076.9895	1259.2274	1391.9081	1400.9267	1335.1054	1210.1573	1072.9137	900.0837	782.8277	740.2709 (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 from living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	25.2673	25.3256	25.3830	25.6560	25.7078	25.9515	25.9515	25.9971	25.8571	25.7078	25.6033	25.4950
alpha	2.6845	2.6884	2.6922	2.7104	2.7139	2.7301	2.7301	2.7331	2.7238	2.7139	2.7069	2.6997
util living area												
	0.9346	0.8987	0.8412	0.7310	0.5884	0.4368	0.3276	0.3721	0.5711	0.7939	0.9036	0.9418 (86)

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Living	18.7614	19.1438	19.6575	20.2614	20.6782	20.8966	20.9652	20.9503	20.7809	20.2031	19.3871	18.6962
Non living	17.4298	17.9075	18.5429	19.2732	19.7480	19.9817	20.0424	20.0336	19.8742	19.2263	18.2262	17.3528
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	19.8548	19.1438	19.6575	20.2614	20.6782	20.8966	20.9652	20.9503	20.7809	20.2031	19.3871	19.0185 (87)
Th 2	20.0395	20.0415	20.0434	20.0527	20.0544	20.0624	20.0624	20.0639	20.0593	20.0544	20.0509	20.0472 (88)
util rest of house	0.9261	0.8862	0.8220	0.7006	0.5452	0.3811	0.2618	0.3024	0.5125	0.7622	0.8896	0.9342 (89)
MIT 2	18.9991	17.9075	18.5429	19.2732	19.7480	19.9817	20.0424	20.0336	19.8742	19.2263	18.2262	17.8384 (90)
Living area fraction									FLA = Living area / (4) =			0.2945 (91)
MIT	19.2511	18.2717	18.8712	19.5642	20.0219	20.2512	20.3142	20.3036	20.1412	19.5140	18.5681	18.1859 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2511	18.2717	18.8712	19.5642	20.0219	20.2512	20.3142	20.3036	20.1412	19.5140	18.5681	18.1859 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9180	0.8574	0.7944	0.6834	0.5437	0.3926	0.2798	0.3207	0.5179	0.7414	0.8619	0.9150	(94)
Useful gains	716.0675	801.1019	855.5550	860.5624	756.7184	550.0487	373.5685	388.1028	555.6624	667.3620	674.6918	677.3747	(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	1582.0744	1411.6859	1303.1074	1111.3514	865.5087	582.2207	382.6599	401.4693	624.6782	927.0860	1197.5903	1466.7241	(97)
Space heating kWh	644.3091	410.3124	332.9790	180.5681	80.9400	0.0000	0.0000	0.0000	0.0000	193.2347	376.4869	587.2760	(98a)
Space heating requirement - total per year (kWh/year)												2806.1062	
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	644.3091	410.3124	332.9790	180.5681	80.9400	0.0000	0.0000	0.0000	0.0000	193.2347	376.4869	587.2760	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2806.1062	
Space heating per m2										(98c) / (4) =		27.9215	(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 %)													302.4811 (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	644.3091	410.3124	332.9790	180.5681	80.9400	0.0000	0.0000	0.0000	0.0000	193.2347	376.4869	587.2760	(98)
Space heating efficiency (main heating system 1)	302.4811	302.4811	302.4811	302.4811	302.4811	0.0000	0.0000	0.0000	0.0000	302.4811	302.4811	302.4811	(210)
Space heating fuel (main heating system)	213.0081	135.6489	110.0826	59.6957	26.7587	0.0000	0.0000	0.0000	0.0000	63.8832	124.4663	194.1530	(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	231.0131	204.2963	217.5230	192.9635	188.0873	170.6520	169.5146	175.7540	177.0854	196.0082	206.5436	228.7657	(64)
Efficiency of water heater (217)m	179.3127	179.3127	179.3127	179.3127	179.3127	179.3127	179.3127	179.3127	179.3127	179.3127	179.3127	179.3127	(216)
Fuel for water heating, kWh/month	128.8325	113.9329	121.3093	107.6128	104.8934	95.1700	94.5357	98.0153	98.7578	109.3108	115.1863	127.5792	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	23.8267	19.1147	17.2106	12.6093	9.7398	7.9575	8.8849	11.5490	15.0010	19.6821	22.2309	24.4889	(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												927.6964	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												179.3127	
Water heating fuel used												1315.1360	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												192.2952	(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												2435.1277	(238)

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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	927.6964	0.1557	144.4649	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1315.1360	0.1407	185.0187	(264)
Space and water heating			329.4836	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	192.2952	0.1443	27.7541	(268)
Total CO2, kg/year			357.2377	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.5500	(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	927.6964	1.5765	1462.4820	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1315.1360	1.5202	1999.2536	(278)
Space and water heating			3461.7355	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	192.2952	1.5338	294.9488	(282)
Total Primary energy kWh/year			3756.6843	(286)
Dwelling Primary energy Rate (DPER)			37.3800	(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	43.4000 (1b)	x	2.5000 (2b)	=	108.5000 (1b)	- (3b)
First floor	37.6000 (1c)	x	2.6000 (2c)	=	97.7600 (1c)	- (3c)
Second floor	19.5000 (1d)	x	2.1000 (2d)	=	40.9500 (1d)	- (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.5000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	247.2100	(5)

2. Ventilation rate

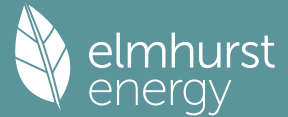
	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	(6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1618 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.4118	(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) =	0.3500 (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	0.4463	0.4375	0.4288	0.3850	0.3763	0.3325	0.3325	0.3238	0.3500	0.3763	0.3938	0.4113	(22b)
Effective ac	0.5996	0.5957	0.5919	0.5741	0.5708	0.5553	0.5553	0.5524	0.5613	0.5708	0.5775	0.5846	(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 Semi-glazed door			3.1000	1.0000	3.1000			(26a)
TER Opening Type (Uw = 1.20)			21.4900	1.1450	24.6069			(27)
RL			0.5300	2.0221	1.0717			(27a)
Heatloss Floor 1			43.9000	0.1300	5.7070			(28a)
External Wall 1	116.6000	24.5900	92.0100	0.1800	16.5618			(29a)
Flat Roof	17.9000		17.9000	0.1100	1.9690			(30)
Slope	23.0000	0.5300	22.4700	0.1100	2.4717			(30)
Total net area of external elements Aum(A, m2)			201.4000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	55.4881			(33)

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

95.7741 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	19.9000	0.1600	3.1840
E6 Intermediate floor within a dwelling	27.5000	0.0000	0.0000
E16 Corner (normal)	24.6000	0.0900	2.2140
E18 Party wall between dwellings	14.2000	0.0600	0.8520
E1 Steel lintel with perforated steel base plate	19.0000	0.0500	0.9500
E3 Sill	4.9500	0.0500	0.2475
E4 Jamb	33.0000	0.0500	1.6500
E11 Eaves (insulation at rafter level)	5.9000	0.0400	0.2360
E13 Gable (insulation at rafter level)	3.3000	0.0800	0.2640
E15 Flat roof with parapet	14.3000	0.5600	8.0080
E14 Flat roof	8.2000	0.0800	0.6560
P1 Party wall - Ground floor	6.4000	0.0800	0.5120
P2 Party wall - Intermediate floor within a dwelling	6.4000	0.0000	0.0000
P5 Party wall - Roof (insulation at rafter level)	5.4000	0.0800	0.4320
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			19.2055 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	74.6936 (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	48.9141	48.5986	48.2894	46.8369	46.5651	45.3001	45.3001	45.0658	45.7874	46.5651	47.1149	47.6896 (38)
Heat transfer coeff	123.6076	123.2922	122.9829	121.5305	121.2587	119.9937	119.9937	119.7594	120.4809	121.2587	121.8085	122.3832 (39)
Average = Sum(39)m / 12 =												121.5292
HLP	1.2299	1.2268	1.2237	1.2093	1.2066	1.1940	1.1940	1.1916	1.1988	1.2066	1.2120	1.2177 (40)
HLP (average)												1.2092
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy

2.7441 (42)

