

MEP Design

Energy

Sustainability

Carbon Profiling

Wellbeing

Certification

Doc Ref: JF458-XX-XX-RP-X-0001
Rev: 3
Date: 22nd March 2024
Prepared By: Lee Pasifull OCEA, DEA, NDEA

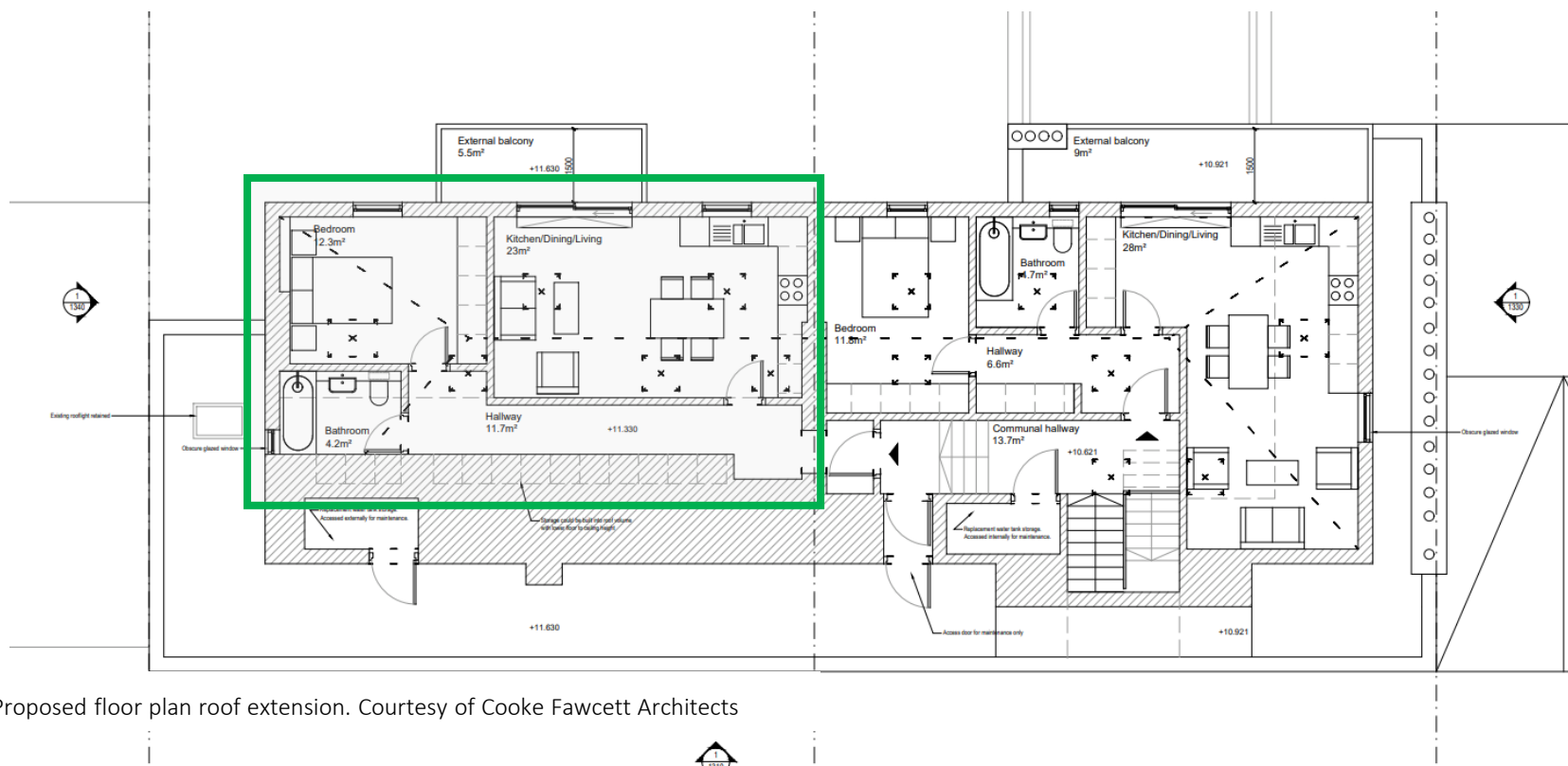
Harcourt House, 16-17 Haringey Park, N8 9JB
Planning Stage Energy Strategy

Project Scope

The proposal is for the erection of one additional storey at roof level to existing building to provide up to 2no. self-contained apartments, plant and associated works. The site is based in Haringey Park, N8 9JB

Sampled Unit

JFMEP have carried out the sampling on 1 no. apartments, situated on the top floor. This has allowed a concise calculation to show compliance with SAP 10. Elmhurst Design SAP 10 software was used to carry out the study, which assessed the yearly carbon emissions, fabric energy efficiency and the primary energy targets.



Proposed floor plan roof extension. Courtesy of Cooke Fawcett Architects

Due to the nature of the project, in that there are only two proposed residential dwellings, many of the policies contained with the below section are not applicable. However, it is in the intention to provide where possible measures to ensure that the project focuses on mitigation of carbon emissions, passive design and future proofed solutions.

National Planning Policy Framework (NPPF)

The NPPF focuses on meeting the challenge of climate change, from a social, environmental and economic standpoint. The proposal ensures that the mitigation of emissions through optimised design, i.e. building orientation, and the potential integration renewable and low carbon technologies are adopted where feasible .

The London Plan 2021

The London Plan guidance make no reference to a minor development scheme. This also applies to the GLA (Greater London Authority) guidance, which focuses on 10 or more dwellings and/or commercial space higher than 1000m² being zero carbon.

Haringey Council Local Plan

Policy SP4 of the Haringey Local Plan focuses on following requirements. A response to these policies has been detailed below.

	Condition	Response
Minimum Targets	From 2011 onwards, all new residential development will achieve a minimum 25% reduction in total (regulated) CO2 emissions in line with Code for Sustainable Homes Level 4 energy standards, and should aim to achieve Level 6	The project will be assessed under AD Part L1 2021 and will perform 25% better than Part L 2013 (15% improvement on Part L 2021).
	The Council will promote low- and zero-carbon energy generation through the following measures:	-
	a. Requiring all developments to assess, identify and implement, where viable, site-wide and area wide decentralised energy facilities including the potential to link into a wider network	Not applicable due to the project being a major development
	b. Establishing local networks of decentralised heat and energy facilities by requiring developers to prioritise connection to existing or planned networks where feasible;	Not applicable due to the project being a major development
	c. Working with neighbouring boroughs and other partners to explore ways of implementing subregional decentralised energy networks including the potential in the Upper Lee Valley Opportunity Area; and	Not applicable due to the project being a major development
	d. All new developments will be required, where viable, to achieve a reduction in predicted carbon dioxide emissions of 20% from onsite renewable energy regeneration, which can include connections to local sources of decentralised renewable energy.	Not applicable due to the project being a major development
	From 2011 onwards, all new residential development will achieve a minimum 25% reduction in total (regulated) CO2 emissions in line with Code for Sustainable Homes Level 4 energy standards, and should aim to achieve Level 6	The project will be assessed under AD Part L1 2021 and will perform 25% better than Part L 2013 (15% improvement on Part L 2021).

Be Lean: Use Less Energy

For all developments a balance will need to be reached between the need to retain heat, the heat generated within a development and the need to remove excess heat. It is noted that there will be no alteration to the main building fabric and only the air pressure testing will be carried out. Should any building fabric be altered, Part L1b figures should be applied.

Energy Efficient Design Measures

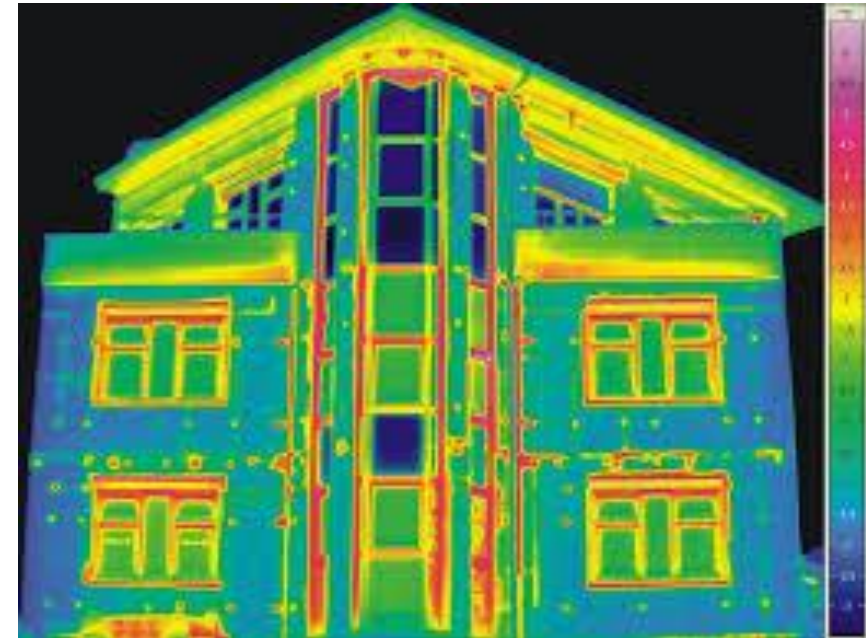
- Optimally sized windows that achieve good daylight levels but avoid excessive solar gain in summer and heat loss in winter
- A design air leakage rate of 7-10 m³/m²hr to apartments
- Careful design to reduce the effect of non-repeating thermal bridges including the use of high-performance thermal breaks where feasible
- All lighting, both in individual apartments and in the communal areas will use lamps with a luminous efficacy of at least 45 lamp-lumens/watt (equivalent to an "A" rating)
- All common area lighting will have automatic controls with occupancy and daylight sensors

Air Tightness

Much as thermal bridging, improving U values also shift greater focus onto the air tightness of the building envelope. To ensure a high level of air tightness is achieved the measures detailed within the ACD's are to be incorporated and implemented throughout construction. It is proposed that dwellings are tested for air tightness targeting an air permeability of 7.00m³/hr.m² at 50 Pa.

Low Energy Lighting

100% of installed lighting exceed the minimum performance criteria to be considered low energy, exceeding Part L 2013 minimum standards.



Typical Thermographic Survey - Kingspan

Be Lean: Use Less Energy

The building fabric is a critical component of any building, since it both protects the building occupants and plays a major role in regulating the indoor environment. Consisting of the building's roof, floor slabs, walls, windows, and doors, the fabric controls the flow of energy between the interior and exterior of the building.

The priority is to reduce the baseline emissions through efficient design measures. To minimize space heating and cooling energy requirements, the following measures should be utilized.

Element Description	U-Value Limit	U-Value Assumed in Model
Ground Floors	Dwelling Below	0.00
Exposed Soffits	Dwelling Below	0.00
External Walls	0.26 W/m²K	0.15 W/m²K
Party Walls	0.00 W/m²K	0.00 W/m²K
Pitched Roofs	0.18 W/m²K	0.10W/m²K
Flat Roofs	0.18 W/m²K	0.10 W/m²K
Air Permeability	8.00m³/ (h.m²) at 50 Pa	4.00m³/ (h.m²) at 50 Pa
Glazing	1.60 W/m²K	1.30 W/m²K Gg: 0.4-0.6
Doors	1.60 W/m²K	1.00 W/m²K

Be Clean: Use Energy Efficiently

The second step is to assess the technical feasibilities of various low carbon, decentralised and renewable technologies. Economic and practical feasibilities should be considered separately; however, comments have been made in these areas where appropriate.

Option 1 - Mains Gas Boiler to supply heating and hot water

PRACTICAL: this would be practical for individual units and allows individual control and servicing.

TECHNICAL: Assumed system is a Vaillant Ecotec plus condensing combi boiler. Seasonal efficiency of boiler 89.9%. These systems will be backed up with highly efficient delayed start thermostats, and time and temperature zone control (at least 2 zones per unit).

FINANCIAL: Good EPC rating, with low mains gas fuel and standing charges. Integrates with existing site infrastructure

ENVIRONMENTAL: with future to turn away from servicing buildings with fossil fuels, it would be necessary to provide a future proofing strategy, should the switch over to a renewable or low carbon fuel be decided. A hydrogen ready boiler should be reviewed. PV array will be required to offset the primary energy amount from gas fuel (approximately 2.5kWp per unit).

Feasibility

The gas boiler option will require a large amount of PV, which would cause detriment to the characteristics of the site and surrounding areas. Therefore, this option has been discounted.

Option 2 - Air Source Heat Pump with Cylinder

PRACTICAL: there is likely to be a space restraint for external plant and should be reviewed before this option is decided.

TECHNICAL: Assumed system is a Daikin Altherma indoor and outdoor unit. Hot water via integrated Daikin cylinder (floor standing unit)

FINANCIAL: Typical payback times are currently around nine years, including current grants

ENVIRONMENTAL: Approximately 57.75% of overall CO2 emissions would be offset from using a system with a high Coefficient of Performance (COP) rating and high SEER/EER

Feasibility

Sufficient space is required for airflow into the machine and adequate clearance is needed at the front of the heat pump to prevent cold air re-circulation. Access is also needed for service and maintenance.

There are site constraints with regards to available outdoor space, access issues and acoustic limitations due to the surrounding area being predominantly residential.

Be Clean: Use Energy Efficiently

The second step is to assess the technical feasibilities of various low carbon, decentralised and renewable technologies. Economic and practical feasibilities should be considered separately; however, comments have been made in these areas where appropriate.

Option 3 - Exhaust Air Heat Pump

PRACTICAL: Easy to install and beneficial in apartments with space restraints. Additional design is required to ensure adequate ducting to external façade/roofs. May require a minor planning amendment.

TECHNICAL: Assumed system is a NIBE fighter F470 unit, integrated water heater and whole house ventilation. Heat production is reliable and economical, thanks to an integrated hot water heater, immersion heater, circulation pump and control system.

FINANCIAL: Typical payback times are currently around eight years, including current grants. Higher capital cost than a conventional gas boiler. However, these systems are very cost effective when considering the exclusion of the gas supply, being needed for the property

ENVIRONMENTAL: Approximately 63.38% of overall CO2 emissions would be offset from using a system with a high Coefficient of Performance (COP) rating and high SEER/EER

Feasibility

Sufficient space is required for airflow into the machine. The unit is compact and would therefore be feasible for this project. The building fabric is designed to be perfect for this unit due to its low heat loss. As a precaution, the cylinder reheat time should be reviewed prior to specification, to ensure that hot water is available efficiently and with no severe time restraints. Heat losses would need to be reduced to a point where this system is economically viable. May not integrate with existing building.

Option 4 – High Retention Electric Panel Heating with Heat Pump Hot Water Cylinder

PRACTICAL: Easy to install radiators, with an exhaust heat pump cylinder producing hot water.

TECHNICAL: The inner vessel is made from Stainless Steel with a Hot Water Heat Pump mounted on top. The heat pump can produce hot water very efficiently as it extracts heat from external air supplied via insulated ductwork. A dual tariff is required (minimum 7 hour).

FINANCIAL: The Dimplex Edel cylinder is approximately £2.5k, which makes it financially viable when tied with simpler installed electric radiators. Additionally, the cost for a mains gas supply would be saved.

ENVIRONMENTAL: Approximately 54.75% of overall CO2 emissions would be offset from using this system.

Feasibility

Future proofed and viable solution, producing heating and hot water.

The next step is to ensure an efficient and future proofed building service solution. The following energy model scenarios have been reviewed and reported accordingly. Planning policy requires consideration for the property to have a connection to a future de-centralised heat network. In reviewing the London Heat map there doesn't appear to be any local energy distribution within the area or close to the property and it would be impractical to make provision at this stage.

Option 2: Air Source Heat Pump	Air source heat pump system with radiators or underfloor heating. Assumed efficiency of 250%. Hot water supplied via immersion. 120 litre capacity, 1.30kw/day loss.
Option 3: Exhaust Heat Pump	All-in-one exhaust and supply air heat pump which provides heating, ventilation, heat recovery and hot water.
Option 4: High Retention Storage Heaters and Heat Pump Hot Water Cylinder	High retention storage heater (all electric scheme). Dual tariff and heat pump cylinder

	TER	DER	Improvement over Part L	TFEE	DFEE	Improvement over Part L	TPER	DPER	Improvement over Part L	EPC	
Option 2: Air Source Heat Pump	14.2	6	57.75	35.54	32.44	8.72	75.57	63.61	15.83	C	77
Option 3: Exhaust Heat Pump	14.01	5.13	63.38	35.54	32.44	8.72	74.56	54.04	27.52	B	81
Option 4: High Retention Storage Heaters, System 4 ventilation	14.01	6.34	54.75	35.54	32.44	8.72	74.56	69.68	6.54	B	83

Technology	Viable	Reasoning
Solar (Photovoltaic)		There is space to add a photovoltaic array to the new building. However, the potential to install a photovoltaic array may cause detriment to the character of the site and surrounding area. Moreso, the three options put forward ensure a significant reduction in carbon emissions, when compared against a Part L notional target.
Solar Thermal (Hot Water)		As with the PV panels, there is potential to install a small solar thermal array to the roof, to provide renewable hot water. This is a less preferred option as individual systems would need to be installed to each apartment.
Wind Turbine		Due to the location the uneven and turbulent wind patterns that can be expected to occur near buildings, the effective operational time is likely to be limited. Additionally due to noise, vibration, reflected light and shadow flicker it is not best practice to locate near residential areas.
Biomass		Biomass technology could potentially offer a solution to satisfying heating and hot water loads to the project. However, it has been discounted as there is no space allocation for the pellets on site. There is also an increased fire risk where combustible materials are going to be stored
Air Source Heat Pump		Air Source Heat Pumps are feasible for the scheme. However, there may be space restraints when looking to situate the outdoor condenser units. Additionally, acoustics may be an issue
Ground Source Heat Pump		The site would be difficult to accommodate both a vertical borehole system or plateau setup, in regard to safe working area, existing building and lack of open available space. Ground Source Heat Pumps have therefore been discounted based on these potential constraints.

