

**Harcourt House,
16-17 Haringey Park, N8 9JB**

Planning Stage Sustainability Statement

Prepared by: Lee Pasifull
Client: Upspace
Date: 27th June 2025
Reference: JF458-RP-Z-0001

Issue and Revision Record

Rev	Date	Originator	Checked	Description
PR1v	06.08.24	Lee Pasifull	Daniel Johncock	Draft For Discussion
PR2v	19.03.25	Lee Pasifull	Daniel Johncock	Updated Report
PR3v	18.06.25	Lee Pasifull	Daniel Johncock	Updated Report
PR4V	27.06.25	Lee Pasifull	Daniel Johncock	Updated Report

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1 Executive Summary

The following energy statement has been prepared for the proposed development at Harcourt House, 16-17 Haringey Park, Hornsey, London, N8 9JB

The proposal is for the erection of one additional storey at roof level to existing building to provide two self-contained apartments, plant and associated works. The planning report has been updated to reflect the Rev C drawing set, for planning (June 2025)

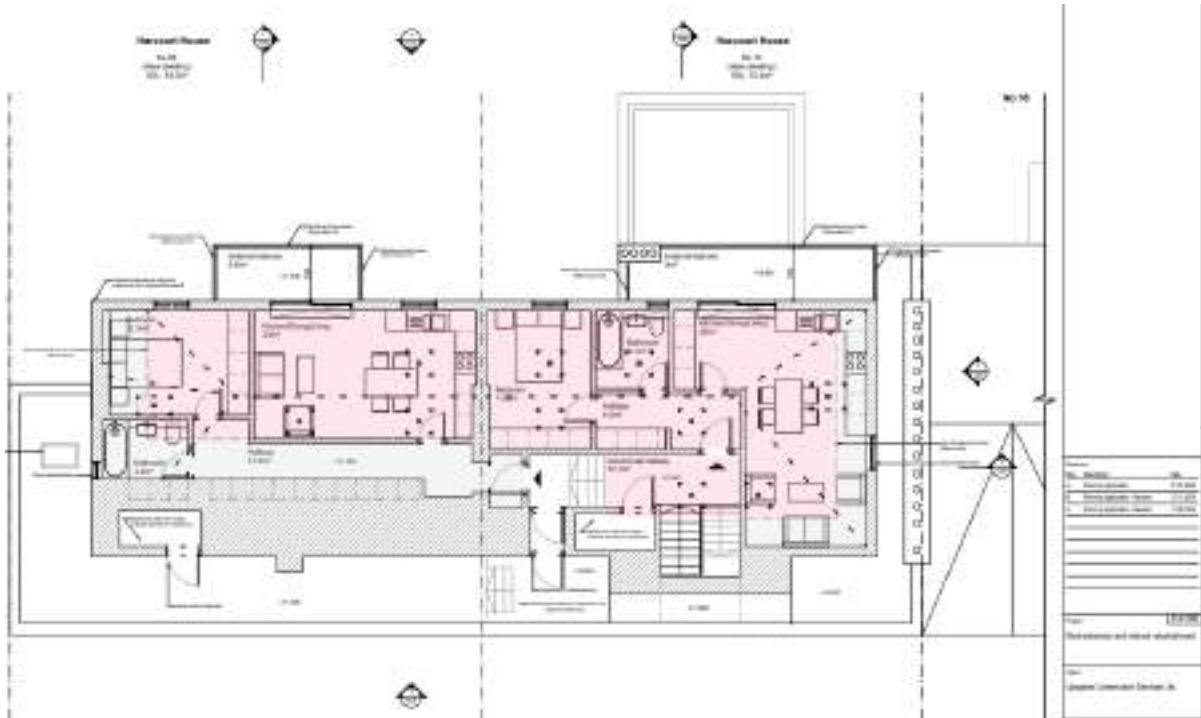


Figure 1 – Dwelling general arrangement plans

The Energy and Sustainability Statement outlines the sustainability and energy strategies for meeting the sustainability targets set out by local and national policies, focusing on the Haringey Council Sustainability Framework and Sustainability Checklist.

For the purposes of this report, and to satisfy the above principles, regulated carbon emissions for the units have been derived from a calculation developed via Elmhurst Design SAP10.

The energy strategy follows and responds to the 'Be Lean', 'Be Clean', 'Be Green' methodology and adopts various energy efficiency measures as well as low carbon renewable technologies where feasible.

The following measures have been incorporated: -

Be Lean Use less energy, minimise energy demand through efficient design and the incorporation of passive measures	Building Fabric • Deliver high-performance building fabric on new building parts. • Achieve high levels of air tightness. • Reduce thermal bridging impacts using accredited/bespoke details on new elements. Passive Design • Improved daylighting.
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	• Review of natural shading. Energy Efficiency • Energy efficient lighting controls • Energy efficient heating and controls • Appropriate energy metering and monitoring • Provision of energy efficient appliances
Be Clean Supply energy efficiently. reduce energy consumption through use of low-carbon technology	• The review into energy efficient building services and conditioning plant: - o Gas boiler - o Air source heat pumps - o Electric direct heating - o Exhaust air heat pump. - o Mechanical ventilation with heat recovery
Be Green Use renewable energy systems	Renewable Technologies • A study into the potential for installing renewable technology, further reducing energy demand and carbon emissions. This includes: - - o Solar Photovoltaics - o Solar Thermal - o Heat Pumps - o Wind Turbines - o CHP - o Biomass Boilers

2.Summary of Results

By adopting Be Lean, Clean and Green measures, there is a compliance pass when assessing the dwelling against AD Part L2021 benchmarks (notional dwelling).