Hot water usage for mixer showers	70.2294	69.1740	67.6361	64.6935	62.5220	60.1003	58.7238	60.2501	61.9232	64.5234	67.5291	69.9604 (42a)
Hot water usage for baths	30.3242	29.8738	29.2396	28.0703	27.1947	26.2238	25.6994	26.3291	27.0148	28.0537	29.2471	30.2217 (42b)
Hot water usage for other uses	42.7324	41.1785	39.6246	38.0707	36.5168	34.9629	34.9629	36.5168	38.0707	39.6246	41.1785	42.7324 (42c)
Average daily hot water use (litres/day)												131.7121 (43)
Daily hot water use	143.2860	140.2263	136.5003	130.8345	126.2334	121.2869	119.3860	123.0960	127.0087	132.2016	137.9548	142.9144 (44)
Energy content (annual)	226.9300	199.6804	209.7959	179.1058	169.9344	149.1364	144.3870	152.4185	156.6144	179.3964	196.5418	223.7694 (45)
Distribution loss (46)m = 0.15 x (45)m	34.0395	29.9521	31.4694	26.8659	25.4902	22.3705	21.6581	22.8628	23.4922	26.9095	29.4813	33.5654 (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	273.5249	241.7661	256.3908	224.1977	216.5293	194.2283	190.9819	199.0134	201.7063	225.9913	241.6337	270.3643 (62)
WWHRS	-32.1060	-28.3948	-29.7334	-24.6204	-22.9453	-19.6345	-18.4042	-19.5710	-20.3146	-23.9487	-27.1309	-31.5114 (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	241.4189	213.3714	226.6574	199.5773	193.5840	174.5938	172.5777	179.4424	181.3917	202.0426	214.5027	238.8529 (64)
Total per year (kWh/year)												2438.0129 (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	112.7301	100.0623	107.0330	95.6262	93.7791	85.6613	85.2846	87.9551	88.1478	96.9252	101.4236	111.6793 (65)

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

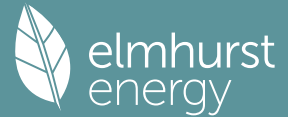
Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	129.7356	143.6358	129.7356	134.0601	129.7356	134.0601	129.7356	129.7356	134.0601	129.7356	134.0601	129.7356 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	257.1336	259.8018	253.0779	238.7636	220.6943	203.7117	192.3663	189.6980	196.4219	210.7363	228.8056	245.7881 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205 (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)	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643 (71)
Water heating gains (Table 5)	151.5190	148.9023	143.8616	132.8141	126.0472	118.9741	114.6299	118.2192	122.4275	130.2758	140.8662	150.1065 (72)
Total internal gains	605.5498	619.5015	593.8367	572.7994	543.6387	520.9075	500.8933	501.8144	517.0711	537.9093	570.8934	592.7919 (73)

6. Solar gains

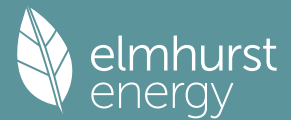
[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W
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		W/m2		or Table 6b		or Table 6c		Table 6d			
Northeast		13.7200		11.2829		0.6300		0.7700		47.3095	(75)
Southwest		7.7700		36.7938		0.6300		0.7700		87.3711	(79)
Southwest		0.5300		37.0308		0.6300		0.7000		7.7897	(82)
Solar gains	142.4703	259.9098	400.6638	570.7613	706.2810	730.4080	692.0420	586.6198	458.9674	299.4705	119.8737 (83)
Total gains	748.0201	879.4113	994.5005	1143.5607	1249.9197	1251.3154	1192.9353	1088.4342	976.0385	837.3798	712.6655 (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
tau	21.6305	21.6858	21.7404	22.0002	22.0495	22.2820	22.2820	22.3256	22.1918	22.0495	21.9500
alpha	2.4420	2.4457	2.4494	2.4667	2.4700	2.4855	2.4855	2.4884	2.4795	2.4700	2.4633
util living area	0.9449	0.9191	0.8779	0.7945	0.6744	0.5276	0.4080	0.4555	0.6535	0.8389	0.9214
											0.9503 (86)
MIT	18.2518	18.6151	19.1534	19.8541	20.4187	20.7790	20.9155	20.8870	20.6040	19.8599	18.9487
Th 2	19.8961	19.8986	19.9011	19.9126	19.9148	19.9248	19.9248	19.9267	19.9209	19.9148	19.9104
util rest of house											
	0.9369	0.9077	0.8605	0.7651	0.6275	0.4586	0.3195	0.3647	0.5881	0.8088	0.9084
MIT 2	16.7088	17.1655	17.8383	18.7000	19.3600	19.7536	19.8779	19.8597	19.5867	18.7305	17.5999
Living area fraction											
MIT	17.1633	17.5924	18.2256	19.0399	19.6718	20.0556	20.1835	20.1623	19.8863	19.0631	17.9971
Temperature adjustment											0.0000
adjusted MIT	17.1633	17.5924	18.2256	19.0399	19.6718	20.0556	20.1835	20.1623	19.8863	19.0631	17.9971
											17.1020 (93)
8. Space heating requirement											
Utilisation	0.9092	0.8760	0.8271	0.7376	0.6159	0.4675	0.3417	0.3856	0.5858	0.7800	0.8778
Useful gains	680.1361	770.3460	822.5526	843.5079	769.8599	584.9758	407.5858	419.7312	571.7873	653.1761	653.6784
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000
Heat loss rate W	1589.9982	1564.8785	1442.0540	1232.3087	966.6487	654.6403	429.9975	450.5654	697.1444	1026.2233	1327.3621
Space heating kWh	676.9374	533.9258	460.9090	279.9366	146.4109	0.0000	0.0000	0.0000	0.0000	277.5472	485.0523
Space heating requirement - total per year (kWh/year)											688.5799 (98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Solar heating contribution - total per year (kWh/year)											0.0000 (98b)
Space heating kWh	676.9374	533.9258	460.9090	279.9366	146.4109	0.0000	0.0000	0.0000	0.0000	277.5472	485.0523
Space heating requirement after solar contribution - total per year (kWh/year)											688.5799 (98c)
Space heating per m2										(98c) / (4) =	35.3164 (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
Space heating requirement	676.9374	533.9258	460.9090	279.9366	146.4109	0.0000	0.0000	0.0000	0.0000	277.5472	485.0523
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
Space heating fuel (main heating system)	733.4099	578.4678	499.3597	303.2899	158.6250	0.0000	0.0000	0.0000	0.0000	300.7011	525.5171
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
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
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
Water heating											
Water heating requirement	241.4189	213.3714	226.6574	199.5773	193.5840	174.5938	172.5777	179.4424	181.3917	202.0426	214.5027
Efficiency of water heater	86.2430	86.0297	85.6169	84.8186	83.4418	79.8000	79.8000	79.8000	79.8000	84.7722	85.8318
Fuel for water heating, kWh/month	279.9286	248.0207	264.7345	235.2991	231.9989	218.7892	216.2628	224.8652	227.3079	238.3359	249.9107
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
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
Lighting	26.9565	21.6255	19.4714	14.2656	11.0191	9.0027	10.0520	13.0660	16.9714	22.2674	25.1510
Electricity generated by PVs (Appendix M) (negative quantity)	-41.0390	-58.0864	-83.8153	-94.5986	-102.2823	-95.5282	-94.2998	-88.8573	-79.3450	-66.5283	-45.1794
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Electricity generated by PVs (Appendix M) (negative quantity)	-22.5072	-47.4210	-94.4020	-142.0195	-188.0353	-189.0600	-186.8839	-158.1660	-115.8068	-67.9543	-30.0917
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Annual totals kWh/year											
Space heating fuel - main system 1											3845.3944 (211)
Space heating fuel - main system 2											0.0000 (213)
Space heating fuel - secondary											0.0000 (215)

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Efficiency of water heater	79.8000	
Water heating fuel used	2912.2447	(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)	217.5544	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2145.1537	(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	4916.0397	(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	3845.3944	0.2100	807.5328 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2912.2447	0.2100	611.5714 (264)
Space and water heating			1419.1042 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	217.5544	0.1443	31.3998 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-885.0093	0.1345	-119.0468
PV Unit electricity exported	-1260.1444	0.1258	-158.5783
Total			-277.6251 (269)
Total CO2, kg/year			1184.8082 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.7900 (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	3845.3944	1.1300	4345.2957 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2912.2447	1.1300	3290.8365 (278)
Space and water heating			7636.1322 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	217.5544	1.5338	333.6921 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-885.0093	1.4971	-1324.9827
PV Unit electricity exported	-1260.1444	0.4619	-582.0876
Total			-1907.0703 (283)
Total Primary energy kWh/year			6192.8548 (286)
Target Primary Energy Rate (TPER)			61.6200 (287)