Timber

All timber used for basic or finishing building elements in the scheme will be sourced from responsibly managed and sustainable forests or plantations. Such timber products are the only truly renewable construction material in common use and growing trees also absorb and fix CO₂. Forests can also provide the habitat for a wide variety of plant and animal life, preserving important ecology and promoting biodiversity.

Local Sourcing

A building that is truly sustainable must be constructed using locally sourced, sustainable materials i.e. materials that can be supplied without any adverse effect on the environment. Therefore, where practical, materials should be sourced from local suppliers, reducing the environmental impacts and CO₂ emissions associated with transportation to the site.

Reuse and Recycling

Scope for increased recycling will be incorporated by specifying recycled materials where possible and ensuring that even where new materials are used, as much as possible can be recycled at the end of the buildings' life.

Any material not required from the original building can be recycled and used as aggregate.

Specifying materials with a high-recycled content is also another method of saving processing or manufacturing energy. The recycled content of a material can be described as either post-consumer or post-industrial to indicate at what point in the life cycle a material is reclaimed.

Lifecycle Assessment

A Life Cycle Assessment (LCA) - is a tool that can be used to assess the environmental impacts of a product, process or service from design to disposal i.e. across its entire lifecycle. This process should be carried out during technical design stage.

Conclusion

The proposed development has been assessed in line with the London Plan energy hierarchy, with a view of demonstrating how best to achieve a sustainable, future proofed scheme, when compared against the existing building model benchmark figures, as required to meet local and regional planning policies. The purpose of the strategy is to reduce the overall energy demand as far as possible with regards to the practicality and economic factors, by implementing energy efficiency measures and introducing low carbon and renewable technologies.

The units will benefit from passive design measures, upgraded building services and potential renewable technology. The options listed provide several flexible options to comply. The recommended route is to adopt **Option 3 or 4**, subject to further design. Whichever option is determined; the development will comply with Part L figures and local & national requirements in energy efficiency. While no confirmed strategy has been confirmed, each of the options below allow an enhancement between Building Regulations 2021. Moreso, each option will allow a minimum of 54.75% reduction from CO2 emissions, when compared against the Part L TER benchmark.

	TER	DER	Improvement over Part L	TfEE	DfEE	Improvement over Part L	TPER	DPER	Improvement over Part L	EPC	
Option 2: Air Source Heat Pump	14.2	6	57.75	35.54	32.44	8.72	75.57	63.61	15.83	C	77
Option 3: Exhaust Heat Pump	14.01	5.13	63.38	35.54	32.44	8.72	74.56	54.04	27.52	B	81
Option 4: High Retention Storage Heaters and Heat Pump Hot Water Cylinder	14.01	6.34	54.75	35.54	32.44	8.72	74.56	69.68	6.54	B	83

SAP Documentation

Elmhurst Report Apartment Type 1

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Thu 21 Mar 2024 09:06:37

Project Information			
Assessed By	Lee Pasifull	Building Type	Flat, Semi-detached
OCDEA Registration	EES/024192	Assessment Date	2024-03-21

Dwelling Details			
Assessment Type	As designed	Total Floor Area	63 m ²
Site Reference	Unit 1 - Harcourt House	Plot Reference	Unit 1 - Harcourt House - Pane
Address			

Client Details	
Name	John Francis MEP
Company	JFMEP
Address	SUScon, Dartford, DA1 5FW

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate			
Fuel for main heating system	Electricity		
Target carbon dioxide emission rate	14.01 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	6.34 kgCO ₂ /m ²		OK
1b Target primary energy rate and dwelling primary energy			
Target primary energy	74.56 kWh _{PE} /m ²		
Dwelling primary energy	69.68 kWh _{PE} /m ²		OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	35.5 kWh/m ²		
Dwelling fabric energy efficiency	32.4 kWh/m ²		OK

2a Fabric U-values				
Element	Maximum permitted average U-Value [W/m ² K]	Dwelling average U-Value [W/m ² K]	Element with highest individual U-Value	
External walls	0.26	0.15	Walls (1) (0.15)	OK
Party walls	0.2	0	Party Wall (1) (0)	N/A
Curtain walls	1.6	0	N/A	N/A
Floors	0.18	N/A	N/A	N/A
Roofs	0.16	0.1	Roof (1) (0.1)	OK
Windows, doors, and roof windows	1.6	1.3	W1 (s) (1.3)	OK
Rooflights	2.2	N/A	N/A	N/A

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))		
Name	Net area [m ²]	U-Value [W/m ² K]
Exposed wall: Walls (1)	63.275	0.15
Party wall: Party Wall (1)	14.01	0 (!)
Exposed roof: Roof (1)	65.52	0.1 (!)

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	Area [m ²]	Orientation	Frame factor	U-Value [W/m ² K]
W1 (s), New Window	1.2	South	0.8	1.3
W1 (s), New Window	1.2	South	0.8	1.3
W2 (s), New Window	5.17	South	0.8	1.3
W3 (w), New Window	0.525	East	0.8	1.3

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))				
Building part 1 - Main Dwelling: Thermal bridging calculated from linear thermal transmittances for each junction				
Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E1: Steel lintel with perforated steel base plate	Calculated by person with suitable expertise	0.05	Appendix R
External wall	E3: Sill	Calculated by person with suitable expertise	0.05	Appendix R

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E4: Jamb	Calculated by person with suitable expertise	0.05	Appendix R
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.16	Appendix R
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0 (!)	Appendix R
External wall	E14: Flat roof	Calculated by person with suitable expertise	0.08	Appendix R
Roof	R11: Upstands or kerbs of rooflights	Calculated by person with suitable expertise	0.08	Appendix R
Party wall	P1: Ground floor	Calculated by person with suitable expertise	0.08	Appendix R
Party wall	P2: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0 (!)	Appendix R
Party wall	P4: Roof (insulation at ceiling level)	Calculated by person with suitable expertise	0.12	Appendix R
External wall	E20: Exposed floor (normal)	Calculated by person with suitable expertise	0.32	Appendix R

3 Air permeability (better than typically expected values are flagged with a subsequent (!))

Maximum permitted air permeability at 50Pa	8 m ³ /hm ²	
Dwelling air permeability at 50Pa	5 m ³ /hm ² , Design value	OK
Air permeability test certificate reference		

4 Space heating

Main heating system 1: Electric storage heaters - Electricity

Efficiency	100.0%
Emitter type	
Flow temperature	
System type	High heat retention storage heaters
Manufacturer	
Model	
Commissioning	

Main heating system 2: Heat pump with radiators or underfloor heating - Electricity

Efficiency	0.0%
Emitter type	
Flow temperature	
System type	Heat Pump
Manufacturer	Auer
Model	EDL170-520RF
Commissioning	

Secondary heating system: N/A

Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water

Cylinder/store - type: N/A

Capacity	N/A
Declared heat loss	N/A
Primary pipework insulated	N/A
Manufacturer	
Model	
Commissioning	

Waste water heat recovery system 1 - type: N/A

Efficiency	
Manufacturer	
Model	

6 Controls		
Main heating 1 - type: Controls for high heat retention storage heaters		
Function		
Ecodesign class		
Manufacturer		
Model		
Main heating 2 - type: Not applicable		
Function		
Ecodesign class		
Manufacturer		
Model		
Water heating - type: Cylinder thermostat and HW separately timed		
Manufacturer		
Model		
7 Lighting		
Minimum permitted light source efficacy	75 lm/W	
Lowest light source efficacy	15 lm/W	FAIL
External lights control	N/A	
8 Mechanical ventilation		
System type: N/A		
Maximum permitted specific fan power	N/A	
Specific fan power	N/A	N/A
Minimum permitted heat recovery efficiency	N/A	
Heat recovery efficiency	N/A	N/A
Manufacturer/Model		
Commissioning		
9 Local generation		
N/A		
10 Heat networks		
N/A		
11 Supporting documentary evidence		
N/A		
12 Declarations		
a. Assessor Declaration		
This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design information submitted for this dwelling for the purpose of carrying out the "As designed" assessment, and that the supporting documentary evidence (SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required) has been reviewed in the course of preparing this BREL Compliance Report.		
Signed:	Assessor ID:	
Name:	Date:	
b. Client Declaration		
N/A		

Summary for Input Data

Property Reference	Unit 1 - Harcourt House	Issued on Date	21/03/2024
Assessment Reference	Unit 1 - Harcourt House - Pane	Prop Type Ref	UNIT 1 Sample
Property			

SAP Rating	83 B	DER	6.34	TER	14.01
Environmental	95 A	% DER < TER			54.75
CO ₂ Emissions (t/year)	0.34	DFEE	32.44	TFEE	35.54
Compliance Check	See BREL	% DFEE < TFEE			8.72
% DPER < TPER	6.54	DPER	69.68	TPER	74.56

Assessor Details	Mr. Lee Pasifull	Assessor ID	Y856-0001
Client			

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

Orientation	West	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Suburban	
1.0 Property Type	Flat, Semi-Detached	
Position of Flat	Top-floor flat	
Which Floor	4	
2.0 Number of Storeys	1	
3.0 Date Built	2024	
3.0 Property Age Band	L	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	N/A	kJ/m²K
7.0 Electricity Tariff	7 Hour Off Peak	
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:	30.08 m	63.31 m ²	2.50 m
1st Storey:	26.38 m	49.04 m ²	2.85 m
2nd Storey:	0.00 m	0.00 m ²	0.00 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	23.20	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
	Main External Wall	Cavity Wall	Cavity wall : plasterboard on dabs, AAC block, filled cavity, any outside structure	0.15	60.00	71.37	63.28	0.00	None	8.10	Enter Gross Area

9.1 Party Walls	Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)	Shelter Res	Shelter
	Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	14.01	0.00	None

9.2 Internal Walls	Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
	Internal Wall 1	Plasterboard on timber frame	9.00	40.27

10.0 External Roofs	
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Summary for Input Data

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
External Flat Roof	External Flat Roof	Plasterboard, insulated flat roof	0.10	9.00	65.52	65.52	None	0.00	Enter Gross Area	0.00

10.2 Internal Ceilings

Description	Storey	Construction	Area (m²)
Internal Ceiling 1	Lowest occupied	Plasterboard ceiling, carpeted chipboard floor	65.52

11.1 Party Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Concrete floor slab, carpeted	100.00	65.52

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
New Window	Manufacturer	Window	Double Low-E Soft 0.05		Air Filled	0.68	Wood	0.80	1.30
New Door	Manufacturer	Half Glazed Door	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.00
Rooflight	Manufacturer	Roof Light	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.40

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
W1 (s)	New Window	Main External Wall	South	2.40	0
W2 (s)	New Window	Main External Wall	South	5.17	0
W3 (w)	New Window	Main External Wall	East	0.53	0

14.0 Conservatory

None

15.0 Draught Proofing

100 %

16.0 Draught Lobby

No

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E1 Steel lintel with perforated steel base plate	Independently assessed	17.61	0.05	0.05	Appendix R	Yes
E3 Sill	Independently assessed	4.00	0.05	0.05	Appendix R	No
E4 Jamb	Independently assessed	43.80	0.05	0.05	Appendix R	Yes
E5 Ground floor (normal)	Independently assessed	27.22	0.16	0.16	Appendix R	Yes
E6 Intermediate floor within a dwelling	Independently assessed	26.38	0.00	0.00	Appendix R	Yes
E14 Flat roof	Independently assessed	26.38	0.08	0.08	Appendix R	Yes
R11 Upstands or kerbs of rooflights	Independently assessed	5.76	0.08	0.08	Appendix R	Yes
P1 Party wall - Ground floor	Independently assessed	3.87	0.08	0.08	Appendix R	No
P2 Party wall - Intermediate floor within a dwelling	Independently assessed	3.87	0.00	0.00	Appendix R	No
P4 Party wall - Roof (insulation at ceiling level)	Independently assessed	4.71	0.12	0.12	Appendix R	No
E20 Exposed floor (normal)	Independently assessed	10.41	0.32	0.32	Appendix R	No

Y-value

0.11 W/m²K

Description

Target

18.0 Pressure Testing

Yes

Designed AP₅₀ 5.00 m³/(h.m²) @ 50 Pa

Property Tested? Yes

Test Method Blower Door

As Built AP₅₀ 0.10 m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Mechanical Ventilation System Present No

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System

No

22.0 Lighting

No Fixed Lighting No

Name	Efficacy	Power	Capacity	Count
LED	15.00	5	75	20

24.0 Main Heating 1

SAP table

Description HRSH

Percentage of Heat 100.00 %

Summary for Input Data



Database Ref. No.	0
Fuel Type	Electricity
SAP Code	409
In Winter	100.00
In Summer	302.95
Controls SAP Code	2404
Delayed Start Stat	Yes
Burner Control	Modulating
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	Underfloor
Underfloor Heating	Yes - Pipes in Wood
Flow Temperature	Enter value
Flow Temperature Value	35.00
Boiler Interlock	Yes
Combi boiler type	No Combi
Combi keep hot type	None

Number Of Heaters
5

PCDF Index
230003 m

25.0 Main Heating 2

Database	
Description	Edel
Percentage of Heat	0.00 %
Database Ref. No.	105752
Fuel Type	Electricity
SAP Code	0
In Winter	0.00
In Summer	302.95
Model Name	EDL170-520RF
Manufacturer	Auer
Controls	2100
Delayed Start Stat	No
HETAS approved System	No
Oil Pump Inside	No
FI Case	0.00
Flue Type	None or Unknown
Fan Assisted Flue	No
Flow Temperature	Enter value

26.0 Heat Networks

None

Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1	None								
Heat source 2	None								
Heat source 3	None								
Heat source 4	None								
Heat source 5	None								

Summary for Input Data

28.0 Water Heating

Water Heating	Main Heating 2
SAP Code	914
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Immersion Heater	Dual
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
Shower	Combi boiler or unvented hot water system	11.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder

Hot Water Cylinder	Internal Store	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	173.00	L
Loss	1.92	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	

31.0 Thermal Store

None

34.0 Small-scale Hydro

Electricity Generated	0.00	kWh/Year
Apportioned	0.00	
Connected to dwelling's electricity meter	Yes	
Electricity Generation	Annual	

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

Lower cost measures

None

Further measures to achieve even higher standards

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

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Property Reference	Unit 1 - Harcourt House			Issued on Date	21/03/2024
Assessment Reference	Unit 1 - Harcourt House - Pane	Prop Type Ref	Unit 1 Sample		
Property					
SAP Rating	83 B	DER	6.34	TER	14.01
Environmental	95 A	% DER < TER			54.75
CO ₂ Emissions (t/year)	0.34	DFEE	32.44	TFEE	35.54
Compliance Check	See BREL	% DFEE < TFEE			8.72
% DPER < TPER	6.54	DPER	69.68	TPER	74.56
Assessor Details	Mr. Lee Pasifull			Assessor ID	Y856-0001
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	63.3100 (1b)	2.5000 (2b)	158.2750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.3100		158.2750 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	158.2750 (5)

2. Ventilation rate

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

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.2500	(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) =	0.2125 (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	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497 (22b)
Effective ac	0.5367	0.5353	0.5339	0.5273	0.5261	0.5204	0.5204	0.5193	0.5226	0.5261	0.5286	0.5312 (25)

3. Heat losses and heat loss parameter

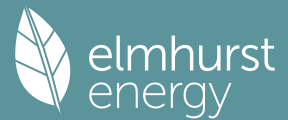
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
New Window (Uw = 1.30)			8.1000	1.2357	10.0095		(27)
Main External Wall	71.3700	8.1000	63.2700	0.1500	9.4905	60.0000	3796.2000 (29a)
External Flat Roof	65.5200		65.5200	0.1000	6.5520	9.0000	589.6800 (30)
Total net area of external elements Aum(A, m ²)			136.8900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		26.0520		(33)
Party Wall 1			14.0100	0.0000	0.0000	110.0000	1541.1000 (32)
Party Floor 1			65.5200			80.0000	5241.6000 (32d)
Internal Wall 1			40.2700			9.0000	362.4300 (32c)
Internal Ceiling 1			65.5200			9.0000	589.6800 (32e)

Heat capacity Cm = Sum(A x k)	(28) ... (30) + (32) + (32a) ... (32e) =	12120.6900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		191.4498 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	17.6100	0.0500	0.8805
E3 Sill	4.0000	0.0500	0.2000
E4 Jamb	43.8000	0.0500	2.1900
E5 Ground floor (normal)	27.2200	0.1600	4.3552
E6 Intermediate floor within a dwelling	26.3800	0.0000	0.0000
E14 Flat roof	26.3800	0.0800	2.1104

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R11 Upstands or kerbs of rooflights	5.7600	0.0800	0.4608
P1 Party wall - Ground floor	3.8720	0.0800	0.3098
P2 Party wall - Intermediate floor within a dwelling	3.8720	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	4.7060	0.1200	0.5647
E20 Exposed floor (normal)	10.4080	0.3200	3.3306
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			14.4019 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss		(33) + (36) + (36a) =	40.4539 (37)

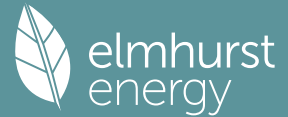
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	28.0324	27.9580	27.8850	27.5423	27.4782	27.1797	27.1797	27.1244	27.2946	27.4782	27.6079	27.7435 (38)
Average = Sum(39)m / 12 =	68.4864	68.4119	68.3390	67.9962	67.9321	67.6336	67.6336	67.5783	67.7486	67.9321	68.0618	68.1975 (39)
												67.9959
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0818	1.0806	1.0794	1.0740	1.0730	1.0683	1.0683	1.0674	1.0701	1.0730	1.0751	1.0772 (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												2.0735 (42)
Hot water usage for mixer showers												80.7943 (42a)
Hot water usage for baths												25.4028 (42b)
Hot water usage for other uses												35.8648 (42c)
Average daily hot water use (litres/day)												131.0128 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	142.4588	139.5572	135.9439	130.2586	125.7106	120.7936	118.7632	122.3594	126.1721	131.3523	137.1309	142.0619 (44)
Energy content (annual)	225.6199	198.7277	208.9407	178.3175	169.2306	148.5299	143.6338	151.5064	155.5828	178.2439	195.3681	222.4346 (45)
Distribution loss (46)m = 0.15 x (45)m												2176.1358
Water storage loss:												
Store volume												173.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.9200 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0368 (55)
Total storage loss												
If cylinder contains dedicated solar storage												32.1408 (56)
Primary loss												32.1408 (57)
Combi loss												0.0000 (59)
Total heat required for water heating calculated for each month												
WWHRS	257.7607	227.7581	241.0815	209.4215	201.3714	179.6339	175.7746	183.6472	186.6868	210.3847	226.4721	254.5754 (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	257.7607	227.7581	241.0815	209.4215	201.3714	179.6339	175.7746	183.6472	186.6868	210.3847	226.4721	254.5754 (64)
12Total per year (kWh/year)												2554.5678 (64)
Electric shower(s)												2555 (64)
Heat gains from water heating, kWh/month												
	75.0186	66.0769	69.4728	59.2906	56.2692	49.3862	47.7582	50.3759	51.7313	59.2661	64.9599	73.9595 (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	103.6754	103.6754	103.6754	103.6754	103.6754	103.6754	103.6754	103.6754	103.6754	103.6754	103.6754	103.6754 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	97.1415	107.5496	97.1415	100.3796	97.1415	100.3796	97.1415	97.1415	100.3796	97.1415	100.3796	97.1415 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	181.2110	183.0914	178.3529	168.2651	155.5310	143.5628	135.5673	133.6869	138.4254	148.5132	161.2473	173.2155 (68)
Pumps, fans	33.3675	33.3675	33.3675	33.3675	33.3675	33.3675	33.3675	33.3675	33.3675	33.3675	33.3675	33.3675 (69)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Water heating gains (Table 5)	-82.9403	-82.9403	-82.9403	-82.9403	-82.9403	-82.9403	-82.9403	-82.9403	-82.9403	-82.9403	-82.9403	-82.9403 (71)
Total internal gains	100.8315	98.3288	93.3774	82.3480	75.6306	68.5919	64.1912	67.7095	71.8490	79.6587	90.2221	99.4079 (72)
	433.2867	443.0724	422.9744	405.0953	382.4058	366.6369	351.0026	352.6405	364.7566	379.4161	405.9516	423.8676 (73)

6. Solar gains												
[Jan]												
	Area	Solar flux	g	FF	Access	Gains						
	m2	Table 6a	W/m2	Specific data	factor	W						
				or Table 6b	Table 6d							
East	0.5300	19.6403	0.6800	0.8000	0.7700	3.9242 (76)						
South	7.5700	46.7521	0.6800	0.8000	0.7700	133.4224 (78)						
Solar gains	137.3467	226.1882	290.9873	333.0283	350.4190	338.6161	330.2698	318.2679	305.4677	244.7942	163.0441	118.5164 (83)
Total gains	570.6334	669.2606	713.9617	738.1236	732.8248	705.2530	681.2724	670.9084	670.2243	624.2103	568.9957	542.3840 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	49.1610	49.2145	49.2670	49.5154	49.5621	49.7808	49.7808	49.8216	49.6964	49.5621	49.4676	49.3693
alpha	4.2774	4.2810	4.2845	4.3010	4.3041	4.3187	4.3187	4.3214	4.3131	4.3041	4.2978	4.2913
util living area	0.9737	0.9499	0.9166	0.8526	0.7469	0.5826	0.4298	0.4542	0.6452	0.8580	0.9519	0.9783 (86)
MIT	19.9495	20.1559	20.3740	20.6154	20.7997	20.9056	20.9347	20.9324	20.8833	20.6535	20.2587	19.9030 (87)
Th 2	20.0158	20.0167	20.0177	20.0221	20.0229	20.0268	20.0268	20.0275	20.0253	20.0229	20.0213	20.0195 (88)
util rest of house	0.9677	0.9391	0.8987	0.8211	0.6943	0.5051	0.3381	0.3624	0.5708	0.8215	0.9397	0.9733 (89)
MIT 2	18.8063	19.0637	19.3322	19.6224	19.8264	19.9298	19.9502	19.9497	19.9107	19.6729	19.1994	18.7509 (90)
Living area fraction									fLA = Living area / (4) =			0.3665 (91)
MIT	19.2252	19.4639	19.7140	19.9863	20.1831	20.2874	20.3110	20.3098	20.2671	20.0322	19.5876	19.1731 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2252	19.4639	19.7140	19.9863	20.1831	20.2874	20.3110	20.3098	20.2671	20.0322	19.5876	19.1731 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9617	0.9319	0.8924	0.8198	0.7035	0.5266	0.3653	0.3895	0.5901	0.8219	0.9331	0.9678 (94)
Useful gains	548.7992	623.6907	637.1251	605.1109	515.5394	371.3748	248.8506	261.3444	395.5073	513.0538	530.9321	524.9358 (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	1022.1749	996.3457	903.0279	753.8253	576.2725	384.6589	250.9852	264.2201	417.8144	640.7519	849.9304	1021.1254 (97)
Space heating kWh	352.1916	250.4242	197.8317	107.0743	45.1854	0.0000	0.0000	0.0000	0.0000	95.0074	229.6788	369.1651 (98a)
Space heating requirement - total per year (kWh/year)												1646.5584
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	352.1916	250.4242	197.8317	107.0743	45.1854	0.0000	0.0000	0.0000	0.0000	95.0074	229.6788	369.1651 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1646.5584
Space heating per m2										(98c) / (4) =		26.0079 (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)
Fraction of main heating from main system 2												0.0000 (203)
Fraction of total heating from main system 1												1.0000 (204)
Fraction of total heating from main system 2												0.0000 (205)
Efficiency of main space heating system 1 (in %)												100.0000 (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	352.1916	250.4242	197.8317	107.0743	45.1854	0.0000	0.0000	0.0000	0.0000	95.0074	229.6788	369.1651 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	352.1916	250.4242	197.8317	107.0743	45.1854	0.0000	0.0000	0.0000	0.0000	95.0074	229.6788	369.1651 (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)
Space heating fuel used, main system 2												0.0000 (213)
Water heating												
Water heating requirement	257.7607	227.7581	241.0815	209.4215	201.3714	179.6339	175.7746	183.6472	186.6868	210.3847	226.4721	254.5754 (64)
Efficiency of water heater	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550 (216)
Fuel for water heating, kWh/month	85.0822	75.1788	79.5767	69.1263	66.4691	59.2939	58.0200	60.6187	61.6220	69.4442	74.7544	84.0308 (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	57.4647	46.1003	41.5082	30.4107	23.4901	19.1916	21.4285	27.8535	36.1790	47.4688	53.6159	59.0618 (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												1646.5584 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												302.9550
Water heating fuel used												843.2169 (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)												463.7731 (232)

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

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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	2953.5484 (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 (high-rate cost)	0.0000	0.0000	0.0000 (261)
Space heating - main system 1 (low-rate cost)	1646.5584	0.1374	226.2213 (261)
Space heating - main system 2 (high-rate cost)	0.0000	0.0000	0.0000 (262)
Space heating - main system 2 (low-rate cost)	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating - high rate cost	62.2349	0.1481	9.2173 (264)
Water heating - low rate cost	780.9820	0.1243	97.0770 (264)
Space and water heating			332.5155 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	463.7731	0.1490	69.1114 (268)
Total CO2, kg/year			401.6269 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			6.3400 (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 (high-rate cost)	0.0000	0.0000	0.0000 (275)
Space heating - main system 1 (low-rate cost)	1646.5584	1.4974	2465.4983 (275)
Space heating - main system 2 (high-rate cost)	0.0000	0.0000	0.0000 (276)
Space heating - main system 2 (low-rate cost)	0.0000	0.0000	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating - high rate cost	62.2349	1.5536	96.6879 (278)
Water heating - low rate cost	780.9820	1.4449	1128.4384 (278)
Space and water heating			3690.6246 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	463.7731	1.5547	721.0487 (282)
Total Primary energy kWh/year			4411.6733 (286)
Dwelling Primary energy Rate (DPER)			69.6800 (287)

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

1. Overall dwelling characteristics

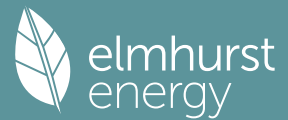
	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	63.3100 (1b)	x 2.5000 (2b)	= 158.2750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.3100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 158.2750 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	(6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 20.0000 / (5) = 0.1264 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3764 (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) = 0.3199 (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	0.4079	0.3999	0.3919	0.3519	0.3439	0.3039	0.3039	0.2959	0.3199	0.3439	0.3599	0.3759 (22b)
Effective ac	0.5832	0.5800	0.5768	0.5619	0.5591	0.5462	0.5462	0.5438	0.5512	0.5591	0.5648	0.5706 (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	
TER Opening Type (Uw = 1.20)			8.1000	1.1450	9.2748			(27)
Main External Wall	71.3700	8.1000	63.2700	0.1800	11.3886			(29a)
External Flat Roof	65.5200		65.5200	0.1100	7.2072			(30)
Total net area of external elements Aum(A, m2)			136.8900					(31)
Fabric heat loss, W/K = Sum (A x U)					27.8706			(33)
Party Wall 1			14.0100	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 191.4498 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element				
E1 Steel lintel with perforated steel base plate	17.6100	0.0500	0.8805	
E3 Sill	4.0000	0.0500	0.2000	
E4 Jamb	43.8000	0.0500	2.1900	
E5 Ground floor (normal)	27.2200	0.1600	4.3552	
E6 Intermediate floor within a dwelling	26.3800	0.0000	0.0000	
E14 Flat roof	26.3800	0.0800	2.1104	
R11 Upstands or kerbs of rooflights	5.7600	0.0800	0.4608	
P1 Party wall - Ground floor	3.8720	0.0800	0.3098	
P2 Party wall - Intermediate floor within a dwelling	3.8720	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	4.7060	0.1200	0.5647	
E20 Exposed floor (normal)	10.4080	0.3200	3.3306	

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

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 42.2725 (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	30.4601	30.2914	30.1261	29.3493	29.2040	28.5275	28.5275	28.4022	28.7881	29.2040	29.4980	29.8053	(38)
Heat transfer coeff	72.7327	72.5640	72.3986	71.6219	71.4765	70.8000	70.8000	70.6747	71.0606	71.4765	71.7705	72.0779	(39)
Average = Sum(39)m / 12 =												71.6212	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1488	1.1462	1.1436	1.1313	1.1290	1.1183	1.1183	1.1163	1.1224	1.1290	1.1336	1.1385	(40)
HLP (average)												1.1313	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

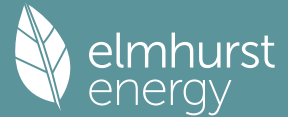
Assumed occupancy													2.0735 (42)
Hot water usage for mixer showers	58.9855	58.0991	56.8074	54.3359	52.5120	50.4781	49.3220	50.6039	52.0091	54.1930	56.7175	58.7595	(42a)
Hot water usage for baths	25.4889	25.1104	24.5773	23.5944	22.8584	22.0424	21.6016	22.1309	22.7073	23.5805	24.5836	25.4028	(42b)
Hot water usage for other uses	35.8648	34.5606	33.2565	31.9523	30.6481	29.3439	29.3439	30.6481	31.9523	33.2565	34.5606	35.8648	(42c)
Average daily hot water use (litres/day)												110.6193	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	120.3393	117.7701	114.6411	109.8826	106.0186	101.8644	100.2674	103.3829	106.6687	111.0299	115.8618	120.0271	(44)
Energy conte	190.5880	167.7030	176.1991	150.4238	142.7214	125.2541	121.2648	128.0096	131.5331	150.6666	165.0664	187.9334	(45)
Energy content (annual)										Total = Sum(45)m =		1837.3633	
Distribution loss (46)m = 0.15 x (45)m	28.5882	25.1555	26.4299	22.5636	21.4082	18.7881	18.1897	19.2014	19.7300	22.6000	24.7600	28.1900	(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	237.1829	209.7888	222.7941	195.5156	189.3163	170.3459	167.8597	174.6045	176.6250	197.2615	210.1582	234.5283	(62)
WWHRS	-26.9657	-23.8487	-24.9730	-20.6786	-19.2717	-16.4910	-15.4576	-16.4377	-17.0622	-20.1144	-22.7872	-26.4664	(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	210.2171	185.9401	197.8211	174.8370	170.0446	153.8550	152.4020	158.1669	159.5628	177.1471	187.3710	208.0620	(64)
Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2135.4266	(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	100.6464	89.4298	95.8621	86.0894	84.7308	77.7205	77.5965	79.8391	79.8082	87.3726	90.9580	99.7638	(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	103.6754	103.6754	103.6754	103.6754	103.6754	103.6754	103.6754	103.6754	103.6754	103.6754	103.6754	103.6754	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	100.0193	110.7357	100.0193	103.3533	100.0193	103.3533	100.0193	100.0193	103.3533	100.0193	103.3533	100.0193	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	181.2110	183.0914	178.3529	168.2651	155.5310	143.5628	135.5673	133.6869	138.4254	148.5132	161.2473	173.2155	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.3675	33.3675	33.3675	33.3675	33.3675	33.3675	33.3675	33.3675	33.3675	33.3675	33.3675	33.3675	(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)	-82.9403	-82.9403	-82.9403	-82.9403	-82.9403	-82.9403	-82.9403	-82.9403	-82.9403	-82.9403	-82.9403	-82.9403	(71)
Water heating gains (Table 5)	135.2774	133.0801	128.8470	119.5686	113.8855	107.9451	104.2963	107.3106	110.8448	117.4362	126.3306	134.0911	(72)
Total internal gains	473.6105	484.0099	464.3218	448.2896	426.5384	408.9638	393.9855	395.1195	406.7261	423.0714	448.0339	464.4286	(73)

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6. Solar gains

[Jan]					Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W
East					0.5300	19.6403		0.6300		0.7000	0.7700	3.1812 (76)
South					7.5700	46.7521		0.6300		0.7000	0.7700	108.1605 (78)
Solar gains	111.3417	183.3621	235.8923	269.9733	284.0713	274.5031	267.7371	258.0076	247.6310	198.4453	132.1736	96.0767 (83)
Total gains	584.9521	667.3720	700.2141	718.2629	710.6097	683.4670	661.7227	653.1271	654.3571	621.5167	580.2075	560.5053 (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	46.2909	46.3985	46.5045	47.0088	47.1044	47.5545	47.5545	47.6388	47.3801	47.1044	46.9114	46.7114
alpha	4.0861	4.0932	4.1003	4.1339	4.1403	4.1703	4.1703	4.1759	4.1587	4.1403	4.1274	4.1141
util living area	0.9732	0.9540	0.9275	0.8727	0.7777	0.6173	0.4598	0.4838	0.6763	0.8702	0.9524	0.9770 (86)
MIT	19.6586	19.8944	20.1670	20.4996	20.7660	20.9346	20.9848	20.9809	20.9001	20.5771	20.0718	19.6181 (87)
Th 2	19.9612	19.9633	19.9654	19.9754	19.9772	19.9859	19.9859	19.9875	19.9826	19.9772	19.9735	19.9695 (88)
util rest of house	0.9669	0.9438	0.9110	0.8430	0.7256	0.5352	0.3589	0.3836	0.5991	0.8346	0.9399	0.9716 (89)
MIT 2	18.4317	18.7271	19.0656	19.4727	19.7735	19.9442	19.9799	19.9794	19.9128	19.5713	18.9603	18.3868 (90)
Living area fraction	18.8813	19.1549	19.4692	19.8490	20.1372	20.3071	20.3482	20.3464	20.2746	19.9399	19.3677	18.8380 (92)
MIT	18.8813	19.1549	19.4692	19.8490	20.1372	20.3071	20.3482	20.3464	20.2746	19.9399	19.3677	18.8380 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8813	19.1549	19.4692	19.8490	20.1372	20.3071	20.3482	20.3464	20.2746	19.9399	19.3677	18.8380 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9586	0.9339	0.9016	0.8389	0.7344	0.5623	0.3957	0.4200	0.6225	0.8331	0.9309	0.9638 (94)
Useful gains	560.7109	623.2492	631.3186	602.5245	521.8688	384.3081	261.8196	274.2810	407.3444	517.8036	540.0994	540.2375 (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	1060.5363	1034.3920	938.9528	784.1861	603.0632	404.0636	265.3698	278.9135	438.7705	667.5825	880.4561	1055.0784 (97)
Space heating kWh	371.8701	276.2880	228.8799	130.7963	60.4086	0.0000	0.0000	0.0000	0.0000	111.4354	245.0568	383.0417 (98a)
Space heating requirement - total per year (kWh/year)												1807.7768
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	371.8701	276.2880	228.8799	130.7963	60.4086	0.0000	0.0000	0.0000	0.0000	111.4354	245.0568	383.0417 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1807.7768
Space heating per m ²										(98c) / (4) =		28.5544 (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	371.8701	276.2880	228.8799	130.7963	60.4086	0.0000	0.0000	0.0000	0.0000	111.4354	245.0568	383.0417 (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)	402.8928	299.3369	247.9739	141.7078	65.4481	0.0000	0.0000	0.0000	0.0000	120.7318	265.5003	414.9964 (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	210.2171	185.9401	197.8211	174.8370	170.0446	153.8550	152.4020	158.1669	159.5628	177.1471	187.3710	208.0620 (64)
Efficiency of water heater	85.3247	84.9461	84.3877	83.4181	81.9779	79.8000	79.8000	79.8000	79.8000	83.0503	84.6627	79.8000 (216)
Fuel for water heating, kWh/month	246.3732	218.8918	234.4194	209.5911	207.4273	192.8007	190.9800	198.2041	199.9534	213.3009	221.3148	243.6054 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	20.7820	16.6721	15.0114	10.9980	8.4952	6.9406	7.7496	10.0732	13.0841	17.1670	19.3901	21.3596 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-17.0448	-25.2935	-38.2447	-45.3084	-50.8922	-48.2586	-47.6866	-44.0195	-37.8891	-29.9468	-19.1882	-14.5937 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	-6.1298	-13.1838	-26.7492	-40.9836	-54.9834	-55.5276	-54.8580	-46.0672	-33.2806	-19.0975	-8.2623	-4.8248 (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)