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Property Reference	Westcott Court				Issued on Date	14/03/2024	
Assessment Reference	Westcott Court - Be Green			Prop Type Ref			
Property							
SAP Rating	84 B		DER	3.55		TER	11.79
Environmental	97 A		% DER < TER				69.89
CO ₂ Emissions (t/year)	0.33		DFEE	33.85		TFEE	42.38
Compliance Check	See BREL		% DFEE < TFEE				20.12
% DPER < TPER	39.34		DPER	37.38		TPER	61.62
Assessor Details	Mr. Samuel Westover					Assessor ID	AX13-0001
Client							

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

1. Overall dwelling characteristics

	Area (m ²)		Storey height (m)		Volume (m ³)	
Ground floor	43.4000 (1b)	x	2.5000 (2b)	=	108.5000 (1b)	- (3b)
First floor	37.6000 (1c)	x	2.6000 (2c)	=	97.7600 (1c)	- (3c)
Second floor	19.5000 (1d)	x	2.1000 (2d)	=	40.9500 (1d)	- (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.5000					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	247.2100	(5)

2. Ventilation rate

	m ³ per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1618 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	4.0000	(17)
Infiltration rate	0.3618	(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) =	0.3075 (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	0.3921	0.3844	0.3767	0.3383	0.3306	0.2922	0.2922	0.2845	0.3075	0.3306	0.3460	0.3614	(22b)
Effective ac	0.5769	0.5739	0.5710	0.5572	0.5546	0.5427	0.5427	0.5405	0.5473	0.5546	0.5598	0.5653	(25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K	
Windows (Uw = 1.00)			28.2000	0.9615	27.1154			(27)
Half-Glazed			3.1000	1.2000	3.7200			(26a)
RL			0.7000	0.9615	0.6731			(27a)
Heatloss Floor 1			43.9000	0.1000	4.3900	75.0000	3292.5000	(28a)
External Wall 1	116.6000	31.3000	85.3000	0.1500	12.7950	70.0000	5971.0000	(29a)
Flat Roof	17.9000		17.9000	0.1000	1.7900	9.0000	161.1000	(30)
Slope	23.0000	0.7000	22.3000	0.1000	2.2300	9.0000	200.7000	(30)
Total net area of external elements Aum(A, m ²)			201.4000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	52.7135			(33)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			9625.3000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							95.7741	(35)
Thermal bridges (User defined value 0.030 * total exposed area)							6.0420	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss				(33) + (36) + (36a) =			58.7555	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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(38)m	47.0610	46.8174	46.5787	45.4576	45.2478	44.2713	44.2713	44.0905	44.6474	45.2478	45.6722	46.1158	(38)
Heat transfer coeff	105.8164	105.5729	105.3342	104.2130	104.0033	103.0268	103.0268	102.8459	103.4029	104.0033	104.4276	104.8713	(39)
Average = Sum(39)m / 12 =												104.2120	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0529	1.0505	1.0481	1.0369	1.0349	1.0251	1.0251	1.0233	1.0289	1.0349	1.0391	1.0435	(40)
HLP (average)												1.0369	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.7441	(42)
Hot water usage for mixer showers														
	70.2294	69.1740	67.6361	64.6935	62.5220	60.1003	58.7238	60.2501	61.9232	64.5234	67.5291	69.9604	(42a)	
Hot water usage for baths														
	30.3242	29.8738	29.2396	28.0703	27.1947	26.2238	25.6994	26.3291	27.0148	28.0537	29.2471	30.2217	(42b)	
Hot water usage for other uses														
	42.7324	41.1785	39.6246	38.0707	36.5168	34.9629	34.9629	36.5168	38.0707	39.6246	41.1785	42.7324	(42c)	
Average daily hot water use (litres/day)													131.7121	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Daily hot water use	143.2860	140.2263	136.5003	130.8345	126.2334	121.2869	119.3860	123.0960	127.0087	132.2016	137.9548	142.9144	(44)	
Energy conte	226.9300	199.6804	209.7959	179.1058	169.9344	149.1364	144.3870	152.4185	156.6144	179.3964	196.5418	223.7694	(45)	
Energy content (annual)										Total = Sum(45)m =			2187.7107	
Distribution loss (46)m = 0.15 x (45)m														
	34.0395	29.9521	31.4694	26.8659	25.4902	22.3705	21.6581	22.8628	23.4922	26.9095	29.4813	33.5654	(46)	
Water storage loss:														
Store volume													150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):													1.8000	(48)
Temperature factor from Table 2b													0.5400	(49)
Enter (49) or (54) in (55)													0.9720	(55)
Total storage loss														
	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)	
If cylinder contains dedicated solar storage														
	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(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														
	280.3244	247.9076	263.1903	230.7778	223.3288	200.8084	197.7814	205.8129	208.2864	232.7908	248.2138	277.1638	(62)	
WWHRS	-49.3113	-43.6113	-45.6673	-37.8143	-35.2416	-30.1565	-28.2669	-30.0590	-31.2010	-36.7826	-41.6702	-48.3981	(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														
	231.0131	204.2963	217.5230	192.9635	188.0873	170.6520	169.5146	175.7540	177.0854	196.0082	206.5436	228.7657	(64)	
Total per year (kWh/year) = Sum(64)m =													2358.2065	(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														
	118.1697	104.9755	112.4726	100.8903	99.2187	90.9255	90.7242	93.3947	93.4119	102.3648	106.6878	117.1189	(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	164.6464	164.6464	164.6464	164.6464	164.6464	164.6464	164.6464	164.6464	164.6464	164.6464	164.6464	164.6464	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.2214	24.1778	19.6627	14.8859	11.1274	9.3942	10.1508	13.1944	17.7095	22.4862	26.2448	27.9779	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	383.7814	387.7639	377.7282	356.3635	329.3944	304.0473	287.1138	283.1314	293.1670	314.5317	341.5008	366.8480	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.2087	54.2087	54.2087	54.2087	54.2087	54.2087	54.2087	54.2087	54.2087	54.2087	54.2087	54.2087	(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)	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	(71)
Water heating gains (Table 5)	158.8303	156.2135	151.1729	140.1254	133.3585	126.2854	121.9411	125.5305	129.7387	137.5871	148.1774	157.4178	(72)
Total internal gains	678.9240	677.2461	657.6547	620.4657	582.9712	548.8178	528.2966	530.9471	549.7061	583.6960	625.0139	661.3346	(73)

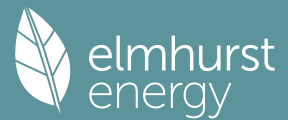
6. Solar gains

[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				18.0000	11.2829	0.5700	0.7000	0.7700	56.1566 (75)				
Southwest				10.2000	36.7938	0.5700	0.7000	0.7700	103.7723 (79)				
Southwest				0.7000	37.0308	0.6300	0.7000	1.0000	10.2883 (82)				
Solar gains	170.2172	310.5979	478.8827	682.1593	843.9994	872.7505	826.9420	701.0728	548.5740	357.9044	207.6656	143.2089	(83)
Total gains	849.1412	987.8440	1136.5375	1302.6250	1426.9706	1421.5683	1355.2386	1232.0199	1098.2801	941.6003	832.6795	804.5436	(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	25.2673	25.3256	25.3830	25.6560	25.7078	25.9515	25.9515	25.9971	25.8571	25.7078	25.6033	25.4950	
alpha	2.6845	2.6884	2.6922	2.7104	2.7139	2.7301	2.7301	2.7331	2.7238	2.7139	2.7069	2.6997	
util living area													
	0.9221	0.8874	0.8261	0.7185	0.5783	0.4315	0.3231	0.3662	0.5617	0.7792	0.8914	0.9307	(86)
Living	18.8778	19.2235	19.7289	20.2950	20.6918	20.8997	20.9664	20.9522	20.7899	20.2446	19.4627	18.8078	