Full SAP Calculation Printout



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	(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	(235d)
Annual totals kWh/year										
Space heating fuel - main system 1									1958.5881	(211)
Space heating fuel - main system 2									0.0000	(213)
Space heating fuel - secondary									0.0000	(215)
Efficiency of water heater									79.8000	
Water heating fuel used									2576.8621	(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)									167.7230	(232)
Energy saving/generation technologies (Appendices M ,N and Q)										
PV generation									-782.3138	(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									4006.8593	(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	1958.5881	0.2100	411.3035 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2576.8621	0.2100	541.1410 (264)
Space and water heating			952.4445 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	167.7230	0.1443	24.2076 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-418.3661	0.1335	-55.8594
PV Unit electricity exported	-363.9477	0.1253	-45.6111
Total			-101.4705 (269)
Total CO2, kg/year			887.1109 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.0100 (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	1958.5881	1.1300	2213.2045 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2576.8621	1.1300	2911.8542 (278)
Space and water heating			5125.0587 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	167.7230	1.5338	257.2591 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-418.3661	1.4934	-624.7877
PV Unit electricity exported	-363.9477	0.4600	-167.4141
Total			-792.2018 (283)
Total Primary energy kWh/year			4720.2168 (286)
Target Primary Energy Rate (TPER)			74.5600 (287)

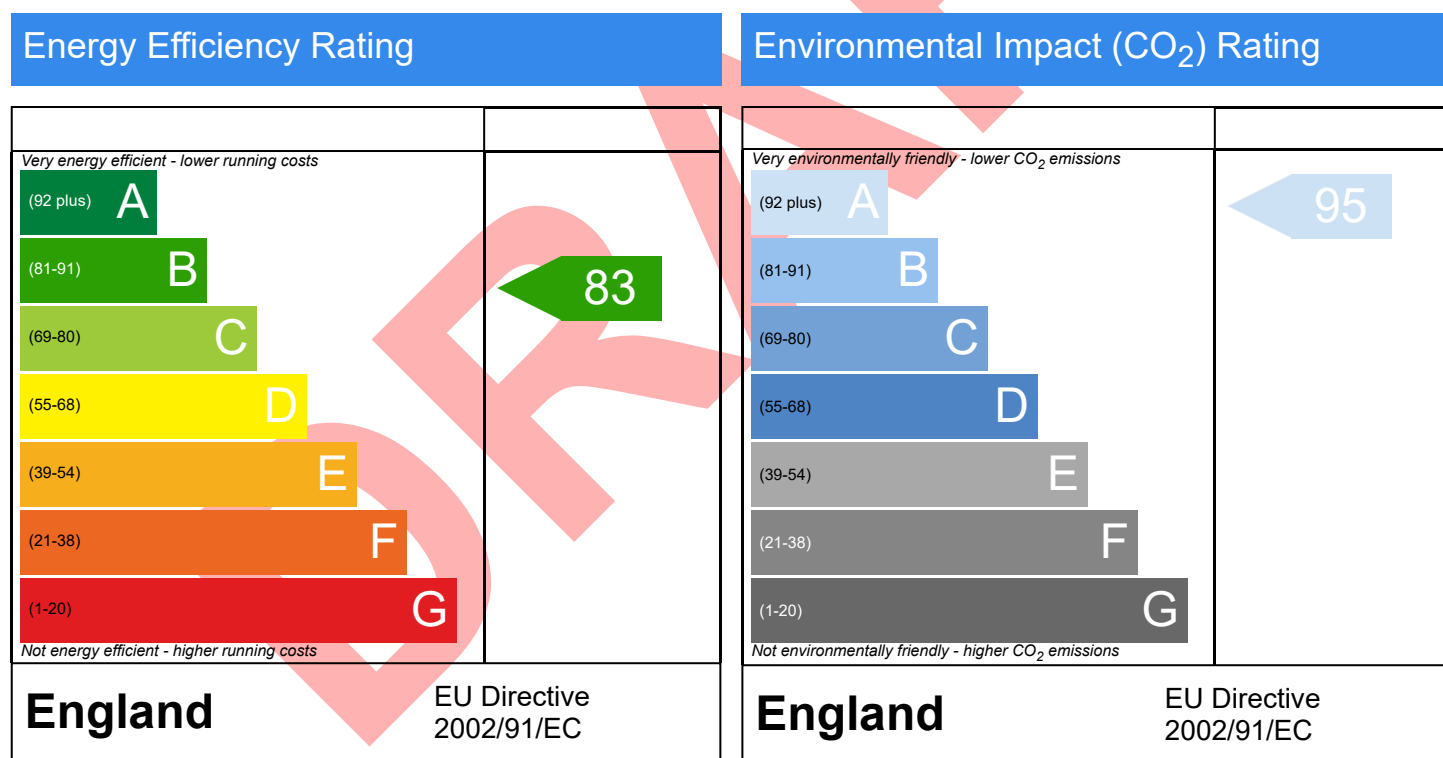
Predicted Energy Assessment



Dwelling type: Flat, Semi-Detached
Date of assessment: 21/03/2024
Produced by: Lee Pasifull
Total floor area: 63.31 m²
DRRN:

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

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



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

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

Overview Report

Dwelling Address	
Report Date	21/03/2024
Property Type	Flat, Semi-Detached
Floor Area [m ²]	63

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

Energy Rating

The current energy rating represents the overall energy efficiency of the dwelling. The potential energy rating is the overall energy rating of the dwelling after all of the recommend measures provided on the next page have been installed. A higher score represents a more energy efficient dwelling with lower fuel bills.

Most energy efficient - lower running costs

CURRENT

POTENTIAL

(92 plus)

A

(81-91)

B

(69-80)

C

(55-68)

D

(39-54)

E

(21-38)

F

(1-20)

G

83

83

Least energy efficient - higher running costs

Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor	Poor	Average	Good	Very Good
-----------	------	---------	------	-----------

Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.15 W/m ² K	Very Good
Roof	Average thermal transmittance 0.1 W/m ² K	Very Good
Windows	High performance glazing	Good
Main heating	Electric storage heaters	Average
Main heating controls	Controls for high heat retention storage heaters	Good
Secondary heating	None	
Hot water	From main system	Very Good
Lighting	Below average lighting efficiency	Poor
Air tightness	Air permeability [AP50] = 5.0 m ³ /h.m ² (assumed)	Good

Primary Energy use

The primary energy use for this property per year is 58 kilowatt hour (kWh) per square metre

Estimated CO₂ emissions of the dwelling

The estimated CO rating provides an indication of the dwelling's impact on the environment in terms of carbon dioxide emissions; the higher the rating the less impact it has on the environment.

The estimated CO emissions for this dwellings is: **0.3** per year

With the recommended measures the potential CO emissions could be: **0** per year

Recommendations

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

Recommended measure	Typical Yearly Saving	Potential Rating after measure installed	Cumulative savings (per year)	Cumulative Potential Rating
---------------------	-----------------------	--	-------------------------------	-----------------------------

Estimated energy use and potential savings

Estimated energy cost for this property over a year

£437

Over a year you could save

£0

The estimated cost and savings show how much the average household would spend in this property for heating, lighting and hot water. It is not based on how energy is used by the people living at the property.

Contacting the assessor and the accreditation scheme

Assessor contact details	
Assessor name	Mr. Lee Pasifull
Assessor's accreditation number	EES/024192
Email Address	lee@lpenergy.co.uk

Accreditation scheme contact details

Accreditation scheme	Elmhurst Energy Systems Ltd
Telephone	07891547141
Email Address	lee@lpenergy.co.uk

Assessment details

Related party disclosure	No related party
Date of assessment	20/03/2024
Date of certificate	20/03/2024
Type of assessment	SAP, new dwelling

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Thu 21 Mar 2024 09:06:37

Project Information			
Assessed By	Lee Pasifull	Building Type	Flat, Semi-detached
OCDEA Registration	EES/024192	Assessment Date	2024-03-21

Dwelling Details			
Assessment Type	As designed	Total Floor Area	63 m ²
Site Reference	Unit 1 - Harcourt House	Plot Reference	Unit 1 - Harcourt House - EAHF
Address			

Client Details	
Name	John Francis MEP
Company	JFMEP
Address	SUScon, Dartford, DA1 5FW

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate			
Fuel for main heating system	Electricity		
Target carbon dioxide emission rate	14.01 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	5.13 kgCO ₂ /m ²		OK
1b Target primary energy rate and dwelling primary energy			
Target primary energy	74.56 kWh _{PE} /m ²		
Dwelling primary energy	54.04 kWh _{PE} /m ²		OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	35.5 kWh/m ²		
Dwelling fabric energy efficiency	32.4 kWh/m ²		OK

2a Fabric U-values				
Element	Maximum permitted average U-Value [W/m ² K]	Dwelling average U-Value [W/m ² K]	Element with highest individual U-Value	
External walls	0.26	0.15	Walls (1) (0.15)	OK
Party walls	0.2	0	Party Wall (1) (0)	N/A
Curtain walls	1.6	0	N/A	N/A
Floors	0.18	N/A	N/A	N/A
Roofs	0.16	0.1	Roof (1) (0.1)	OK
Windows, doors, and roof windows	1.6	1.3	W1 (s) (1.3)	OK
Rooflights	2.2	N/A	N/A	N/A

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))		
Name	Net area [m ²]	U-Value [W/m ² K]
Exposed wall: Walls (1)	63.275	0.15
Party wall: Party Wall (1)	14.01	0 (!)
Exposed roof: Roof (1)	65.52	0.1 (!)

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	Area [m ²]	Orientation	Frame factor	U-Value [W/m ² K]
W1 (s), New Window	1.2	South	0.8	1.3
W1 (s), New Window	1.2	South	0.8	1.3
W2 (s), New Window	5.17	South	0.8	1.3
W3 (w), New Window	0.525	East	0.8	1.3

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))				
Building part 1 - Main Dwelling: Thermal bridging calculated from linear thermal transmittances for each junction				
Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E1: Steel lintel with perforated steel base plate	Calculated by person with suitable expertise	0.05	Appendix R
External wall	E3: Sill	Calculated by person with suitable expertise	0.05	Appendix R

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E4: Jamb	Calculated by person with suitable expertise	0.05	Appendix R
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.16	Appendix R
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0 (!)	Appendix R
External wall	E14: Flat roof	Calculated by person with suitable expertise	0.08	Appendix R
Roof	R11: Upstands or kerbs of rooflights	Calculated by person with suitable expertise	0.08	Appendix R
Party wall	P1: Ground floor	Calculated by person with suitable expertise	0.08	Appendix R
Party wall	P2: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0 (!)	Appendix R
Party wall	P4: Roof (insulation at ceiling level)	Calculated by person with suitable expertise	0.12	Appendix R
External wall	E20: Exposed floor (normal)	Calculated by person with suitable expertise	0.32	Appendix R

3 Air permeability (better than typically expected values are flagged with a subsequent (!))

Maximum permitted air permeability at 50Pa	8 m ³ /hm ²	
Dwelling air permeability at 50Pa	5 m ³ /hm ² , Design value	OK
Air permeability test certificate reference		

4 Space heating

Main heating system 1: Heat pump with radiators or underfloor heating - Electricity

Efficiency	298.3%
Emitter type	Underfloor
Flow temperature	35°C
System type	Heat Pump
Manufacturer	NIBE Energy Systems Ltd
Model	Fighter 470
Commissioning	

Secondary heating system: N/A

Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water

Cylinder/store - type: N/A

Capacity	N/A
Declared heat loss	N/A
Primary pipework insulated	N/A
Manufacturer	
Model	
Commissioning	

Waste water heat recovery system 1 - type: N/A

Efficiency	
Manufacturer	
Model	

6 Controls

Main heating 1 - type: Time and temperature zone control by arrangement of plumbing and electrical services

Function	
Ecodesign class	
Manufacturer	
Model	

Water heating - type: Cylinder thermostat and HW separately timed

Manufacturer	
Model	

7 Lighting		
Minimum permitted light source efficacy	75 lm/W	
Lowest light source efficacy	15 lm/W	FAIL
External lights control	N/A	
8 Mechanical ventilation		
System type: N/A		
Maximum permitted specific fan power	N/A	
Specific fan power	N/A	N/A
Minimum permitted heat recovery efficiency	N/A	
Heat recovery efficiency	N/A	N/A
Manufacturer/Model		
Commissioning		
9 Local generation		
N/A		
10 Heat networks		
N/A		
11 Supporting documentary evidence		
N/A		
12 Declarations		
a. Assessor Declaration		
This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design information submitted for this dwelling for the purpose of carrying out the "As designed" assessment, and that the supporting documentary evidence (SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required) has been reviewed in the course of preparing this BREL Compliance Report.		
Signed:	Assessor ID:	
Name:	Date:	
b. Client Declaration		
N/A		

Summary for Input Data



Property Reference	Unit 1 - Harcourt House	Issued on Date	21/03/2024
Assessment Reference	Unit 1 - Harcourt House - EAHF	Prop Type Ref	UNIT 1 Sample
Property			

SAP Rating	81 B	DER	5.13	TER	14.01
Environmental	96 A	% DER < TER			63.38
CO ₂ Emissions (t/year)	0.3	DFEE	32.44	TFEE	35.54
Compliance Check	See BREL	% DFEE < TFEE			8.72
% DPER < TPER	27.52	DPER	54.04	TPER	74.56

Assessor Details	Mr. Lee Pasifull	Assessor ID	Y856-0001
Client			

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

Orientation	West	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Suburban	
1.0 Property Type	Flat, Semi-Detached	
Position of Flat	Top-floor flat	
Which Floor	4	
2.0 Number of Storeys	1	
3.0 Date Built	2024	
3.0 Property Age Band	L	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	N/A	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Basement:	0.00 m	0.00 m ²	0.00 m
Ground floor:	30.08 m	63.31 m ²	2.50 m
1st Storey:	26.38 m	49.04 m ²	2.85 m
2nd Storey:	0.00 m	0.00 m ²	0.00 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	23.20	m ²
-----------------	-------	----------------

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
	Main External Wall	Cavity Wall	Cavity wall : plasterboard on dabs, AAC block, filled cavity, any outside structure	0.15	60.00	71.37	63.28	0.00	None	8.10	Enter Gross Area

9.1 Party Walls	Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)	Shelter Res	Shelter
	Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	14.01	0.00	None

9.2 Internal Walls	Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
	Internal Wall 1	Plasterboard on timber frame	9.00	40.27

10.0 External Roofs	
---------------------	--

Summary for Input Data

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
External Flat Roof	External Flat Roof	Plasterboard, insulated flat roof	0.10	9.00	65.52	65.52	None	0.00	Enter Gross Area	0.00

10.2 Internal Ceilings

Description	Storey	Construction	Area (m²)
Internal Ceiling 1	Lowest occupied	Plasterboard ceiling, carpeted chipboard floor	65.52

11.1 Party Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Concrete floor slab, carpeted	100.00	65.52

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
New Window	Manufacturer	Window	Double Low-E Soft 0.05		Air Filled	0.68	Wood	0.80	1.30
New Door	Manufacturer	Half Glazed Door	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.00
Rooflight	Manufacturer	Roof Light	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.40

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
W1 (s)	New Window	Main External Wall	South	2.40	0
W2 (s)	New Window	Main External Wall	South	5.17	0
W3 (w)	New Window	Main External Wall	East	0.53	0

14.0 Conservatory

None

15.0 Draught Proofing

100 %

16.0 Draught Lobby

No

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E1 Steel lintel with perforated steel base plate	Independently assessed	17.61	0.05	0.05	Appendix R	Yes
E3 Sill	Independently assessed	4.00	0.05	0.05	Appendix R	No
E4 Jamb	Independently assessed	43.80	0.05	0.05	Appendix R	Yes
E5 Ground floor (normal)	Independently assessed	27.22	0.16	0.16	Appendix R	Yes
E6 Intermediate floor within a dwelling	Independently assessed	26.38	0.00	0.00	Appendix R	Yes
E14 Flat roof	Independently assessed	26.38	0.08	0.08	Appendix R	Yes
R11 Upstands or kerbs of rooflights	Independently assessed	5.76	0.08	0.08	Appendix R	Yes
P1 Party wall - Ground floor	Independently assessed	3.87	0.08	0.08	Appendix R	No
P2 Party wall - Intermediate floor within a dwelling	Independently assessed	3.87	0.00	0.00	Appendix R	No
P4 Party wall - Roof (insulation at ceiling level)	Independently assessed	4.71	0.12	0.12	Appendix R	No
E20 Exposed floor (normal)	Independently assessed	10.41	0.32	0.32	Appendix R	No

Y-value

0.11 W/m²K

Description

Target

18.0 Pressure Testing

Yes

Designed AP₅₀ 5.00 m³/(h.m²) @ 50 Pa

Property Tested? Yes

Test Method Blower Door

As Built AP₅₀ 0.10 m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Mechanical Ventilation System Present No

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System

No

22.0 Lighting

No Fixed Lighting No

Name	Efficiency	Power	Capacity	Count
LED	15.00	5	75	20

24.0 Main Heating 1

Database

Description Heat Pump

Percentage of Heat 100.00 %

Summary for Input Data

Database Ref. No.	100393
Fuel Type	Electricity
SAP Code	0
In Winter	298.32
In Summer	220.69
Model Name	Fighter 470
Manufacturer	NIBE Energy Systems Ltd
System Type	Heat Pump
Controls SAP Code	2207
Delayed Start Stat	Yes
Burner Control	Modulating
HETAS approved System	No
Oil Pump Inside	No
FI Case	0.00
Flue Type	Balanced
Fan Assisted Flue	No
Is MHS Pumped	Pump in heated space
Heating Pump Age	2013 or later
Heat Emitter	Underfloor
Underfloor Heating	Yes - Pipes in Wood
Flow Temperature	Enter value
Flow Temperature Value	35.00
Boiler Interlock	Yes
Combi boiler type	No Combi
Combi keep hot type	None

25.0 Main Heating 2

None

26.0 Heat Networks

None

	Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1	None									
Heat source 2	None									
Heat source 3	None									
Heat source 4	None									
Heat source 5	None									

28.0 Water Heating

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

28.1 Showers

Summary for Input Data

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Combi boiler or unvented hot water system	11.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder

Internal Store	
Cylinder Stat	Yes
Cylinder In Heated Space	Yes
Independent Time Control	Yes
Insulation Type	Measured Loss
Cylinder Volume	170.00 L
Loss	1.56 kWh/day
Pipes insulation	Fully insulated primary pipework
In Airing Cupboard	No

31.0 Thermal Store

None

34.0 Small-scale Hydro

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

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

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

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

Full SAP Calculation Printout



Property Reference	Unit 1 - Harcourt House				Issued on Date	21/03/2024
Assessment Reference	Unit 1 - Harcourt House - EAHP		Prop Type Ref	UNIT 1 Sample		
Property						
SAP Rating	81 B	DER	5.13	TER	14.01	
Environmental	96 A	% DER < TER				63.38
CO ₂ Emissions (t/year)	0.3	DFEE	32.44	TFEE	35.54	
Compliance Check	See BREL	% DFEE < TFEE				8.72
% DPER < TPER	27.52	DPER	54.04	TPER	74.56	
Assessor Details	Mr. Lee Pasifull				Assessor ID	Y856-0001
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	63.3100 (1b)	x 2.5000 (2b)	= 158.2750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.3100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 158.2750 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.2500 (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) = 0.2125 (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	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497 (22b)
Effective ac	0.5367	0.5353	0.5339	0.5273	0.5261	0.5204	0.5204	0.5193	0.5226	0.5261	0.5286	0.5312 (25)

3. Heat losses and heat loss parameter

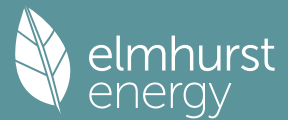
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
New Window (Uw = 1.30)			8.1000	1.2357	10.0095		(27)
Main External Wall	71.3700	8.1000	63.2700	0.1500	9.4905	60.0000	3796.2000 (29a)
External Flat Roof	65.5200		65.5200	0.1000	6.5520	9.0000	589.6800 (30)
Total net area of external elements Aum(A, m ²)			136.8900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		26.0520		(33)
Party Wall 1			14.0100	0.0000	0.0000	110.0000	1541.1000 (32)
Party Floor 1			65.5200			80.0000	5241.6000 (32d)
Internal Wall 1			40.2700			9.0000	362.4300 (32c)
Internal Ceiling 1			65.5200			9.0000	589.6800 (32e)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
(28) ... (30) + (32) + (32a) ... (32e) = 12120.6900 (34)
191.4498 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	17.6100	0.0500	0.8805
E3 Sill	4.0000	0.0500	0.2000
E4 Jamb	43.8000	0.0500	2.1900
E5 Ground floor (normal)	27.2200	0.1600	4.3552
E6 Intermediate floor within a dwelling	26.3800	0.0000	0.0000
E14 Flat roof	26.3800	0.0800	2.1104

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R11 Upstands or kerbs of rooflights	5.7600	0.0800	0.4608
P1 Party wall - Ground floor	3.8720	0.0800	0.3098
P2 Party wall - Intermediate floor within a dwelling	3.8720	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	4.7060	0.1200	0.5647
E20 Exposed floor (normal)	10.4080	0.3200	3.3306
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			14.4019 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss		(33) + (36) + (36a) =	40.4539 (37)

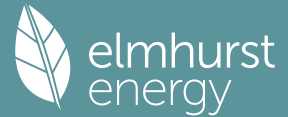
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	28.0324	27.9580	27.8850	27.5423	27.4782	27.1797	27.1797	27.1244	27.2946	27.4782	27.6079	27.7435 (38)
Average = Sum(39)m / 12 =	68.4864	68.4119	68.3390	67.9962	67.9321	67.6336	67.6336	67.5783	67.7486	67.9321	68.0618	68.1975 (39)
												67.9959
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0818	1.0806	1.0794	1.0740	1.0730	1.0683	1.0683	1.0674	1.0701	1.0730	1.0751	1.0772 (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												2.0735 (42)
Hot water usage for mixer showers												80.7943 (42a)
Hot water usage for baths												25.4028 (42b)
Hot water usage for other uses												35.8648 (42c)
Average daily hot water use (litres/day)												131.0128 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	142.4588	139.5572	135.9439	130.2586	125.7106	120.7936	118.7632	122.3594	126.1721	131.3523	137.1309	142.0619 (44)
Energy content (annual)	225.6199	198.7277	208.9407	178.3175	169.2306	148.5299	143.6338	151.5064	155.5828	178.2439	195.3681	222.4346 (45)
Distribution loss (46)m = 0.15 x (45)m												2176.1358
Water storage loss:												
Store volume												170.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5600 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8424 (55)
Total storage loss												
If cylinder contains dedicated solar storage												
Primary loss	26.1144	23.5872	26.1144	25.2720	26.1144	25.2720	26.1144	26.1144	25.2720	26.1144	25.2720	26.1144 (57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Total heat required for water heating calculated for each month												
WWHRS	251.7343	222.3149	235.0551	203.5895	195.3450	173.8019	169.7482	177.6208	180.8548	204.3583	220.6401	248.5490 (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												
12Total per year (kWh/year)												
Electric shower(s)												
Heat gains from water heating, kWh/month												

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	103.6754	103.6754	103.6754	103.6754	103.6754	103.6754	103.6754	103.6754	103.6754	103.6754	103.6754	103.6754 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	97.1415	107.5496	97.1415	100.3796	97.1415	100.3796	97.1415	97.1415	100.3796	97.1415	100.3796	97.1415 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	181.2110	183.0914	178.3529	168.2651	155.5310	143.5628	135.5673	133.6869	138.4254	148.5132	161.2473	173.2155 (68)
Pumps, fans	33.3675	33.3675	33.3675	33.3675	33.3675	33.3675	33.3675	33.3675	33.3675	33.3675	33.3675	33.3675 (69)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Water heating gains (Table 5)	-82.9403	-82.9403	-82.9403	-82.9403	-82.9403	-82.9403	-82.9403	-82.9403	-82.9403	-82.9403	-82.9403	-82.9403 (71)
Total internal gains	100.8315	98.3288	93.3774	82.3480	75.6306	68.5919	64.1912	67.7095	71.8490	79.6587	90.2221	99.4079 (72)
	433.2867	443.0724	422.9744	405.0953	382.4058	366.6369	351.0026	352.6405	364.7566	379.4161	405.9516	423.8676 (73)

6. Solar gains												
[Jan]												
	Area	Solar flux	g	FF	Access	Gains						
	m2	Table 6a	W/m2	Specific data	factor	W						
				or Table 6b	Table 6d							
East	0.5300	19.6403	0.6800	0.8000	0.7700	3.9242 (76)						
South	7.5700	46.7521	0.6800	0.8000	0.7700	133.4224 (78)						
Solar gains	137.3467	226.1882	290.9873	333.0283	350.4190	338.6161	330.2698	318.2679	305.4677	244.7942	163.0441	118.5164 (83)
Total gains	570.6334	669.2606	713.9617	738.1236	732.8248	705.2530	681.2724	670.9084	670.2243	624.2103	568.9957	542.3840 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	49.1610	49.2145	49.2670	49.5154	49.5621	49.7808	49.7808	49.8216	49.6964	49.5621	49.4676	49.3693
alpha	4.2774	4.2810	4.2845	4.3010	4.3041	4.3187	4.3187	4.3214	4.3131	4.3041	4.2978	4.2913
util living area	0.9737	0.9499	0.9166	0.8526	0.7469	0.5826	0.4298	0.4542	0.6452	0.8580	0.9519	0.9783 (86)
Living	19.7591	20.0170	20.2896	20.5911	20.8215	20.9536	20.9900	20.9871	20.9258	20.6387	20.1453	19.7007
Non living	18.5967	18.9181	19.2534	19.6147	19.8694	19.9974	20.0229	20.0221	19.9740	19.6775	19.0863	18.5262
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	31	28	31	30	31	30	31	31	30	31	30	31
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0
MIT	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000 (87)
Th 2	20.0158	20.0167	20.0177	20.0221	20.0229	20.0268	20.0268	20.0275	20.0253	20.0229	20.0213	20.0195 (88)
util rest of house	0.9677	0.9391	0.8987	0.8211	0.6943	0.5051	0.3381	0.3624	0.5708	0.8215	0.9397	0.9733 (89)
MIT 2	20.0158	20.0167	20.0177	20.0221	20.0229	20.0268	20.0268	20.0275	20.0253	20.0229	20.0213	20.0195 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	20.3764	20.3770	20.3776	20.3805	20.3810	20.3834	20.3834	20.3839	20.3825	20.3810	20.3799	20.3788 (92)
Temperature adjustment	0.0000											
adjusted MIT	20.3764	20.3770	20.3776	20.3805	20.3810	20.3834	20.3834	20.3839	20.3825	20.3810	20.3799	20.3788 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9701	0.9433	0.9057	0.8333	0.7146	0.5344	0.3722	0.3966	0.5991	0.8359	0.9445	0.9753 (94)
Useful gains	553.5735	631.3461	646.6680	615.1127	523.6404	376.8723	253.5473	266.0838	401.5565	521.7812	537.4334	528.9772 (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	1101.0166	1058.8145	948.3837	780.6279	589.7176	391.1548	255.8875	269.2248	425.6300	664.4429	903.8556	1103.3532 (97)
Space heating kWh	407.2977	287.2588	224.4765	119.1709	49.1614	0.0000	0.0000	0.0000	0.0000	106.1403	263.8239	427.3357 (98a)
Space heating requirement - total per year (kWh/year)												1884.6652
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	407.2977	287.2588	224.4765	119.1709	49.1614	0.0000	0.0000	0.0000	0.0000	106.1403	263.8239	427.3357 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1884.6652
Space heating per m2												(98c) / (4) = 29.7688 (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 %)												298.3181 (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	407.2977	287.2588	224.4765	119.1709	49.1614	0.0000	0.0000	0.0000	0.0000	106.1403	263.8239	427.3357 (98)
Space heating efficiency (main heating system 1)	298.3181	298.3181	298.3181	298.3181	298.3181	0.0000	0.0000	0.0000	0.0000	298.3181	298.3181	298.3181 (210)
Space heating fuel (main heating system)	136.5313	96.2928	75.2474	39.9476	16.4795	0.0000	0.0000	0.0000	0.0000	35.5796	88.4371	143.2484 (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	251.7343	222.3149	235.0551	203.5895	195.3450	173.8019	169.7482	177.6208	180.8548	204.3583	220.6401	248.5490 (64)
Efficiency of water heater	220.6850	220.6850	220.6850	220.6850	220.6850	220.6850	220.6850	220.6850	220.6850	220.6850	220.6850	220.6850 (216)
Fuel for water heating, kWh/month	114.0695	100.7385	106.5116	92.2534	88.5176	78.7556	76.9188	80.4861	81.9516	92.6018	99.9796	112.6261 (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	57.4647	46.1003	41.5082	30.4107	23.4901	19.1916	21.4285	27.8535	36.1790	47.4688	53.6159	59.0618 (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												631.7637 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												220.6850
Water heating fuel used												1125.4103 (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)												463.7731 (232)

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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	2220.9472 (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	631.7637	0.1561	98.6044 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1125.4103	0.1412	158.9344 (264)
Space and water heating			257.5388 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	463.7731	0.1443	66.9368 (268)
Total CO2, kg/year			324.4756 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.1300 (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	631.7637	1.5778	996.7975 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1125.4103	1.5222	1713.1102 (278)
Space and water heating			2709.9077 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	463.7731	1.5338	711.3507 (282)
Total Primary energy kWh/year			3421.2584 (286)
Dwelling Primary energy Rate (DPER)			54.0400 (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	63.3100 (1b)	x 2.5000 (2b)	= 158.2750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.3100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 158.2750 (5)

2. Ventilation rate

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

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1264 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3764	(18)
Number of sides sheltered		2	(19)

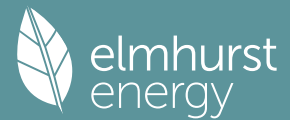
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3199	(21)

	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	0.4079	0.3999	0.3919	0.3519	0.3439	0.3039	0.3039	0.2959	0.3199	0.3439	0.3599	0.3759 (22b)
Effective ac	0.5832	0.5800	0.5768	0.5619	0.5591	0.5462	0.5462	0.5438	0.5512	0.5591	0.5648	0.5706 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opening Type (Uw = 1.20)			8.1000	1.1450	9.2748		(27)
Main External Wall	71.3700	8.1000	63.2700	0.1800	11.3886		(29a)

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External Flat Roof	65.5200	65.5200	0.1100	7.2072	(30)
Total net area of external elements Aum(A, m2)		136.8900			(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =		27.8706	(33)
Party Wall 1		14.0100	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 191.4498 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	17.6100	0.0500	0.8805
E3 Sill	4.0000	0.0500	0.2000
E4 Jamb	43.8000	0.0500	2.1900
E5 Ground floor (normal)	27.2200	0.1600	4.3552
E6 Intermediate floor within a dwelling	26.3800	0.0000	0.0000
E14 Flat roof	26.3800	0.0800	2.1104
R11 Upstands or kerbs of rooflights	5.7600	0.0800	0.4608
P1 Party wall - Ground floor	3.8720	0.0800	0.3098
P2 Party wall - Intermediate floor within a dwelling	3.8720	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	4.7060	0.1200	0.5647
E20 Exposed floor (normal)	10.4080	0.3200	3.3306

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 14.4019 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 42.2725 (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	30.4601	30.2914	30.1261	29.3493	29.2040	28.5275	28.5275	28.4022	28.7881	29.2040	29.4980	29.8053
Heat transfer coeff	72.7327	72.5640	72.3986	71.6219	71.4765	70.8000	70.8000	70.6747	71.0606	71.4765	71.7705	72.0779
Average = Sum(39)m / 12 =												71.6212

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1488	1.1462	1.1436	1.1313	1.1290	1.1183	1.1183	1.1163	1.1224	1.1290	1.1336	1.1385
HLP (average)												1.1313
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0735
Hot water usage for mixer showers												
58.9855	58.0991	56.8074	54.3359	52.5120	50.4781	49.3220	50.6039	52.0091	54.1930	56.7175	58.7595	(42a)
Hot water usage for baths												
25.4889	25.1104	24.5773	23.5944	22.8584	22.0424	21.6016	22.1309	22.7073	23.5805	24.5836	25.4028	(42b)
Hot water usage for other uses												
35.8648	34.5606	33.2565	31.9523	30.6481	29.3439	29.3439	30.6481	31.9523	33.2565	34.5606	35.8648	(42c)
Average daily hot water use (litres/day)												110.6193

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	120.3393	117.7701	114.6411	109.8826	106.0186	101.8644	100.2674	103.3829	106.6687	111.0299	115.8618	120.0271
Energy conte	190.5880	167.7030	176.1991	150.4238	142.7214	125.2541	121.2648	128.0096	131.5331	150.6666	165.0664	187.9334
Energy content (annual)												
Distribution loss (46)m = 0.15 x (45)m	28.5882	25.1555	26.4299	22.5636	21.4082	18.7881	18.1897	19.2014	19.7300	22.6000	24.7600	28.1900

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
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
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
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
Total heat required for water heating calculated for each month	237.1829	209.7888	222.7941	195.5156	189.3163	170.3459	167.8597	174.6045	176.6250	197.2615	210.1582	234.5283
WWHRS	-26.9657	-23.8487	-24.9730	-20.6786	-19.2717	-16.4910	-15.4576	-16.4377	-17.0622	-20.1144	-22.7872	-26.4664
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
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
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
Output from w/h	210.2171	185.9401	197.8211	174.8370	170.0446	153.8550	152.4020	158.1669	159.5628	177.1471	187.3710	208.0620

12Total per year (kWh/year) Total per year (kWh/year) = Sum(64)m = 2135.4266 (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 0.0000 (64a)