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Non living	17.5745	18.0051	18.6278	19.3107	19.7617	19.9842	20.0431	20.0349	19.8823	19.2730	18.3183	17.4920
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	19.9144	19.2235	19.7289	20.2950	20.6918	20.8997	20.9664	20.9522	20.7899	20.2446	19.4627	19.1145 (87)
Th 2	20.0395	20.0415	20.0434	20.0527	20.0544	20.0624	20.0624	20.0639	20.0593	20.0544	20.0509	20.0472 (88)
util rest of house												
	0.9123	0.8739	0.8059	0.6876	0.5353	0.3762	0.2581	0.2974	0.5033	0.7464	0.8761	0.9219 (89)
MIT 2	19.0568	18.0051	18.6278	19.3107	19.7617	19.9842	20.0431	20.0349	19.8823	19.2730	18.3183	17.9525 (90)
Living area fraction									FLA = Living area / (4) =			0.2945 (91)
MIT	19.3094	18.3639	18.9521	19.6006	20.0357	20.2539	20.3150	20.3050	20.1496	19.5592	18.6554	18.2947 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3094	18.3639	18.9521	19.6006	20.0357	20.2539	20.3150	20.3050	20.1496	19.5592	18.6554	18.2947 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9038	0.8448	0.7791	0.6715	0.5344	0.3878	0.2759	0.3156	0.5092	0.7269	0.8480	0.9014	(94)
Useful gains	767.4265	834.4899	885.4347	874.7702	762.5446	551.2858	373.9651	388.7755	559.2803	684.4463	706.1514	725.2150	(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	1588.2386	1421.4270	1311.6329	1115.1437	866.9360	582.5001	382.7468	401.6178	625.5464	931.7825	1206.7003	1478.1317	(97)
Space heating kWh	610.6842	394.4217	317.0915	173.0689	77.6673	0.0000	0.0000	0.0000	0.0000	184.0181	360.3952	560.1700	(98a)
Space heating requirement - total per year (kWh/year)												2677.5170	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	610.6842	394.4217	317.0915	173.0689	77.6673	0.0000	0.0000	0.0000	0.0000	184.0181	360.3952	560.1700	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2677.5170	
Space heating per m2										(98c) / (4) =		26.6420	(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 %)													302.4811 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	610.6842	394.4217	317.0915	173.0689	77.6673	0.0000	0.0000	0.0000	0.0000	184.0181	360.3952	560.1700	(98)
Space heating efficiency (main heating system 1)	302.4811	302.4811	302.4811	302.4811	302.4811	0.0000	0.0000	0.0000	0.0000	302.4811	302.4811	302.4811	(210)
Space heating fuel (main heating system)	201.8917	130.3955	104.8302	57.2164	25.6767	0.0000	0.0000	0.0000	0.0000	60.8362	119.1464	185.1918	(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	231.0131	204.2963	217.5230	192.9635	188.0873	170.6520	169.5146	175.7540	177.0854	196.0082	206.5436	228.7657	(64)
Efficiency of water heater (217)m	179.3127	179.3127	179.3127	179.3127	179.3127	179.3127	179.3127	179.3127	179.3127	179.3127	179.3127	179.3127	(216)
Fuel for water heating, kWh/month	128.8325	113.9329	121.3093	107.6128	104.8934	95.1700	94.5357	98.0153	98.7578	109.3108	115.1863	127.5792	(219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	23.8267	19.1147	17.2106	12.6093	9.7398	7.9575	8.8849	11.5490	15.0010	19.6821	22.2309	24.4889	(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													885.1849 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													179.3127
Water heating fuel used													1315.1360 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year													0.0000 (231)
Electricity for lighting (calculated in Appendix L)													192.2952 (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													2392.6162 (238)

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10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	885.1849	16.4900	145.9670 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1315.1360	16.4900	216.8659 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	192.2952	16.4900	31.7095 (250)
Additional standing charges			0.0000 (251)
Total energy cost			394.5424 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.9762 (257)
SAP value		84.1760
SAP rating (Section 12)		84 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	885.1849	0.1557	137.8330 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1315.1360	0.1407	185.0187 (264)
Space and water heating			322.8517 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	192.2952	0.1443	27.7541 (268)
Total CO2, kg/year			350.6058 (272)
CO2 emissions per m2			3.4900 (273)
EI value			96.7711
EI rating			97 (274)
EI band			A

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	43.4000 (1b)	x 2.5000 (2b)	= 108.5000 (1b) - (3b)
First floor	37.6000 (1c)	x 2.6000 (2c)	= 97.7600 (1c) - (3c)
Second floor	19.5000 (1d)	x 2.1000 (2d)	= 40.9500 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.5000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	247.2100 (5)

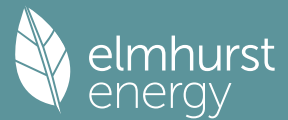
2. Ventilation rate

	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	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1618 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000 (17)	
Infiltration rate		0.3618 (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) =	0.3075 (21)	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.2000	4.0000	4.0000	3.7000	3.7000	3.3000	3.4000	3.2000	3.3000	3.5000	3.5000	3.8000 (22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500 (22a)
Adj infilt rate	0.3229	0.3075	0.3075	0.2845	0.2845	0.2537	0.2614	0.2460	0.2537	0.2691	0.2691	0.2922 (22b)
Effective ac	0.5521	0.5473	0.5473	0.5405	0.5405	0.5322	0.5342	0.5303	0.5322	0.5362	0.5362	0.5427 (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 = 1.00)			28.2000	0.9615	27.1154			(27)					
Half-Glazed			3.1000	1.2000	3.7200			(26a)					
RL			0.7000	0.9615	0.6731			(27a)					
Heatloss Floor 1			43.9000	0.1000	4.3900	75.0000	3292.5000	(28a)					
External Wall 1	116.6000	31.3000	85.3000	0.1500	12.7950	70.0000	5971.0000	(29a)					
Flat Roof	17.9000		17.9000	0.1000	1.7900	9.0000	161.1000	(30)					
Slope	23.0000	0.7000	22.3000	0.1000	2.2300	9.0000	200.7000	(30)					
Total net area of external elements Aum(A, m2)			201.4000					(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)... (30) + (32) =	52.7135		(33)					
Heat capacity Cm = Sum(A x k)							(28)... (30) + (32) + (32a)... (32e) =	9625.3000 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								95.7741 (35)					
Thermal bridges (User defined value 0.030 * total exposed area)								6.0420 (36)					
Point Thermal bridges							(36a) =	0.0000					
Total fabric heat loss							(33) + (36) + (36a) =	58.7555 (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	45.0429	44.6474	44.6474	44.0905	44.0905	43.4154	43.5769	43.2586	43.4154	43.7433	43.7433	44.2713	(38)
Heat transfer coeff	103.7983	103.4029	103.4029	102.8459	102.8459	102.1708	102.3324	102.0141	102.1708	102.4987	102.4987	103.0268	(39)
Average = Sum(39)m / 12 =												102.7507	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0328	1.0289	1.0289	1.0233	1.0233	1.0166	1.0182	1.0151	1.0166	1.0199	1.0199	1.0251	(40)
HLP (average)												1.0224	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.7441 (42)
Hot water usage for mixer showers	70.2294	69.1740	67.6361	64.6935	62.5220	60.1003	58.7238	60.2501	61.9232	64.5234	67.5291	69.9604	(42a)
Hot water usage for baths	30.3242	29.8738	29.2396	28.0703	27.1947	26.2238	25.6994	26.3291	27.0148	28.0537	29.2471	30.2217	(42b)
Hot water usage for other uses	42.7324	41.1785	39.6246	38.0707	36.5168	34.9629	34.9629	36.5168	38.0707	39.6246	41.1785	42.7324	(42c)
Average daily hot water use (litres/day)												131.7121	(43)
Daily hot water use	Jan 143.2860	Feb 140.2263	Mar 136.5003	Apr 130.8345	May 126.2334	Jun 121.2869	Jul 119.3860	Aug 123.0960	Sep 127.0087	Oct 132.2016	Nov 137.9548	Dec 142.9144	(44)
Energy conte	226.9300	199.6804	209.7959	179.1058	169.9344	149.1364	144.3870	152.4185	156.6144	179.3964	196.5418	223.7694	(45)
Energy content (annual)										Total = Sum(45)m =		2187.7107	
Distribution loss (46)m = 0.15 x (45)m	34.0395	29.9521	31.4694	26.8659	25.4902	22.3705	21.6581	22.8628	23.4922	26.9095	29.4813	33.5654	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8000	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9720	(55)
Total storage loss	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(56)
If cylinder contains dedicated solar storage	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320	(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	280.3244	247.9076	263.1903	230.7778	223.3288	200.8084	197.7814	205.8129	208.2864	232.7908	248.2138	277.1638	(62)
WWHRS	-49.3113	-43.6113	-45.6673	-37.8143	-35.2416	-30.1565	-28.2669	-30.0590	-31.2010	-36.7826	-41.6702	-48.3981	(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	231.0131	204.2963	217.5230	192.9635	188.0873	170.6520	169.5146	175.7540	177.0854	196.0082	206.5436	228.7657	(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)
Heat gains from water heating, kWh/month	118.1697	104.9755	112.4726	100.8903	99.2187	90.9255	90.7242	93.3947	93.4119	102.3648	106.6878	117.1189	(65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)