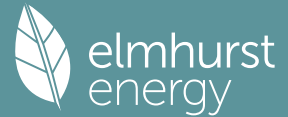
Heat gains from water heating, kWh/month 100.6464 89.4298 95.8621 86.0894 84.7308 77.7205 77.5965 79.8391 79.8082 87.3726 90.9580 99.7638 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	103.6754	103.6754	103.6754	103.6754	103.6754	103.6754	103.6754	103.6754	103.6754	103.6754	103.6754	103.6754
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	100.0193	110.7357	100.0193	103.3533	100.0193	103.3533	100.0193	100.0193	103.3533	100.0193	103.3533	100.0193
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	181.2110	183.0914	178.3529	168.2651	155.5310	143.5628	135.5673	133.6869	138.4254	148.5132	161.2473	173.2155
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.3675	33.3675	33.3675	33.3675	33.3675	33.3675	33.3675	33.3675	33.3675	33.3675	33.3675	33.3675
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
Losses e.g. evaporation (negative values) (Table 5)	-82.9403	-82.9403	-82.9403	-82.9403	-82.9403	-82.9403	-82.9403	-82.9403	-82.9403	-82.9403	-82.9403	-82.9403
Water heating gains (Table 5)	135.2774	133.0801	128.8470	119.5686	113.8855	107.9451	104.2963	107.3106	110.8448	117.4362	126.3306	134.0911
Total internal gains	473.6105	484.0099	464.3218	448.2896	426.5384	408.9638	393.9855	395.1195	406.7261	423.0714	448.0339	464.4286

6. Solar gains

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[Jan]	Area m2				Solar flux Table 6a W/m2	Specific data or Table 6b		g	Specific data or Table 6c	FF	Access factor Table 6d		Gains W
East	0.5300				19.6403			0.6300		0.7000	0.7700		3.1812 (76)
South	7.5700				46.7521			0.6300		0.7000	0.7700		108.1605 (78)
Solar gains	111.3417	183.3621	235.8923	269.9733	284.0713	274.5031	267.7371	258.0076	247.6310	198.4453	132.1736	96.0767 (83)	
Total gains	584.9521	667.3720	700.2141	718.2629	710.6097	683.4670	661.7227	653.1271	654.3571	621.5167	580.2075	560.5053 (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	46.2909	46.3985	46.5045	47.0088	47.1044	47.5545	47.5545	47.6388	47.3801	47.1044	46.9114	46.7114	
alpha	4.0861	4.0932	4.1003	4.1339	4.1403	4.1703	4.1703	4.1759	4.1587	4.1403	4.1274	4.1141	
util living area	0.9732	0.9540	0.9275	0.8727	0.7777	0.6173	0.4598	0.4838	0.6763	0.8702	0.9524	0.9770 (86)	
MIT	19.6586	19.8944	20.1670	20.4996	20.7660	20.9346	20.9848	20.9809	20.9001	20.5771	20.0718	19.6181 (87)	
Th 2	19.9612	19.9633	19.9654	19.9754	19.9772	19.9859	19.9859	19.9875	19.9826	19.9772	19.9735	19.9695 (88)	
util rest of house	0.9669	0.9438	0.9110	0.8430	0.7256	0.5352	0.3589	0.3836	0.5991	0.8346	0.9399	0.9716 (89)	
MIT 2	18.4317	18.7271	19.0656	19.4727	19.7735	19.9442	19.9799	19.9794	19.9128	19.5713	18.9603	18.3868 (90)	
Living area fraction	fLA = Living area / (4) =												0.3665 (91)
MIT	18.8813	19.1549	19.4692	19.8490	20.1372	20.3071	20.3482	20.3464	20.2746	19.9399	19.3677	18.8380 (92)	
Temperature adjustment													0.0000
adjusted MIT	18.8813	19.1549	19.4692	19.8490	20.1372	20.3071	20.3482	20.3464	20.2746	19.9399	19.3677	18.8380 (93)	
8. Space heating requirement													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9586	0.9339	0.9016	0.8389	0.7344	0.5623	0.3957	0.4200	0.6225	0.8331	0.9309	0.9638 (94)	
Useful gains	560.7109	623.2492	631.3186	602.5245	521.8688	384.3081	261.8196	274.2810	407.3444	517.8036	540.0994	540.2375 (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	1060.5363	1034.3920	938.9528	784.1861	603.0632	404.0636	265.3698	278.9135	438.7705	667.5825	880.4561	1055.0784 (97)	
Space heating kWh	371.8701	276.2880	228.8799	130.7963	60.4086	0.0000	0.0000	0.0000	0.0000	111.4354	245.0568	383.0417 (98a)	
Space heating requirement - total per year (kWh/year)												1807.7768	
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	371.8701	276.2880	228.8799	130.7963	60.4086	0.0000	0.0000	0.0000	0.0000	111.4354	245.0568	383.0417 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												1807.7768	
Space heating per m2	(98c) / (4) =											28.5544 (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	371.8701	276.2880	228.8799	130.7963	60.4086	0.0000	0.0000	0.0000	0.0000	111.4354	245.0568	383.0417 (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)	402.8928	299.3369	247.9739	141.7078	65.4481	0.0000	0.0000	0.0000	0.0000	120.7318	265.5003	414.9964 (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	210.2171	185.9401	197.8211	174.8370	170.0446	153.8550	152.4020	158.1669	159.5628	177.1471	187.3710	208.0620 (64)	
Efficiency of water heater	85.3247	84.9461	84.3877	83.4181	81.9779	79.8000	79.8000	79.8000	79.8000	83.0503	84.6627	79.8000 (216)	
(217)m	85.3247	84.9461	84.3877	83.4181	81.9779	79.8000	79.8000	79.8000	79.8000	83.0503	84.6627	85.4094 (217)	
Fuel for water heating, kWh/month	246.3732	218.8918	234.4194	209.5911	207.4273	192.8007	190.9800	198.2041	199.9534	213.3009	221.3148	243.6054 (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	20.7820	16.6721	15.0114	10.9980	8.4952	6.9406	7.7496	10.0732	13.0841	17.1670	19.3901	21.3596 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-17.0448	-25.2935	-38.2447	-45.3084	-50.8922	-48.2586	-47.6866	-44.0195	-37.8891	-29.9468	-19.1882	-14.5937 (233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-6.1298	-13.1838	-26.7492	-40.9836	-54.9834	-55.5276	-54.8580	-46.0672	-33.2806	-19.0975	-8.2623	-4.8248 (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												1958.5881 (211)	
Space heating fuel - main system 2													0.0000 (213)

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Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	2576.8621 (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)	167.7230 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-782.3138 (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	4006.8593 (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	1958.5881	0.2100	411.3035 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2576.8621	0.2100	541.1410 (264)
Space and water heating			952.4445 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	167.7230	0.1443	24.2076 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-418.3661	0.1335	-55.8594
PV Unit electricity exported	-363.9477	0.1253	-45.6111
Total			-101.4705 (269)
Total CO2, kg/year			887.1109 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.0100 (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	1958.5881	1.1300	2213.2045 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2576.8621	1.1300	2911.8542 (278)
Space and water heating			5125.0587 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	167.7230	1.5338	257.2591 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-418.3661	1.4934	-624.7877
PV Unit electricity exported	-363.9477	0.4600	-167.4141
Total			-792.2018 (283)
Total Primary energy kWh/year			4720.2168 (286)
Target Primary Energy Rate (TPER)			74.5600 (287)

Predicted Energy Assessment

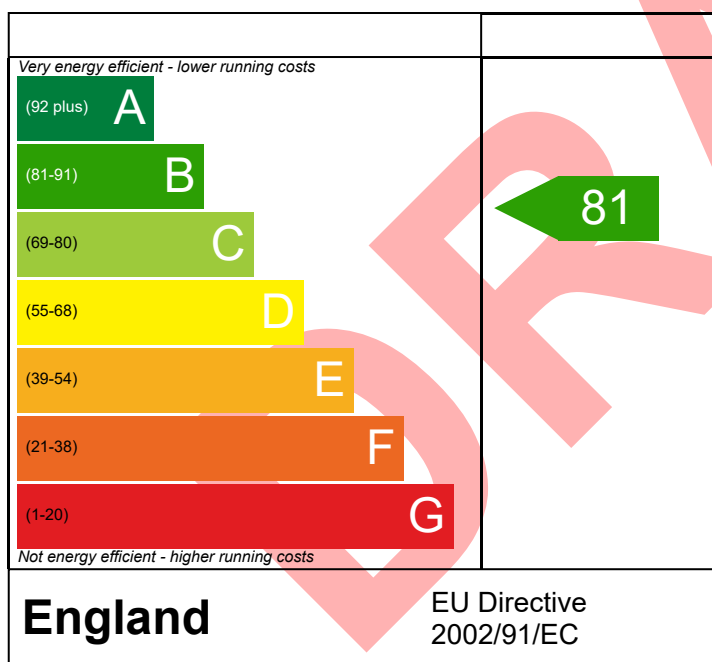


Dwelling type: Flat, Semi-Detached
Date of assessment: 21/03/2024
Produced by: Lee Pasifull
Total floor area: 63.31 m²
DRRN:

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

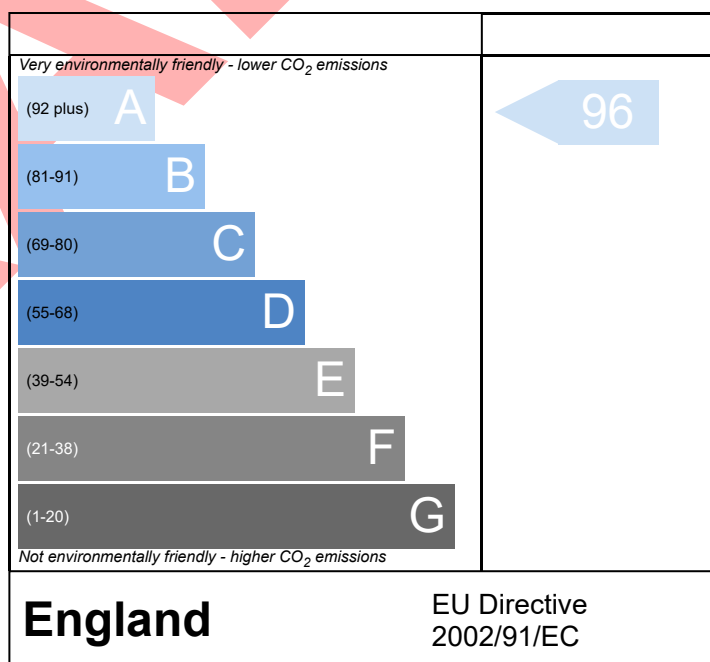
The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.

Energy Efficiency Rating



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

Environmental Impact (CO₂) Rating



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

Overview Report

Dwelling Address	
Report Date	21/03/2024
Property Type	Flat, Semi-Detached
Floor Area [m ²]	63

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

Energy Rating

The current energy rating represents the overall energy efficiency of the dwelling. The potential energy rating is the overall energy rating of the dwelling after all of the recommend measures provided on the next page have been installed. A higher score represents a more energy efficient dwelling with lower fuel bills.

Most energy efficient - lower running costs

CURRENT

POTENTIAL

(92 plus)

A

(81-91)

B

(69-80)

C

(55-68)

D

(39-54)

E

(21-38)

F

(1-20)

G

81

81

Least energy efficient - higher running costs

Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor	Poor	Average	Good	Very Good
-----------	------	---------	------	-----------

Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.15 W/m ² K	Very Good
Roof	Average thermal transmittance 0.1 W/m ² K	Very Good
Windows	High performance glazing	Good
Main heating	Air source heat pump, underfloor, electric	Good
Main heating controls	Time and temperature zone control	Very Good
Secondary heating	None	
Hot water	From main system	Average
Lighting	Below average lighting efficiency	Poor
Air tightness	Air permeability [AP50] = 5.0 m ³ /h.m ² (assumed)	Good

Primary Energy use

The primary energy use for this property per year is 49 kilowatt hour (kWh) per square metre

Estimated CO₂ emissions of the dwelling

The estimated CO rating provides an indication of the dwelling's impact on the environment in terms of carbon dioxide emissions; the higher the rating the less impact it has on the environment.

The estimated CO emissions for this dwellings is: **0.3** per year

With the recommended measures the potential CO emissions could be: **0** per year

Recommendations

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

Recommended measure	Typical Yearly Saving	Potential Rating after measure installed	Cumulative savings (per year)	Cumulative Potential Rating
---------------------	-----------------------	--	-------------------------------	-----------------------------

Estimated energy use and potential savings

Estimated energy cost for this property over a year

£511

Over a year you could save

£0

The estimated cost and savings show how much the average household would spend in this property for heating, lighting and hot water. It is not based on how energy is used by the people living at the property.

Contacting the assessor and the accreditation scheme

Assessor contact details	
Assessor name	Mr. Lee Pasifull
Assessor's accreditation number	EES/024192
Email Address	lee@lpenergy.co.uk

Accreditation scheme contact details

Accreditation scheme	Elmhurst Energy Systems Ltd
Telephone	07891547141
Email Address	lee@lpenergy.co.uk

Assessment details

Related party disclosure	No related party
Date of assessment	20/03/2024
Date of certificate	20/03/2024
Type of assessment	SAP, new dwelling

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Thu 21 Mar 2024 09:06:37

Project Information			
Assessed By	Lee Pasifull	Building Type	Flat, Semi-detached
OCDEA Registration	EES/024192	Assessment Date	2024-03-21

Dwelling Details			
Assessment Type	As designed	Total Floor Area	63 m ²
Site Reference	Unit 1 - Harcourt House	Plot Reference	Unit 1 - Harcourt House - HP
Address			

Client Details	
Name	John Francis MEP
Company	JFMEP
Address	SUScon, Dartford, DA1 5FW

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate			
Fuel for main heating system	Electricity		
Target carbon dioxide emission rate	14.2 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	6.0 kgCO ₂ /m ²		OK
1b Target primary energy rate and dwelling primary energy			
Target primary energy	75.57 kWh _{PE} /m ²		
Dwelling primary energy	63.61 kWh _{PE} /m ²		OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	35.5 kWh/m ²		
Dwelling fabric energy efficiency	32.4 kWh/m ²		OK

2a Fabric U-values				
Element	Maximum permitted average U-Value [W/m ² K]	Dwelling average U-Value [W/m ² K]	Element with highest individual U-Value	
External walls	0.26	0.15	Walls (1) (0.15)	OK
Party walls	0.2	0	Party Wall (1) (0)	N/A
Curtain walls	1.6	0	N/A	N/A
Floors	0.18	N/A	N/A	N/A
Roofs	0.16	0.1	Roof (1) (0.1)	OK
Windows, doors, and roof windows	1.6	1.3	W1 (s) (1.3)	OK
Rooflights	2.2	N/A	N/A	N/A

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))			
Name	Net area [m ²]	U-Value [W/m ² K]	
Exposed wall: Walls (1)	63.275	0.15	
Party wall: Party Wall (1)	14.01	0 (!)	
Exposed roof: Roof (1)	65.52	0.1 (!)	

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	Area [m ²]	Orientation	Frame factor	U-Value [W/m ² K]
W1 (s), New Window	1.2	South	0.8	1.3
W1 (s), New Window	1.2	South	0.8	1.3
W2 (s), New Window	5.17	South	0.8	1.3
W3 (w), New Window	0.525	East	0.8	1.3

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))				
Building part 1 - Main Dwelling: Thermal bridging calculated from linear thermal transmittances for each junction				
Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E1: Steel lintel with perforated steel base plate	Calculated by person with suitable expertise	0.05	Appendix R
External wall	E3: Sill	Calculated by person with suitable expertise	0.05	Appendix R

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E4: Jamb	Calculated by person with suitable expertise	0.05	Appendix R
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.16	Appendix R
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0 (!)	Appendix R
External wall	E14: Flat roof	Calculated by person with suitable expertise	0.08	Appendix R
Roof	R11: Upstands or kerbs of rooflights	Calculated by person with suitable expertise	0.08	Appendix R
Party wall	P1: Ground floor	Calculated by person with suitable expertise	0.08	Appendix R
Party wall	P2: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0 (!)	Appendix R
Party wall	P4: Roof (insulation at ceiling level)	Calculated by person with suitable expertise	0.12	Appendix R
External wall	E20: Exposed floor (normal)	Calculated by person with suitable expertise	0.32	Appendix R

3 Air permeability (better than typically expected values are flagged with a subsequent (!))

Maximum permitted air permeability at 50Pa	8 m ³ /hm ²	
Dwelling air permeability at 50Pa	5 m ³ /hm ² , Design value	OK
Air permeability test certificate reference		

4 Space heating

Main heating system 1: Heat pump with radiators or underfloor heating - Electricity

Efficiency	249.9%
Emitter type	Underfloor
Flow temperature	35°C
System type	Air source heat pump
Manufacturer	
Model	
Commissioning	

Secondary heating system: N/A

Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water

Cylinder/store - type: Cylinder

Capacity	210 litres
Declared heat loss	1.58 kWh/day
Primary pipework insulated	Yes
Manufacturer	
Model	
Commissioning	

Waste water heat recovery system 1 - type: N/A

Efficiency	
Manufacturer	
Model	

6 Controls

Main heating 1 - type: Time and temperature zone control by arrangement of plumbing and electrical services

Function	
Ecodesign class	
Manufacturer	
Model	

Water heating - type: Cylinder thermostat and HW separately timed

Manufacturer	
Model	

7 Lighting		
Minimum permitted light source efficacy	75 lm/W	
Lowest light source efficacy	15 lm/W	FAIL
External lights control	N/A	
8 Mechanical ventilation		
System type: N/A		
Maximum permitted specific fan power	N/A	
Specific fan power	N/A	N/A
Minimum permitted heat recovery efficiency	N/A	
Heat recovery efficiency	N/A	N/A
Manufacturer/Model		
Commissioning		
9 Local generation		
N/A		
10 Heat networks		
N/A		
11 Supporting documentary evidence		
N/A		
12 Declarations		
a. Assessor Declaration		
This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design information submitted for this dwelling for the purpose of carrying out the "As designed" assessment, and that the supporting documentary evidence (SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required) has been reviewed in the course of preparing this BREL Compliance Report.		
Signed:	Assessor ID:	
Name:	Date:	
b. Client Declaration		
N/A		