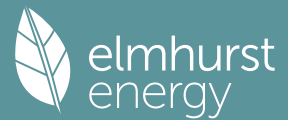
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan 164.6464	Feb 164.6464	Mar 164.6464	Apr 164.6464	May 164.6464	Jun 164.6464	Jul 164.6464	Aug 164.6464	Sep 164.6464	Oct 164.6464	Nov 164.6464	Dec 164.6464	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.2214	24.1778	19.6627	14.8859	11.1274	9.3942	10.1508	13.1944	17.7095	22.4862	26.2448	27.9779	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	383.7814	387.7639	377.7282	356.3635	329.3944	304.0473	287.1138	283.1314	293.1670	314.5317	341.5008	366.8480	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.2087	54.2087	54.2087	54.2087	54.2087	54.2087	54.2087	54.2087	54.2087	54.2087	54.2087	54.2087	(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)	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	(71)
Water heating gains (Table 5)	158.8303	156.2135	151.1729	140.1254	133.3585	126.2854	121.9411	125.5305	129.7387	137.5871	148.1774	157.4178	(72)
Total internal gains	678.9240	677.2461	657.6547	620.4657	582.9712	548.8178	528.2966	530.9471	549.7061	583.6960	625.0139	661.3346	(73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
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Northeast			18.0000		12.9236		0.5700		0.7000		0.7700		64.3222 (75)
Southwest			10.2000		40.4699		0.5700		0.7000		0.7700		114.1402 (79)
Southwest			0.7000		41.7848		0.6300		0.7000		1.0000		11.6091 (82)

Solar gains	190.0714	313.1784	479.5210	707.1500	853.9160	945.1821	885.8418	767.2412	596.6569	386.0760	237.7893	158.2292 (83)
Total gains	868.9954	990.4245	1137.1757	1327.6157	1436.8872	1493.9999	1414.1384	1298.1883	1146.3630	969.7719	862.8032	819.5638 (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	25.7586	25.8571	25.8571	25.9971	25.9971	26.1689	26.1276	26.2091	26.1689	26.0851	26.0851	25.9515
alpha	2.7172	2.7238	2.7238	2.7331	2.7331	2.7446	2.7418	2.7473	2.7446	2.7390	2.7390	2.7301
util living area												
	0.9087	0.8750	0.8037	0.6748	0.5117	0.3299	0.2214	0.2472	0.4723	0.7302	0.8665	0.9184 (86)
Living	19.1301	19.4208	19.9288	20.4642	20.8092	20.9607	20.9910	20.9879	20.8883	20.4425	19.7233	19.0709
Non living	17.9016	18.2626	18.8831	19.5159	19.8949	20.0441	20.0649	20.0661	19.9859	19.5121	18.6507	17.8328
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	20.0434	19.4208	19.9288	20.4642	20.8092	20.9607	20.9910	20.9879	20.8883	20.4425	19.7233	19.3407 (87)
Th 2	20.0561	20.0593	20.0593	20.0639	20.0639	20.0695	20.0682	20.0708	20.0695	20.0668	20.0668	20.0624 (88)
util rest of house												
	0.8971	0.8598	0.7806	0.6398	0.4635	0.2723	0.1561	0.1772	0.4080	0.6907	0.8476	0.9078 (89)
MIT 2	19.1972	18.2626	18.8831	19.5159	19.8949	20.0441	20.0649	20.0661	19.9859	19.5121	18.6507	18.2346 (90)
Living area fraction									fLA = Living area /	(4) =		0.2945 (91)
MIT	19.4464	18.6038	19.1911	19.7952	20.1642	20.3141	20.3377	20.3376	20.2517	19.7861	18.9666	18.5604 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4464	18.6038	19.1911	19.7952	20.1642	20.3141	20.3377	20.3376	20.2517	19.7861	18.9666	18.5604 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8886	0.8315	0.7564	0.6291	0.4689	0.2877	0.1751	0.1975	0.4211	0.6776	0.8207	0.8868 (94)
Useful gains	772.1737	823.5137	860.1632	835.1449	673.7481	429.7603	247.6852	256.3941	482.6986	657.0855	708.0873	726.7734 (95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate W	1489.1344	1344.6256	1219.2366	1017.6820	736.8048	440.7731	249.4528	258.8700	516.1357	839.0652	1124.0620	1386.7771 (97)
Space heating kWh	533.4187	350.1871	267.1506	131.4267	46.9142	0.0000	0.0000	0.0000	0.0000	135.3929	299.5018	491.0428 (98a)
Space heating requirement - total per year (kWh/year)												2255.0348
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	533.4187	350.1871	267.1506	131.4267	46.9142	0.0000	0.0000	0.0000	0.0000	135.3929	299.5018	491.0428 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2255.0348
Space heating per m2										(98c) / (4) =		22.4382 (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 %)												303.2744 (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	533.4187	350.1871	267.1506	131.4267	46.9142	0.0000	0.0000	0.0000	0.0000	135.3929	299.5018	491.0428 (98)
Space heating efficiency (main heating system 1)	303.2744	303.2744	303.2744	303.2744	303.2744	0.0000	0.0000	0.0000	0.0000	303.2744	303.2744	303.2744 (210)
Space heating fuel (main heating system)	175.8865	115.4688	88.0888	43.3359	15.4692	0.0000	0.0000	0.0000	0.0000	44.6437	98.7561	161.9137 (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	231.0131	204.2963	217.5230	192.9635	188.0873	170.6520	169.5146	175.7540	177.0854	196.0082	206.5436	228.7657 (64)
Efficiency of water heater (217)m	179.6231	179.6231	179.6231	179.6231	179.6231	179.6231	179.6231	179.6231	179.6231	179.6231	179.6231	179.6231 (216)
Fuel for water heating, kWh/month	128.6099	113.7361	121.0997	107.4269	104.7122	95.0056	94.3724	97.8460	98.5872	109.1220	114.9873	127.3588 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	23.8267	19.1147	17.2106	12.6093	9.7398	7.9575	8.8849	11.5490	15.0010	19.6821	22.2309	24.4889 (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												

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Space heating fuel - main system 1	743.5626	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	179.6231	
Water heating fuel used	1312.8640	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	0.0000	(231)
Electricity for lighting (calculated in Appendix L)	192.2952	(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	2248.7219	(238)

10a. Fuel costs - using BEDF prices (538)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	743.5626	25.1600	187.0804 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1312.8640	25.1600	330.3166 (247)
Energy for instantaneous electric shower(s)	0.0000	25.1600	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	192.2952	25.1600	48.3815 (250)
Additional standing charges			0.0000 (251)
Total energy cost			565.7784 (255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	743.5626	0.1563	116.2367 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1312.8640	0.1407	184.6990 (264)
Space and water heating			300.9357 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	192.2952	0.1443	27.7541 (268)
Total CO2, kg/year			328.6899 (272)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	743.5626	1.5787	1173.8574 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1312.8640	1.5202	1995.7997 (278)
Space and water heating			3169.6571 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	192.2952	1.5338	294.9488 (282)
Total Primary energy kWh/year			3464.6060 (286)

SAP 10 EPC IMPROVEMENTS

Westcott Court - Be Green

Current energy efficiency rating:	B 84
Current environmental impact rating:	A 97

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

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.9	-£ 81	-40 kg (12.1%)
U Solar photovoltaic panels	+ 5.7	-£ 222	-119 kg (41.2%)

Recommended measures	Typical annual savings	Energy efficiency impact	Environmental impact
Solar water heating	£81	0.40 kg/m²	B 86 A 97
Solar photovoltaic panels	£222	1.18 kg/m²	A 92 A 98
Total Savings	£303	1.58 kg/m²	

Potential energy efficiency rating:	A 92
Potential environmental impact rating:	A 98

Fuel prices for cost data on this page from database revision number 538 TEST (29 Feb 2024)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):	Current	Potential	Saving
Electricity	£566	£485	£81
Space heating	£187	£207	-£20
Water heating	£330	£229	£101
Lighting	£48	£48	£0
Generated (PV)	-£0	-£222	£222

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Total cost of fuels	£566	£263	£303
Total cost of uses	£565	£262	£303
Delivered energy	22 kWh/m²	10 kWh/m²	12 kWh/m²
Carbon dioxide emissions	0.3 tonnes	0.2 tonnes	0.2 tonnes
CO2 emissions per m²	3 kg/m²	2 kg/m²	2 kg/m²
Primary energy	34 kWh/m²	17 kWh/m²	18 kWh/m²

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

1. Overall dwelling characteristics

	Area (m²)	Storey height (m)	Volume (m³)
Ground floor	43.4000 (1b)	x 2.5000 (2b)	= 108.5000 (1b) - (3b)
First floor	37.6000 (1c)	x 2.6000 (2c)	= 97.7600 (1c) - (3c)
Second floor	19.5000 (1d)	x 2.1000 (2d)	= 40.9500 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.5000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	247.2100 (5)