Summary for Input Data

Property Reference	Unit 1 - Harcourt House		Issued on Date	21/03/2024
Assessment Reference	Unit 1 - Harcourt House - HP	Prop Type Ref	UNIT 1 Sample	
Property				

SAP Rating	77 C	DER	6.00	TER	14.20
Environmental	95 A	% DER < TER			57.75
CO ₂ Emissions (t/year)	0.35	DFEE	32.44	TFEE	35.54
Compliance Check	See BREL	% DFEE < TFEE			8.72
% DPER < TPER	15.83	DPER	63.61	TPER	75.57

Assessor Details	Mr. Lee Pasifull	Assessor ID	Y856-0001
Client			

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

Orientation	West
Property Tenture	ND
Transaction Type	6
Terrain Type	Suburban
1.0 Property Type	Flat, Semi-Detached
Position of Flat	Top-floor flat
Which Floor	4
2.0 Number of Storeys	1
3.0 Date Built	2024
3.0 Property Age Band	L
4.0 Sheltered Sides	2
5.0 Sunlight/Shade	Average or unknown
6.0 Thermal Mass Parameter	Precise calculation
Thermal Mass	N/A
7.0 Electricity Tariff	Standard
Smart electricity meter fitted	Yes
Smart gas meter fitted	Yes

kJ/m²K

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:	30.08 m	63.31 m ²	2.50 m
1st Storey:	26.38 m	49.04 m ²	2.85 m
2nd Storey:	0.00 m	0.00 m ²	0.00 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	23.20	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
Main External Wall	Cavity Wall	Cavity wall : plasterboard on dabs, AAC block, filled cavity, any outside structure	0.15	60.00	71.37	63.28	0.00	None	8.10	Enter Gross Area

9.1 Party Walls									
Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)	Shelter Res	Shelter		
Party Wall 1	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	14.01	0.00	None		

9.2 Internal Walls				
Description	Construction	Kappa (kJ/m ² K)	Area (m ²)	
Internal Wall 1	Plasterboard on timber frame	9.00	40.27	

10.0 External Roofs

Summary for Input Data

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
External Flat Roof	External Flat Roof	Plasterboard, insulated flat roof	0.10	9.00	65.52	65.52	None	0.00	Enter Gross Area	0.00

10.2 Internal Ceilings

Description	Storey	Construction	Area (m²)
Internal Ceiling 1	Lowest occupied	Plasterboard ceiling, carpeted chipboard floor	65.52

11.1 Party Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Party Floor 1	Lowest occupied	Concrete floor slab, carpeted	100.00	65.52

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
New Window	Manufacturer	Window	Double Low-E Soft 0.05		Air Filled	0.68	Wood	0.80	1.30
New Door	Manufacturer	Half Glazed Door	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.00
Rooflight	Manufacturer	Roof Light	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.40

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
W1 (s)	New Window	Main External Wall	South	2.40	0
W2 (s)	New Window	Main External Wall	South	5.17	0
W3 (w)	New Window	Main External Wall	East	0.53	0

14.0 Conservatory

None

15.0 Draught Proofing

100 %

16.0 Draught Lobby

No

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E1 Steel lintel with perforated steel base plate	Independently assessed	17.61	0.05	0.05	Appendix R	Yes
E3 Sill	Independently assessed	4.00	0.05	0.05	Appendix R	No
E4 Jamb	Independently assessed	43.80	0.05	0.05	Appendix R	Yes
E5 Ground floor (normal)	Independently assessed	27.22	0.16	0.16	Appendix R	Yes
E6 Intermediate floor within a dwelling	Independently assessed	26.38	0.00	0.00	Appendix R	Yes
E14 Flat roof	Independently assessed	26.38	0.08	0.08	Appendix R	Yes
R11 Upstands or kerbs of rooflights	Independently assessed	5.76	0.08	0.08	Appendix R	Yes
P1 Party wall - Ground floor	Independently assessed	3.87	0.08	0.08	Appendix R	No
P2 Party wall - Intermediate floor within a dwelling	Independently assessed	3.87	0.00	0.00	Appendix R	No
P4 Party wall - Roof (insulation at ceiling level)	Independently assessed	4.71	0.12	0.12	Appendix R	No
E20 Exposed floor (normal)	Independently assessed	10.41	0.32	0.32	Appendix R	No

Y-value: 0.11 W/m²K

Description: Target

18.0 Pressure Testing

Yes

Designed AP₅₀: 5.00 m³/(h.m²) @ 50 Pa

Property Tested?: Yes

Test Method: Blower Door

As Built AP₅₀: 0.10 m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Mechanical Ventilation System Present: No

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System

No

22.0 Lighting

No Fixed Lighting: No

Name	Efficacy	Power	Capacity	Count
LED	15.00	5	75	20

24.0 Main Heating 1

SAP table

Description: Heat Pump

Percentage of Heat: 100.00 %

Summary for Input Data

Database Ref. No.	0
Fuel Type	Electricity
SAP Code	214
In Winter	249.90
In Summer	175.10
Controls SAP Code	2207
Delayed Start Stat	Yes
Burner Control	Modulating
HETAS approved System	No
Oil Pump Inside	No
FI Case	0.00
Flue Type	Balanced
Fan Assisted Flue	Yes
Is MHS Pumped	Pump in heated space
Heating Pump Age	2013 or later
Heat Emitter	Underfloor
Underfloor Heating	Yes - Pipes in Wood
Flow Temperature	Enter value
Flow Temperature Value	35.00
Boiler Interlock	Yes
Combi boiler type	No Combi
Combi keep hot type	None

25.0 Main Heating 2

26.0 Heat Networks

	Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1	None									
Heat source 2	None									
Heat source 3	None									
Heat source 4	None									
Heat source 5	None									

28.0 Water Heating

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

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Combi boiler or unvented hot water system	11.00		No	

28.3 Waste Water Heat Recovery System

Summary for Input Data

29.0 Hot Water Cylinder

Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	210.00	L
Loss	1.58	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	

31.0 Thermal Store

None

34.0 Small-scale Hydro

0.0 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

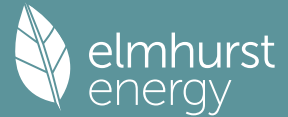
Lower cost measures

None

Further measures to achieve even higher standards

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

Full SAP Calculation Printout



Property Reference	Unit 1 - Harcourt House				Issued on Date	21/03/2024
Assessment Reference	Unit 1 - Harcourt House - HP		Prop Type Ref	UNIT 1 Sample		
Property						
SAP Rating	77 C	DER	6.00	TER	14.20	
Environmental	95 A	% DER < TER				57.75
CO ₂ Emissions (t/year)	0.35	DFEE	32.44	TFEE	35.54	
Compliance Check	See BREL	% DFEE < TFEE				8.72
% DPER < TPER	15.83	DPER	63.61	TPER	75.57	
Assessor Details	Mr. Lee Pasifull				Assessor ID	Y856-0001
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	63.3100 (1b)	x 2.5000 (2b)	= 158.2750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.3100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 158.2750 (5)

2. Ventilation rate

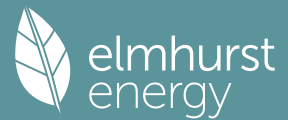
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.2500 (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) = 0.2125 (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	0.2709	0.2656	0.2603	0.2338	0.2284	0.2019	0.2019	0.1966	0.2125	0.2284	0.2391	0.2497 (22b)
Effective ac	0.5367	0.5353	0.5339	0.5273	0.5261	0.5204	0.5204	0.5193	0.5226	0.5261	0.5286	0.5312 (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
New Window (Uw = 1.30)			8.1000	1.2357	10.0095		(27)
Main External Wall	71.3700	8.1000	63.2700	0.1500	9.4905	60.0000	3796.2000 (29a)
External Flat Roof	65.5200		65.5200	0.1000	6.5520	9.0000	589.6800 (30)
Total net area of external elements Aum(A, m ²)			136.8900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		26.0520		(33)
Party Wall 1			14.0100	0.0000	0.0000	110.0000	1541.1000 (32)
Party Floor 1			65.5200			80.0000	5241.6000 (32d)
Internal Wall 1			40.2700			9.0000	362.4300 (32c)
Internal Ceiling 1			65.5200			9.0000	589.6800 (32e)
Heat capacity Cm = Sum(A x k)						(28) ... (30) + (32) + (32a) ... (32e) =	12120.6900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							191.4498 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E1 Steel lintel with perforated steel base plate				17.6100	0.0500	0.8805	
E3 Sill				4.0000	0.0500	0.2000	
E4 Jamb				43.8000	0.0500	2.1900	
E5 Ground floor (normal)				27.2200	0.1600	4.3552	
E6 Intermediate floor within a dwelling				26.3800	0.0000	0.0000	
E14 Flat roof				26.3800	0.0800	2.1104	

Full SAP Calculation Printout



R11 Upstands or kerbs of rooflights	5.7600	0.0800	0.4608
P1 Party wall - Ground floor	3.8720	0.0800	0.3098
P2 Party wall - Intermediate floor within a dwelling	3.8720	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	4.7060	0.1200	0.5647
E20 Exposed floor (normal)	10.4080	0.3200	3.3306
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			14.4019 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss		(33) + (36) + (36a) =	40.4539 (37)

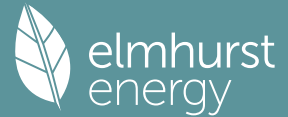
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	28.0324	27.9580	27.8850	27.5423	27.4782	27.1797	27.1797	27.1244	27.2946	27.4782	27.6079	27.7435 (38)
Average = Sum(39)m / 12 =	68.4864	68.4119	68.3390	67.9962	67.9321	67.6336	67.6336	67.5783	67.7486	67.9321	68.0618	68.1975 (39)
												67.9959
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0818	1.0806	1.0794	1.0740	1.0730	1.0683	1.0683	1.0674	1.0701	1.0730	1.0751	1.0772 (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												2.0735 (42)
Hot water usage for mixer showers												
Hot water usage for baths	81.1051	79.8862	78.1101	74.7119	72.2040	69.4073	67.8177	69.5803	71.5126	74.5154	77.9866	80.7943 (42a)
Hot water usage for other uses	25.4889	25.1104	24.5773	23.5944	22.8584	22.0424	21.6016	22.1309	22.7073	23.5805	24.5836	25.4028 (42b)
Average daily hot water use (litres/day)	35.8648	34.5606	33.2565	31.9523	30.6481	29.3439	29.3439	30.6481	31.9523	33.2565	34.5606	35.8648 (42c)
												131.0128 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	142.4588	139.5572	135.9439	130.2586	125.7106	120.7936	118.7632	122.3594	126.1721	131.3523	137.1309	142.0619 (44)
Energy content (annual)	225.6199	198.7277	208.9407	178.3175	169.2306	148.5299	143.6338	151.5064	155.5828	178.2439	195.3681	222.4346 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		2176.1358
Water storage loss:	33.8430	29.8091	31.3411	26.7476	25.3846	22.2795	21.5451	22.7260	23.3374	26.7366	29.3052	33.3652 (46)
Store volume												210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5800 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8532 (55)
Total storage loss	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492 (56)
If cylinder contains dedicated solar storage	26.4492	23.8896	26.4492	25.5960	26.4492	25.5960	26.4492	26.4492	25.5960	26.4492	25.5960	26.4492 (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	275.3315	243.6285	258.6523	226.4255	218.9422	196.6379	193.3454	201.2180	203.6908	227.9555	243.4761	272.1462 (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	275.3315	243.6285	258.6523	226.4255	218.9422	196.6379	193.3454	201.2180	203.6908	227.9555	243.4761	272.1462 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2761.4498 (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	114.7879	101.9976	109.2421	97.7770	96.0385	87.8726	87.5275	90.1452	90.2177	99.0354	103.4463	113.7288 (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	103.6754	103.6754	103.6754	103.6754	103.6754	103.6754	103.6754	103.6754	103.6754	103.6754	103.6754	103.6754 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	97.1415	107.5496	97.1415	100.3796	97.1415	100.3796	97.1415	97.1415	100.3796	97.1415	100.3796	97.1415 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	181.2110	183.0914	178.3529	168.2651	155.5310	143.5628	135.5673	133.6869	138.4254	148.5132	161.2473	173.2155 (68)
Pumps, fans	33.3675	33.3675	33.3675	33.3675	33.3675	33.3675	33.3675	33.3675	33.3675	33.3675	33.3675	33.3675 (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)	-82.9403	-82.9403	-82.9403	-82.9403	-82.9403	-82.9403	-82.9403	-82.9403	-82.9403	-82.9403	-82.9403	-82.9403 (71)
Total internal gains	154.2848	151.7821	146.8307	135.8013	129.0840	122.0452	117.6445	121.1629	125.3023	133.1120	143.6754	152.8613 (72)
	489.7400	499.5258	479.4278	461.5486	438.8591	420.0902	404.4559	406.0939	418.2100	435.8694	462.4049	480.3210 (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							
East	0.5300	19.6403	0.6800	0.8000	0.7700	3.9242 (76)						
South	7.5700	46.7521	0.6800	0.8000	0.7700	133.4224 (78)						
Solar gains	137.3467	226.1882	290.9873	333.0283	350.4190	338.6161	330.2698	318.2679	305.4677	244.7942	163.0441	118.5164 (83)
Total gains	627.0867	725.7139	770.4151	794.5769	789.2781	758.7064	734.7257	724.3618	723.6777	680.6636	625.4490	598.8373 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	49.1610	49.2145	49.2670	49.5154	49.5621	49.7808	49.7808	49.8216	49.6964	49.5621	49.4676	49.3693
alpha	4.2774	4.2810	4.2845	4.3010	4.3041	4.3187	4.3187	4.3214	4.3131	4.3041	4.2978	4.2913
util living area	0.9639	0.9357	0.8971	0.8252	0.7120	0.5477	0.4001	0.4227	0.6075	0.8263	0.9356	0.9695 (86)
MIT	19.8621	20.1085	20.3671	20.6469	20.8524	20.9633	20.9924	20.9902	20.9410	20.6954	20.2373	19.8063 (87)
Th 2	20.0158	20.0167	20.0177	20.0221	20.0229	20.0268	20.0268	20.0275	20.0253	20.0229	20.0213	20.0195 (88)
util rest of house	0.9561	0.9226	0.8764	0.7908	0.6581	0.4727	0.3140	0.3363	0.5344	0.7857	0.9201	0.9628 (89)
MIT 2	18.7248	19.0292	19.3441	19.6751	19.8981	20.0040	20.0239	20.0234	19.9854	19.7373	19.1970	18.6580 (90)
Living area fraction									fLA = Living area /	(4) =		0.3665 (91)
MIT	19.1416	19.4247	19.7190	20.0312	20.2478	20.3555	20.3788	20.3777	20.3356	20.0884	19.5782	19.0788 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1416	19.4247	19.7190	20.0312	20.2478	20.3555	20.3788	20.3777	20.3356	20.0884	19.5782	19.0788 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9473	0.9133	0.8692	0.7911	0.6711	0.4987	0.3455	0.3679	0.5585	0.7887	0.9118	0.9546 (94)
Useful gains	594.0703	662.7664	669.6454	628.6136	529.7155	378.3341	253.8226	266.4633	404.1506	536.8528	570.2750	571.6343 (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	1016.4449	993.6637	903.3724	756.8810	580.6731	389.2661	255.5717	268.8064	422.4516	644.5646	849.2897	1014.6956 (97)
Space heating kWh	314.2468	222.3630	173.8929	92.3525	37.9125	0.0000	0.0000	0.0000	0.0000	80.1376	200.8906	329.6376 (98a)
Space heating requirement - total per year (kWh/year)												1451.4334
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	314.2468	222.3630	173.8929	92.3525	37.9125	0.0000	0.0000	0.0000	0.0000	80.1376	200.8906	329.6376 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1451.4334
Space heating per m2										(98c) / (4) =		22.9258 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													249.9000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	314.2468	222.3630	173.8929	92.3525	37.9125	0.0000	0.0000	0.0000	0.0000	80.1376	200.8906	329.6376 (98)	
Space heating efficiency (main heating system 1)	249.9000	249.9000	249.9000	249.9000	249.9000	0.0000	0.0000	0.0000	0.0000	249.9000	249.9000	249.9000 (210)	
Space heating fuel (main heating system)	125.7490	88.9808	69.5850	36.9558	15.1710	0.0000	0.0000	0.0000	0.0000	32.0679	80.3884	131.9078 (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	275.3315	243.6285	258.6523	226.4255	218.9422	196.6379	193.3454	201.2180	203.6908	227.9555	243.4761	272.1462 (64)	
Efficiency of water heater	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000 (216)	
Fuel for water heating, kWh/month	157.2425	139.1368	147.7169	129.3121	125.0384	112.3003	110.4200	114.9161	116.3283	130.1859	139.0497	155.4233 (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	57.4647	46.1003	41.5082	30.4107	23.4901	19.1916	21.4285	27.8535	36.1790	47.4688	53.6159	59.0618 (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													580.8057 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													175.1000
Water heating fuel used													1577.0701 (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)													463.7731 (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)
 2621.6489 (238)

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

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year
Space heating - main system 1	580.8057	0.1561	90.6686 (261)
Total CO ₂ associated with community systems			0.0000 (373)
Water heating (other fuel)	1577.0701	0.1410	222.3209 (264)
Space and water heating			312.9895 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	463.7731	0.1443	66.9368 (268)
Total CO ₂ , kg/year			379.9263 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			6.0000 (273)