2. Ventilation rate

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	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1618 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	4.0000	(17)
Infiltration rate	0.3618	(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) =	0.3075 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	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	0.3921	0.3844	0.3767	0.3383	0.3306	0.2922	0.2922	0.2845	0.3075	0.3306	0.3460	0.3614 (22b)
Effective ac	0.5769	0.5739	0.5710	0.5572	0.5546	0.5427	0.5427	0.5405	0.5473	0.5546	0.5598	0.5653 (25)

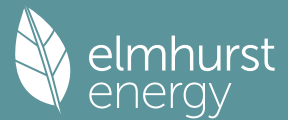
3. Heat losses and heat loss parameter

Element	Gross m²	Openings m²	NetArea m²	U-value W/m²K	A x U W/K	K-value kJ/m²K	A x K kJ/K
Windows (Uw = 1.00)			28.2000	0.9615	27.1154		(27)
Half-Glazed			3.1000	1.2000	3.7200		(26a)
RL			0.7000	0.9615	0.6731		(27a)
Heatloss Floor 1			43.9000	0.1000	4.3900	75.0000	3292.5000 (28a)
External Wall 1	116.6000	31.3000	85.3000	0.1500	12.7950	70.0000	5971.0000 (29a)
Flat Roof	17.9000		17.9000	0.1000	1.7900	9.0000	161.1000 (30)
Slope	23.0000	0.7000	22.3000	0.1000	2.2300	9.0000	200.7000 (30)
Total net area of external elements Aum(A, m²)			201.4000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	52.7135		(33)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	9625.3000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K							95.7741 (35)
Thermal bridges (User defined value 0.030 * total exposed area)							6.0420 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	58.7555 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	47.0610	46.8174	46.5787	45.4576	45.2478	44.2713	44.2713	44.0905	44.6474	45.2478	45.6722	46.1158 (38)
Heat transfer coeff	105.8164	105.5729	105.3342	104.2130	104.0033	103.0268	103.0268	102.8459	103.4029	104.0033	104.4276	104.8713 (39)
Average = Sum(39)m / 12 =												104.2120
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1.0529	1.0505	1.0481	1.0369	1.0349	1.0251	1.0251	1.0233	1.0289	1.0349	1.0391	1.0435 (40)
HLP (average)												1.0369
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

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Assumed occupancy												2.7441 (42)
Hot water usage for mixer showers	70.2294	69.1740	67.6361	64.6935	62.5220	60.1003	58.7238	60.2501	61.9232	64.5234	67.5291	69.9604 (42a)
Hot water usage for baths	30.3242	29.8738	29.2396	28.0703	27.1947	26.2238	25.6994	26.3291	27.0148	28.0537	29.2471	30.2217 (42b)
Hot water usage for other uses	42.7324	41.1785	39.6246	38.0707	36.5168	34.9629	34.9629	36.5168	38.0707	39.6246	41.1785	42.7324 (42c)
Average daily hot water use (litres/day)												131.7121 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	143.2860	140.2263	136.5003	130.8345	126.2334	121.2869	119.3860	123.0960	127.0087	132.2016	137.9548	142.9144 (44)
Energy content (annual)	226.9300	199.6804	209.7959	179.1058	169.9344	149.1364	144.3870	152.4185	156.6144	179.3964	196.5418	223.7694 (45)
Distribution loss (46)m = 0.15 x (45)m	34.0395	29.9521	31.4694	26.8659	25.4902	22.3705	21.6581	22.8628	23.4922	26.9095	29.4813	33.5654 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.9720 (55)
Total storage loss	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320 (56)
If cylinder contains dedicated solar storage	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320 (57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	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	280.3244	247.9076	261.7945	224.0242	210.5345	188.2017	184.7545	193.7165	202.8835	231.3950	248.2138	277.1638 (62)
WWHRS	-49.3113	-43.6113	-45.6673	-37.8143	-35.2416	-30.1565	-28.2669	-30.0590	-31.2010	-36.7826	-41.6702	-48.3981 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Aperture area of solar collector												3.0000 (H1)
Zero-loss collector efficiency												0.8000 (H2)
Collector linear heat loss coefficient												1.8000 (H3)
Collector 2nd order heat loss coefficient												0.0000 (H4)
Collector loop efficiency												0.9000 (H5)
Incidence angle modifier												1.0000 (H6)
Overshading factor												0.8000 (H8)
Overall heat loss coefficient of system												6.5000 (H10)
Heat loss coefficient of collector loop												3.9667 (H11)
Dedicated solar storage volume												75.0000 (H12)
Effective solar volume												75.0000 (H14)
Reference volume												225.0000 (H15)
Storage tank correction coefficient												1.3161 (H16)
Heat delivered to hot water												600.8300 (H24)
Heat delivered to space heating												0.0000 (H29)
Solar input												600.8300
Solar input	-0.0000	-16.2501	-57.1380	-77.6393	-100.1011	-92.2471	-91.6869	-80.7760	-56.4675	-28.5242	-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	231.0131	188.0462	158.9893	108.5707	75.1918	65.7982	64.8008	82.8815	115.2150	166.0883	206.5436	228.7657 (64)
												Total per year (kWh/year) = Sum(64a)m = 1691.9041 (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	118.1697	104.9755	111.3560	95.4874	88.9833	80.8401	80.3027	83.7175	89.0896	101.2482	106.6878	117.1189 (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	164.6464	164.6464	164.6464	164.6464	164.6464	164.6464	164.6464	164.6464	164.6464	164.6464	164.6464	164.6464 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.2214	24.1778	19.6627	14.8859	11.1274	9.3942	10.1508	13.1944	17.7095	22.4862	26.2448	27.9779 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	383.7814	387.7639	377.7282	356.3635	329.3944	304.0473	287.1138	283.1314	293.1670	314.5317	341.5008	366.8480 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.2087	54.2087	54.2087	54.2087	54.2087	54.2087	54.2087	54.2087	54.2087	54.2087	54.2087	54.2087 (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)	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643 (71)
Water heating gains (Table 5)	158.8303	156.2135	149.6721	132.6214	119.6012	112.2779	107.9337	112.5236	123.7355	136.0863	148.1774	157.4178 (72)
Total internal gains	678.9240	677.2461	656.1539	612.9617	569.2139	534.8103	514.2892	517.9402	543.7029	582.1952	625.0139	661.3346 (73)

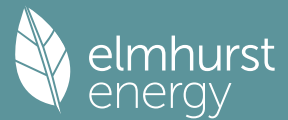
6. Solar gains

[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				18.0000		11.2829	0.5700		0.7000		0.7700		56.1566 (75)
Southwest				10.2000		36.7938	0.5700		0.7000		0.7700		103.7723 (79)
Southwest				0.7000		37.0308	0.6300		0.7000		1.0000		10.2883 (82)
Solar gains	170.2172	310.5979	478.8827	682.1593	843.9994	872.7505	826.9420	701.0728	548.5740	357.9044	207.6656	143.2089	(83)
Total gains	849.1412	987.8440	1135.0367	1295.1210	1413.2133	1407.5608	1341.2312	1219.0130	1092.2769	940.0995	832.6795	804.5436	(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	25.2673	25.3256	25.3830	25.6560	25.7078	25.9515	25.9515	25.9971	25.8571	25.7078	25.6033	25.4950
alpha	2.6845	2.6884	2.6922	2.7104	2.7139	2.7301	2.7301	2.7331	2.7238	2.7139	2.7069	2.6997
util living area	0.9221	0.8874	0.8265	0.7207	0.5822	0.4351	0.3262	0.3697	0.5639	0.7797	0.8914	0.9307 (86)

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Living	18.8778	19.2235	19.7272	20.2893	20.6865	20.8976	20.9656	20.9511	20.7878	20.2432	19.4627	18.8078
Non living	17.5745	18.0051	18.6257	19.3044	19.7564	19.9825	20.0426	20.0341	19.8804	19.2714	18.3183	17.4920
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	19.9144	19.2235	19.7272	20.2893	20.6865	20.8976	20.9656	20.9511	20.7878	20.2432	19.4627	19.1145 (87)
Th 2	20.0395	20.0415	20.0434	20.0527	20.0544	20.0624	20.0624	20.0639	20.0593	20.0544	20.0509	20.0472 (88)
util rest of house												
	0.9123	0.8739	0.8063	0.6898	0.5391	0.3795	0.2607	0.3004	0.5055	0.7469	0.8761	0.9219 (89)
MIT 2	19.0568	18.0051	18.6257	19.3044	19.7564	19.9825	20.0426	20.0341	19.8804	19.2714	18.3183	17.9525 (90)
Living area fraction												
MIT	19.3094	18.3639	18.9501	19.5945	20.0304	20.2520	20.3144	20.3042	20.1477	19.5576	18.6554	18.2947 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3094	18.3639	18.9501	19.5945	20.0304	20.2520	20.3144	20.3042	20.1477	19.5576	18.6554	18.2947 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9038	0.8448	0.7794	0.6736	0.5380	0.3911	0.2786	0.3186	0.5113	0.7274	0.8480	0.9014	(94)
Useful gains	767.4265	834.4899	884.7014	872.3645	760.2947	550.4517	373.6911	388.3796	558.4409	683.8453	706.1514	725.2150	(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	1588.2386	1421.4270	1311.4244	1114.5035	866.3857	582.3117	382.6868	401.5305	625.3453	931.6179	1206.7003	1478.1317	(97)
Space heating kWh	610.6842	394.4217	317.4819	174.3401	78.9317	0.0000	0.0000	0.0000	0.0000	184.3428	360.3952	560.1700	(98a)
Space heating requirement - total per year (kWh/year)												2680.7677	
Solar heating kWh	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	610.6842	394.4217	317.4819	174.3401	78.9317	0.0000	0.0000	0.0000	0.0000	184.3428	360.3952	560.1700	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2680.7677	
Space heating per m2										(98c) / (4) =		26.6743	(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 %)													302.4811 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	610.6842	394.4217	317.4819	174.3401	78.9317	0.0000	0.0000	0.0000	0.0000	184.3428	360.3952	560.1700	(98)
Space heating efficiency (main heating system 1)	302.4811	302.4811	302.4811	302.4811	302.4811	0.0000	0.0000	0.0000	0.0000	302.4811	302.4811	302.4811	(210)
Space heating fuel (main heating system)	201.8917	130.3955	104.9593	57.6367	26.0948	0.0000	0.0000	0.0000	0.0000	60.9436	119.1464	185.1918	(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	231.0131	188.0462	158.9893	108.5707	75.1918	65.7982	64.8008	82.8815	115.2150	166.0883	206.5436	228.7657	(64)
Efficiency of water heater (217)m	179.3127	179.3127	179.3127	179.3127	179.3127	179.3127	179.3127	179.3127	179.3127	179.3127	179.3127	179.3127	(216)
Fuel for water heating, kWh/month	128.8325	104.8705	88.6659	60.5482	41.9333	36.6946	36.1384	46.2218	64.2537	92.6249	115.1863	127.5792	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	6.7945	6.1370	6.7945	6.5753	6.7945	6.5753	6.7945	6.7945	6.5753	6.7945	6.5753	6.7945	(231)
Lighting	23.8267	19.1147	17.2106	12.6093	9.7398	7.9575	8.8849	11.5490	15.0010	19.6821	22.2309	24.4889	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-38.0835	-56.2041	-83.6651	-95.3610	-101.5579	-92.3900	-91.1209	-85.9064	-76.2435	-64.6196	-42.4214	-32.4447	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												886.2596	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												179.3127	
Water heating fuel used												943.5493	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
pump for solar water heating												80.0000	(230g)
Total electricity for the above, kWh/year												80.0000	(231)
Electricity for lighting (calculated in Appendix L)												192.2952	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-860.0181	(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												1242.0860	(238)

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10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	886.2596	16.4900	146.1442 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	943.5493	16.4900	155.5913 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Pump for solar water heating	80.0000	16.4900	13.1920 (249)
Energy for lighting	192.2952	16.4900	31.7095 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-860.0181	16.4900	-141.8170
PV Unit electricity exported	0.0000	5.5900	0.0000
Total			-141.8170 (252)
Total energy cost			204.8200 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.5068 (257)
SAP value		91.7852
SAP rating (Section 12)		92 (258)
SAP band		A

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	886.2596	0.1557	137.9826 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	943.5493	0.1460	137.7545 (264)
Space and water heating			275.7371 (265)
Pumps, fans and electric keep-hot	80.0000	0.1387	11.0970 (267)
Energy for lighting	192.2952	0.1443	27.7541 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-860.0181	0.1345	-115.6501
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-115.6501 (269)
Total CO2, kg/year			198.9381 (272)
CO2 emissions per m2			1.9800 (273)
EI value			98.1679
EI rating			98 (274)
EI band			A

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	43.4000 (1b)	x 2.5000 (2b)	= 108.5000 (1b) - (3b)
First floor	37.6000 (1c)	x 2.6000 (2c)	= 97.7600 (1c) - (3c)
Second floor	19.5000 (1d)	x 2.1000 (2d)	= 40.9500 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.5000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	247.2100 (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	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 40.0000 / (5) = 0.1618 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3618 (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) = 0.3075 (21)

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Wind speed	Jan 4.2000	Feb 4.0000	Mar 4.0000	Apr 3.7000	May 3.7000	Jun 3.3000	Jul 3.4000	Aug 3.2000	Sep 3.3000	Oct 3.5000	Nov 3.5000	Dec 3.8000	(22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9250	0.8250	0.8500	0.8000	0.8250	0.8750	0.8750	0.9500	(22a)
Adj infilt rate													
Effective ac	0.3229	0.3075	0.3075	0.2845	0.2845	0.2537	0.2614	0.2460	0.2537	0.2691	0.2691	0.2922	(22b)
	0.5521	0.5473	0.5473	0.5405	0.5405	0.5322	0.5342	0.5303	0.5322	0.5362	0.5362	0.5427	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Windows (Uw = 1.00)			28.2000	0.9615	27.1154			(27)
Half-Glazed			3.1000	1.2000	3.7200			(26a)
RL			0.7000	0.9615	0.6731			(27a)
Heatloss Floor 1			43.9000	0.1000	4.3900	75.0000	3292.5000	(28a)
External Wall 1	116.6000	31.3000	85.3000	0.1500	12.7950	70.0000	5971.0000	(29a)
Flat Roof	17.9000		17.9000	0.1000	1.7900	9.0000	161.1000	(30)
Slope	23.0000	0.7000	22.3000	0.1000	2.2300	9.0000	200.7000	(30)
Total net area of external elements Aum(A, m2)			201.4000					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	52.7135		(33)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) =	9625.3000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								95.7741 (35)
Thermal bridges (User defined value 0.030 * total exposed area)								6.0420 (36)
Point Thermal bridges							(36a) =	0.0000
Total fabric heat loss							(33) + (36) + (36a) =	58.7555 (37)

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

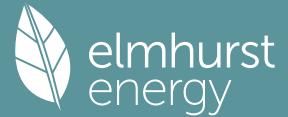
(38)m	Jan 45.0429	Feb 44.6474	Mar 44.6474	Apr 44.0905	May 44.0905	Jun 43.4154	Jul 43.5769	Aug 43.2586	Sep 43.4154	Oct 43.7433	Nov 43.7433	Dec 44.2713	(38)
Heat transfer coeff	103.7983	103.4029	103.4029	102.8459	102.8459	102.1708	102.3324	102.0141	102.1708	102.4987	102.4987	103.0268	(39)
Average = Sum(39)m / 12 =												102.7507	