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

	Energy kWh/year	Primary energy factor kg CO ₂ /kWh	Primary energy kWh/year
Space heating - main system 1	580.8057	1.5779	916.4626 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	1577.0701	1.5213	2399.1380 (278)
Space and water heating			3315.6005 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	463.7731	1.5338	711.3507 (282)
Total Primary energy kWh/year			4026.9512 (286)
Dwelling Primary energy Rate (DPER)			63.6100 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	63.3100 (1b)	x 2.5000 (2b)	= 158.2750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.3100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 158.2750 (5)

2. Ventilation rate

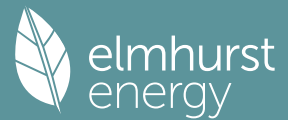
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	20.0000 / (5) = 0.1264 (8)
Pressure Test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3764 (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) = 0.3199 (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	0.4079	0.3999	0.3919	0.3519	0.3439	0.3039	0.3039	0.2959	0.3199	0.3439	0.3599	0.3759 (22b)
Effective ac	0.5832	0.5800	0.5768	0.5619	0.5591	0.5462	0.5462	0.5438	0.5512	0.5591	0.5648	0.5706 (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 Opening Type (Uw = 1.20)			8.1000	1.1450	9.2748		(27)
Main External Wall	71.3700	8.1000	63.2700	0.1800	11.3886		(29a)
External Flat Roof	65.5200		65.5200	0.1100	7.2072		(30)
Total net area of external elements Aum(A, m ²)			136.8900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.8706		(33)
Party Wall 1			14.0100	0.0000	0.0000		(32)

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

191.4498 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	17.6100	0.0500	0.8805
E3 Sill	4.0000	0.0500	0.2000
E4 Jamb	43.8000	0.0500	2.1900
E5 Ground floor (normal)	27.2200	0.1600	4.3552
E6 Intermediate floor within a dwelling	26.3800	0.0000	0.0000
E14 Flat roof	26.3800	0.0800	2.1104
R11 Upstands or kerbs of rooflights	5.7600	0.0800	0.4608
P1 Party wall - Ground floor	3.8720	0.0800	0.3098
P2 Party wall - Intermediate floor within a dwelling	3.8720	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	4.7060	0.1200	0.5647
E20 Exposed floor (normal)	10.4080	0.3200	3.3306

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

14.4019 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 42.2725 (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	30.4601	30.2914	30.1261	29.3493	29.2040	28.5275	28.5275	28.4022	28.7881	29.2040	29.4980	29.8053 (38)
Heat transfer coeff	72.7327	72.5640	72.3986	71.6219	71.4765	70.8000	70.8000	70.6747	71.0606	71.4765	71.7705	72.0779 (39)
Average = Sum(39)m / 12 =												71.6212

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1488	1.1462	1.1436	1.1313	1.1290	1.1183	1.1183	1.1163	1.1224	1.1290	1.1336	1.1385 (40)
HLP (average)												1.1313
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0735 (42)
Hot water usage for mixer showers	58.9855	58.0991	56.8074	54.3359	52.5120	50.4781	49.3220	50.6039	52.0091	54.1930	56.7175	58.7595 (42a)
Hot water usage for baths	25.4889	25.1104	24.5773	23.5944	22.8584	22.0424	21.6016	22.1309	22.7073	23.5805	24.5836	25.4028 (42b)
Hot water usage for other uses	35.8648	34.5606	33.2565	31.9523	30.6481	29.3439	29.3439	30.6481	31.9523	33.2565	34.5606	35.8648 (42c)
Average daily hot water use (litres/day)												110.6193 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	120.3393	117.7701	114.6411	109.8826	106.0186	101.8644	100.2674	103.3829	106.6687	111.0299	115.8618	120.0271 (44)
Energy conte	190.5880	167.7030	176.1991	150.4238	142.7214	125.2541	121.2648	128.0096	131.5331	150.6666	165.0664	187.9334 (45)
Energy content (annual)										Total = Sum(45)m =		1837.3633

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

	28.5882	25.1555	26.4299	22.5636	21.4082	18.7881	18.1897	19.2014	19.7300	22.6000	24.7600	28.1900 (46)
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Water storage loss:

Store volume

210.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day):

1.7016 (48)

Temperature factor from Table 2b

0.5400 (49)

Enter (49) or (54) in (55)

0.9188 (55)

Total storage loss

	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842 (56)
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If cylinder contains dedicated solar storage

	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842 (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)
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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)
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Total heat required for water heating calculated for each month

WWHRS	242.3345	214.4419	227.9457	200.5011	194.4680	175.3315	173.0114	179.7562	181.6105	202.4132	215.1437	239.6800 (62)
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PV diverter	-26.9657	-23.8487	-24.9730	-20.6786	-19.2717	-16.4910	-15.4576	-16.4377	-17.0622	-20.1144	-22.7872	-26.4664 (63a)
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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)
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FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
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Output from w/h	215.3688	190.5932	202.9728	179.8225	175.1962	158.8405	157.5537	163.3186	164.5483	182.2987	192.3565	213.2136 (64)
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Total per year (kWh/year)

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

Heat gains from water heating, kWh/month

	104.7678	93.1523	99.9835	90.0778	88.8521	81.7089	81.7178	83.9605	83.7966	91.4939	94.9464	103.8851 (65)
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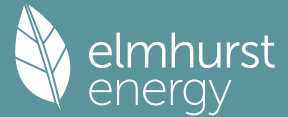
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	103.6754	103.6754	103.6754	103.6754	103.6754	103.6754	103.6754	103.6754	103.6754	103.6754	103.6754	103.6754 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	100.0193	110.7357	100.0193	103.3533	100.0193	103.3533	100.0193	100.0193	103.3533	100.0193	103.3533	100.0193 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	181.2110	183.0914	178.3529	168.2651	155.5310	143.5628	135.5673	133.6869	138.4254	148.5132	161.2473	173.2155 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.3675	33.3675	33.3675	33.3675	33.3675	33.3675	33.3675	33.3675	33.3675	33.3675	33.3675	33.3675 (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)	-82.9403	-82.9403	-82.9403	-82.9403	-82.9403	-82.9403	-82.9403	-82.9403	-82.9403	-82.9403	-82.9403	-82.9403 (71)
Water heating gains (Table 5)	140.8169	138.6196	134.3864	125.1080	119.4249	113.4845	109.8358	112.8501	116.3842	122.9757	131.8701	139.6306 (72)
Total internal gains	479.1499	489.5493	469.8613	453.8291	432.0779	414.5033	399.5250	400.6589	412.2656	428.6109	453.5733	469.9681 (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
East	0.5300	19.6403	0.6300	0.7000	0.7700	3.1812 (76)

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South	7.5700		46.7521		0.6300		0.7000		0.7700		108.1605 (78)	
Solar gains	111.3417	183.3621	235.8923	269.9733	284.0713	274.5031	267.7371	258.0076	247.6310	198.4453	132.1736	96.0767 (83)
Total gains	590.4916	672.9115	705.7535	723.8024	716.1492	689.0064	667.2621	658.6665	659.8966	627.0562	585.7470	566.0447 (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	46.2909	46.3985	46.5045	47.0088	47.1044	47.5545	47.5545	47.6388	47.3801	47.1044	46.9114	46.7114
alpha	4.0861	4.0932	4.1003	4.1339	4.1403	4.1703	4.1703	4.1759	4.1587	4.1403	4.1274	4.1141
util living area												
	0.9723	0.9528	0.9259	0.8702	0.7743	0.6134	0.4563	0.4801	0.6722	0.8673	0.9510	0.9762 (86)
MIT	19.6688	19.9038	20.1753	20.5060	20.7700	20.9361	20.9852	20.9815	20.9023	20.5835	20.0811	19.6285 (87)
Th 2	19.9612	19.9633	19.9654	19.9754	19.9772	19.9859	19.9859	19.9875	19.9826	19.9772	19.9735	19.9695 (88)
util rest of house												
	0.9659	0.9424	0.9091	0.8402	0.7220	0.5314	0.3560	0.3805	0.5950	0.8313	0.9382	0.9707 (89)
MIT 2	18.4444	18.7386	19.0755	19.4798	19.7774	19.9452	19.9801	19.9797	19.9145	19.5781	18.9716	18.3998 (90)
Living area fraction												
	18.8931	19.1656	19.4785	19.8559	20.1411	20.3083	20.3484	20.3468	20.2765	19.9466	19.3782	18.8501 (92)
MIT												0.0000
Temperature adjustment												0.0000
adjusted MIT	18.8931	19.1656	19.4785	19.8559	20.1411	20.3083	20.3484	20.3468	20.2765	19.9466	19.3782	18.8501 (93)

8. Space heating requirement												

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9574	0.9324	0.8997	0.8363	0.7310	0.5586	0.3926	0.4167	0.6186	0.8301	0.9291	0.9628 (94)
Useful gains	565.3561	627.4483	634.9910	605.3102	523.5339	384.8655	261.9410	274.4386	408.1977	520.5125	544.2379	544.9806 (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												
	1061.3921	1035.1663	939.6254	784.6796	603.3425	404.1505	265.3888	278.9380	438.9061	668.0593	881.2120	1055.9449 (97)
Space heating kWh												
	369.0508	273.9865	226.6480	129.1460	59.3776	0.0000	0.0000	0.0000	0.0000	109.7749	242.6213	380.1574 (98a)
Space heating requirement - total per year (kWh/year)												1790.7625
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												
	369.0508	273.9865	226.6480	129.1460	59.3776	0.0000	0.0000	0.0000	0.0000	109.7749	242.6213	380.1574 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1790.7625
Space heating per m2												28.2856 (99)
(98c) / (4) =												

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												
	369.0508	273.9865	226.6480	129.1460	59.3776	0.0000	0.0000	0.0000	0.0000	109.7749	242.6213	380.1574 (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)												
	399.8383	296.8435	245.5558	139.9198	64.3310	0.0000	0.0000	0.0000	0.0000	118.9327	262.8617	411.8715 (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												
	215.3688	190.5932	202.9728	179.8225	175.1962	158.8405	157.5537	163.3186	164.5483	182.2987	192.3565	213.2136 (64)
Efficiency of water heater (217)m												79.8000 (216)
	85.2566	84.8730	84.3078	83.3302	81.9012	79.8000	79.8000	79.8000	79.8000	82.9602	84.5815	85.3415 (217)
Fuel for water heating, kWh/month												
	252.6126	224.5627	240.7521	215.7952	213.9118	199.0482	197.4357	204.6598	206.2009	219.7425	227.4214	249.8358 (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	20.7820	16.6721	15.0114	10.9980	8.4952	6.9406	7.7496	10.0732	13.0841	17.1670	19.3901	21.3596 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-17.0448	-25.2935	-38.2447	-45.3084	-50.8922	-48.2586	-47.6866	-44.0195	-37.8891	-29.9468	-19.1882	-14.5937 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-6.1298	-13.1838	-26.7492	-40.9836	-54.9834	-55.5276	-54.8580	-46.0672	-33.2806	-19.0975	-8.2623	-4.8248 (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												1940.1543 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.8000
Water heating fuel used												2651.9788 (219)
Space cooling fuel												0.0000 (221)

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Electricity for pumps and fans:	86.0000 (231)
Total electricity for the above, kWh/year	
Electricity for lighting (calculated in Appendix L)	167.7230 (232)

Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-782.3138 (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	4063.5423 (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	1940.1543	0.2100	407.4324 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2651.9788	0.2100	556.9155 (264)
Space and water heating			964.3480 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	167.7230	0.1443	24.2076 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-418.3661	0.1335	-55.8594
PV Unit electricity exported	-363.9477	0.1253	-45.6111
Total			-101.4705 (269)
Total CO2, kg/year			899.0143 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.2000 (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	1940.1543	1.1300	2192.3744 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2651.9788	1.1300	2996.7360 (278)
Space and water heating			5189.1105 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	167.7230	1.5338	257.2591 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-418.3661	1.4934	-624.7877
PV Unit electricity exported	-363.9477	0.4600	-167.4141
Total			-792.2018 (283)
Total Primary energy kWh/year			4784.2686 (286)
Target Primary Energy Rate (TPER)			75.5700 (287)

Predicted Energy Assessment

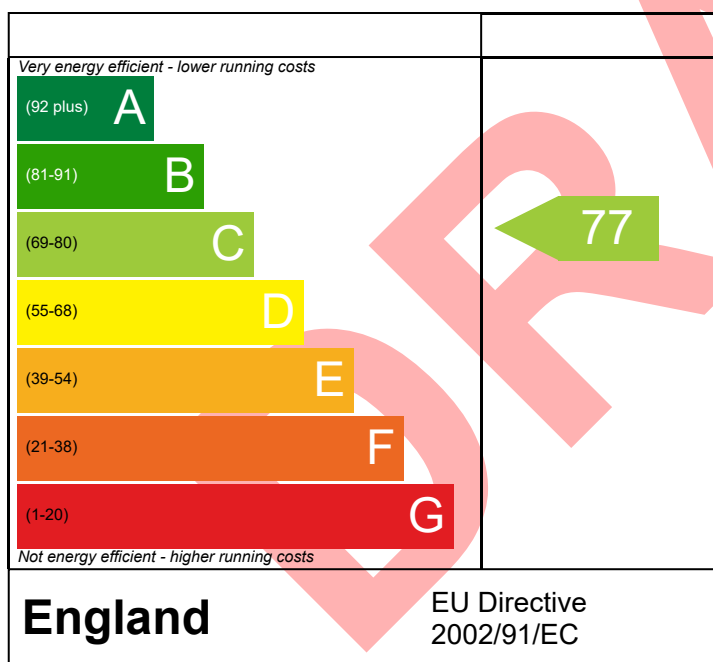


Dwelling type: Flat, Semi-Detached
Date of assessment: 21/03/2024
Produced by: Lee Pasifull
Total floor area: 63.31 m²
DRRN:

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

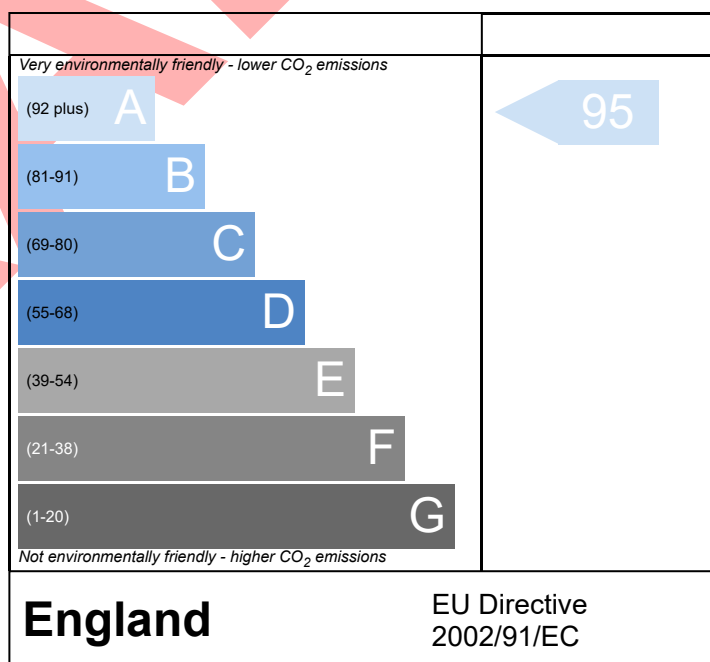
The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.

Energy Efficiency Rating



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

Environmental Impact (CO₂) Rating



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

Overview Report

Dwelling Address	
Report Date	21/03/2024
Property Type	Flat, Semi-Detached
Floor Area [m ²]	63

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

Energy Rating

The current energy rating represents the overall energy efficiency of the dwelling. The potential energy rating is the overall energy rating of the dwelling after all of the recommend measures provided on the next page have been installed. A higher score represents a more energy efficient dwelling with lower fuel bills.

Most energy efficient - lower running costs

CURRENT

POTENTIAL

(92 plus)

A

(81-91)

B

(69-80)

C

(55-68)

D

(39-54)

E

(21-38)

F

(1-20)

G

77

77

Least energy efficient - higher running costs

Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor	Poor	Average	Good	Very Good
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Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.15 W/m ² K	Very Good
Roof	Average thermal transmittance 0.1 W/m ² K	Very Good
Windows	High performance glazing	Good
Main heating	Air source heat pump, underfloor, electric	Good
Main heating controls	Time and temperature zone control	Very Good
Secondary heating	None	
Hot water	From main system	Average
Lighting	Below average lighting efficiency	Poor
Air tightness	Air permeability [AP50] = 5.0 m ³ /h.m ² (assumed)	Good

Primary Energy use

The primary energy use for this property per year is 59 kilowatt hour (kWh) per square metre

Estimated CO₂ emissions of the dwelling

The estimated CO rating provides an indication of the dwelling's impact on the environment in terms of carbon dioxide emissions; the higher the rating the less impact it has on the environment.

The estimated CO emissions for this dwellings is: **0.4** per year

With the recommended measures the potential CO emissions could be: **0** per year

Recommendations

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

Recommended measure	Typical Yearly Saving	Potential Rating after measure installed	Cumulative savings (per year)	Cumulative Potential Rating
---------------------	-----------------------	--	-------------------------------	-----------------------------

Estimated energy use and potential savings

Estimated energy cost for this property over a year

£616

Over a year you could save

£0

The estimated cost and savings show how much the average household would spend in this property for heating, lighting and hot water. It is not based on how energy is used by the people living at the property.

Contacting the assessor and the accreditation scheme

Assessor contact details	
Assessor name	Mr. Lee Pasifull
Assessor's accreditation number	EES/024192
Email Address	lee@lpenergy.co.uk

Accreditation scheme contact details

Accreditation scheme	Elmhurst Energy Systems Ltd
Telephone	07891547141
Email Address	lee@lpenergy.co.uk

Assessment details

Related party disclosure	No related party
Date of assessment	20/03/2024
Date of certificate	20/03/2024
Type of assessment	SAP, new dwelling