HLP	Jan 1.0328	Feb 1.0289	Mar 1.0289	Apr 1.0233	May 1.0233	Jun 1.0166	Jul 1.0182	Aug 1.0151	Sep 1.0166	Oct 1.0199	Nov 1.0199	Dec 1.0251	(40)
HLP (average)												1.0224	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.7441 (42)
Hot water usage for mixer showers	70.2294	69.1740	67.6361	64.6935	62.5220	60.1003	58.7238	60.2501	61.9232	64.5234	67.5291	69.9604 (42a)	
Hot water usage for baths	30.3242	29.8738	29.2396	28.0703	27.1947	26.2238	25.6994	26.3291	27.0148	28.0537	29.2471	30.2217 (42b)	
Hot water usage for other uses	42.7324	41.1785	39.6246	38.0707	36.5168	34.9629	34.9629	36.5168	38.0707	39.6246	41.1785	42.7324 (42c)	
Average daily hot water use (litres/day)												131.7121 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	143.2860	140.2263	136.5003	130.8345	126.2334	121.2869	119.3860	123.0960	127.0087	132.2016	137.9548	142.9144 (44)	
Energy conte	226.9300	199.6804	209.7959	179.1058	169.9344	149.1364	144.3870	152.4185	156.6144	179.3964	196.5418	223.7694 (45)	
Energy content (annual)										Total = Sum(45)m =		2187.7107	
Distribution loss (46)m = 0.15 x (45)m	34.0395	29.9521	31.4694	26.8659	25.4902	22.3705	21.6581	22.8628	23.4922	26.9095	29.4813	33.5654 (46)	
Water storage loss:													
Store volume												150.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):												1.8000 (48)	
Temperature factor from Table 2b												0.5400 (49)	
Enter (49) or (54) in (55)												0.9720 (55)	
Total storage loss	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320 (56)	
If cylinder contains dedicated solar storage	30.1320	27.2160	30.1320	29.1600	30.1320	29.1600	30.1320	30.1320	29.1600	30.1320	29.1600	30.1320 (57)	
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	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	280.3244	247.9076	261.7945	224.0242	210.5345	188.2017	184.7545	193.7165	202.8835	231.3950	248.2138	277.1638 (62)	
WWHRS	-49.3113	-43.6113	-45.6673	-37.8143	-35.2416	-30.1565	-28.2669	-30.0590	-31.2010	-36.7826	-41.6702	-48.3981 (63a)	
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)	
Aperture area of solar collector												3.0000 (H1)	
Zero-loss collector efficiency												0.8000 (H2)	
Collector linear heat loss coefficient												1.8000 (H3)	
Collector 2nd order heat loss coefficient												0.0000 (H4)	
Collector loop efficiency												0.9000 (H5)	
Incidence angle modifier												1.0000 (H6)	
Overshading factor												0.8000 (H8)	
Overall heat loss coefficient of system												6.5000 (H10)	
Heat loss coefficient of collector loop												3.9667 (H11)	
Dedicated solar storage volume												75.0000 (H12)	
Effective solar volume												75.0000 (H14)	
Reference volume												225.0000 (H15)	
Storage tank correction coefficient												1.3161 (H16)	
Heat delivered to hot water												654.9553 (H24)	
Heat delivered to space heating												0.0000 (H29)	
Solar input												654.9553	
Solar input	-0.0000	-17.5801	-58.1325	-81.7724	-102.0155	-101.0088	-99.2121	-90.5868	-64.7439	-35.2190	-4.6842	-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	231.0131	186.7162	157.9948	104.4375	73.2775	57.0364	57.2755	73.0707	106.9386	159.3934	201.8595	228.7657 (64)	
												Total per year (kWh/year) = Sum(64)m = 1637.7789 (64)	
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)	
												0.0000 (64a)	
Heat gains from water heating, kWh/month	118.1697	104.9755	111.3560	95.4874	88.9833	80.8401	80.3027	83.7175	89.0896	101.2482	106.6878	117.1189 (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	164.6464	164.6464	164.6464	164.6464	164.6464	164.6464	164.6464	164.6464	164.6464	164.6464	164.6464	164.6464 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.2214	24.1778	19.6627	14.8859	11.1274	9.3942	10.1508	13.1944	17.7095	22.4862	26.2448	27.9779 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	383.7814	387.7639	377.7282	356.3635	329.3944	304.0473	287.1138	283.1314	293.1670	314.5317	341.5008	366.8480 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.2087	54.2087	54.2087	54.2087	54.2087	54.2087	54.2087	54.2087	54.2087	54.2087	54.2087	54.2087 (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)	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643 (71)
Water heating gains (Table 5)	158.8303	156.2135	149.6721	132.6214	119.6012	112.2779	107.9337	112.5236	123.7355	136.0863	148.1774	157.4178 (72)
Total internal gains	678.9240	677.2461	656.1539	612.9617	569.2139	534.8103	514.2892	517.9402	543.7029	582.1952	625.0139	661.3346 (73)

6. Solar gains

[Jan]	Area m2		Solar flux Table 6a W/m2		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W	
Northeast	18.0000		12.9236		0.5700		0.7000		0.7700		64.3222 (75)	
Southwest	10.2000		40.4699		0.5700		0.7000		0.7700		114.1402 (79)	
Southwest	0.7000		41.7848		0.6300		0.7000		1.0000		11.6091 (82)	
Solar gains	190.0714	313.1784	479.5210	707.1500	853.9160	945.1821	885.8418	767.2412	596.6569	386.0760	237.7893	158.2292 (83)
Total gains	868.9954	990.4245	1135.6749	1320.1117	1423.1299	1479.9924	1400.1310	1285.1814	1140.3598	968.2711	862.8032	819.5638 (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	25.7586	25.8571	25.8571	25.9971	25.9971	26.1689	26.1276	26.2091	26.1689	26.0851	26.0851	25.9515
alpha	2.7172	2.7238	2.7238	2.7331	2.7331	2.7446	2.7418	2.7473	2.7446	2.7390	2.7390	2.7301
util living area	0.9087	0.8750	0.8041	0.6770	0.5155	0.3327	0.2236	0.2496	0.4743	0.7307	0.8665	0.9184 (86)
Living	19.1301	19.4208	19.9272	20.4595	20.8056	20.9598	20.9908	20.9876	20.8871	20.4413	19.7233	19.0709
Non living	17.9016	18.2626	18.8813	19.5109	19.8916	20.0436	20.0648	20.0660	19.9850	19.5108	18.6507	17.8328
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	20.0434	19.4208	19.9272	20.4595	20.8056	20.9598	20.9908	20.9876	20.8871	20.4413	19.7233	19.3407 (87)
Th 2	20.0561	20.0593	20.0593	20.0639	20.0639	20.0695	20.0682	20.0708	20.0695	20.0668	20.0668	20.0668
util rest of house	0.8971	0.8598	0.7811	0.6421	0.4672	0.2747	0.1576	0.1789	0.4099	0.6913	0.8476	0.9078 (89)
MIT 2	19.1972	18.2626	18.8813	19.5109	19.8916	20.0436	20.0648	20.0660	19.9850	19.5108	18.6507	18.2346 (90)
Living area fraction	19.4464	18.6038	19.1893	19.7903	20.1608	20.3134	20.3375	20.3374	20.2507	19.7848	18.9666	18.5604 (92)
MIT	19.4464	18.6038	19.1893	19.7903	20.1608	20.3134	20.3375	20.3374	20.2507	19.7848	18.9666	18.5604 (93)
Temperature adjustment												0.0000
adjusted MIT	19.4464	18.6038	19.1893	19.7903	20.1608	20.3134	20.3375	20.3374	20.2507	19.7848	18.9666	18.5604 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8886	0.8315	0.7568	0.6311	0.4724	0.2902	0.1769	0.1994	0.4229	0.6781	0.8207	0.8868 (94)
Useful gains	772.1737	823.5137	859.4919	833.1699	672.2575	429.4507	247.6276	256.3137	482.2410	656.5973	708.0873	726.7734 (95)
Ext temp.	5.1000	5.6000	7.4000	9.9000	13.0000	16.0000	17.9000	17.8000	15.2000	11.6000	8.0000	5.1000 (96)
Heat loss rate W	1489.1344	1344.6256	1219.0502	1017.1748	736.4557	440.7057	249.4400	258.8523	516.0316	838.9367	1124.0620	1386.7771 (97)
Space heating kWh	533.4187	350.1871	267.5114	132.4835	47.7635	0.0000	0.0000	0.0000	0.0000	135.6605	299.5018	491.0428 (98a)
Space heating requirement - total per year (kWh/year)												2257.5693
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	533.4187	350.1871	267.5114	132.4835	47.7635	0.0000	0.0000	0.0000	0.0000	135.6605	299.5018	491.0428 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2257.5693
Space heating per m2										(98c) / (4) =		22.4634 (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 %)												303.2744 (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	533.4187	350.1871	267.5114	132.4835	47.7635	0.0000	0.0000	0.0000	0.0000	135.6605	299.5018	491.0428 (98)
Space heating efficiency (main heating system 1)	303.2744	303.2744	303.2744	303.2744	303.2744	0.0000	0.0000	0.0000	0.0000	303.2744	303.2744	303.2744 (210)
Space heating fuel (main heating system)	175.8865	115.4688	88.2077	43.6844	15.7493	0.0000	0.0000	0.0000	0.0000	44.7319	98.7561	161.9137 (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)

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	744.3983	1.5786	1175.1262 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	911.7865	1.5425	1406.4600 (278)
Space and water heating			2581.5863 (279)
Pumps, fans and electric keep-hot	80.0000	1.5128	121.0240 (281)
Energy for lighting	192.2952	1.5338	294.9488 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-884.1609	1.4972	-1323.7699
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-1323.7699 (283)

Total Primary energy kWh/year

1673.7892 (286)