Applying excellent building fabric levels to the new elements, improving air tightness, installing energy efficient monitoring, and making a detailed study on overheating and natural daylighting, there was a 25.84% improvement on **Fabric Energy Efficiency** levels, when compared against the Part L notional building.

Once the base energy demand has been reduced (from Be Lean assumptions), the strategy moved onto the most energy efficient services, which would provide heating and hot water services.

Options have been detailed in the 'Be Clean' section and show the potential improvement figures. It should be noted that an all-electric scheme is recommended, to meet Primary Energy targets, while ensuring a future-proven design. The recommended option is to install Exhaust Air Heat Pumps on the units.

The heat pump in question is internally situated and only requires a duct/opening on the north elevation of the building.

An appraisal into viable renewable technologies was conducted to identify where green technologies could be installed, offering a displacement in energy and residual carbon emissions. The study proved that PV was the best option. However, with site restraints, conservation issues and the low yield of the PV, this has been discounted

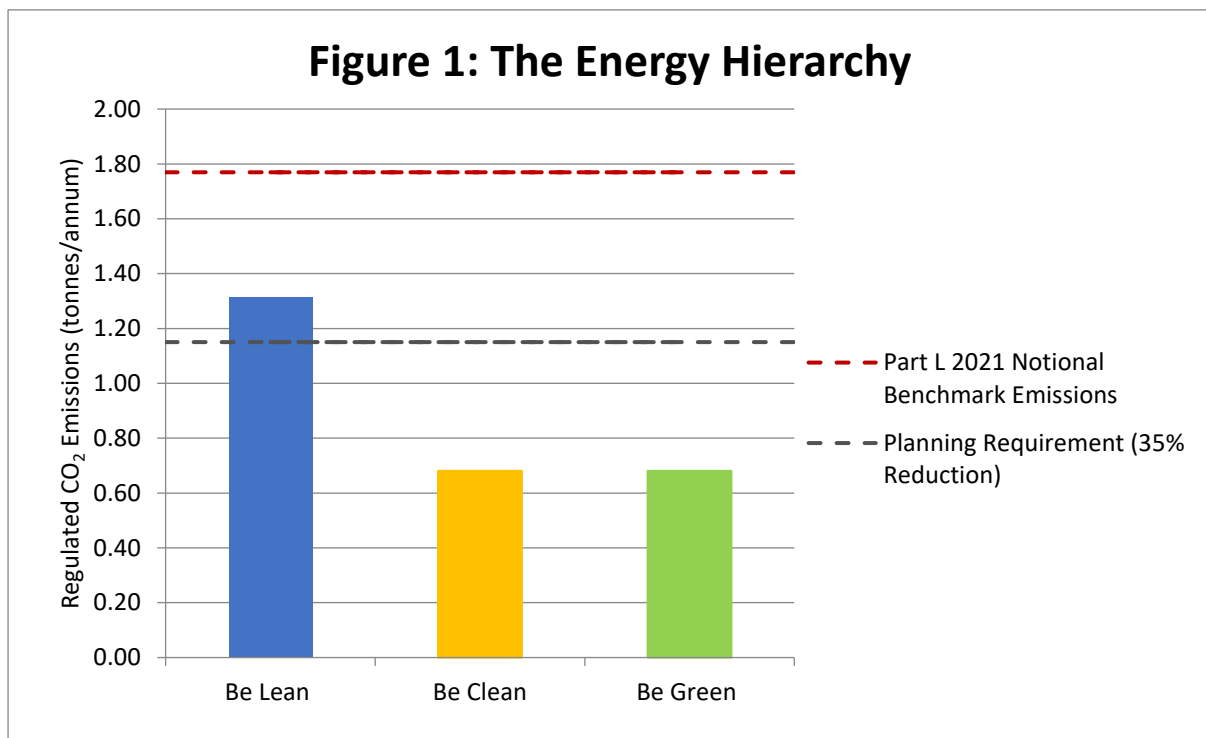
Overall, with the recommended strategy, the potential results show that the considered option (heat pump), reduces carbon emissions by 61.53% when compared against Part L benchmark figures. As the exhaust air heat pump is considered renewable technologies, carbon offset from renewable sources are at 61.53% and therefore comply with the planning requirements.

SAP 10			
	Carbon dioxide emissions (Tonnes CO ₂ per annum)		
		Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	A	1.77	16.61
After Energy Demand Reduction (Be Lean)	B	1.31	16.61
After Energy Efficient Features (Be Clean)	C	0.68	16.61
After Renewable Energy (Be Green)	D	0.68	16.61

Table 3 - Carbon Dioxide Emissions after each stage of the Energy Hierarchy for domestic buildings

	Regulated Carbon dioxide savings			
	(Tonnes CO ₂ per annum)		(%)	
Savings from 'Be Lean'	A-B	0.46	$(A-B)/A*100$	25.84
Savings from 'Be Clean'	B-C	0.63	$(B-C)/A*100$	35.69
Savings from 'Be Green'	C-D	0.00	$(C-D)/A*100$	0.00
Total Cumulative Savings	A-D = E	1.09	$(A-D)/A*100$	61.53

Table 4 - Regulated carbon dioxide savings from each stage of the Energy Hierarchy for non-domestic buildings



Energy Use Intensity / Space Heating Demand

Applications are required to report on the total Energy Use Intensity and Space Heating Demand, in line with the GLA Energy Assessment Guidance (June 2022). Energy Strategy should follow the reporting template set out in Table 5 of the guidance, including what methodology has been used. EUI is a measure of the total energy consumed annually but should exclude on-site renewable energy generation and energy use from electric vehicle charging.

	Proposed Development	GLA Benchmark
Building type	Residential	Residential
EUI	34.26kWh/m ² .r (See section 9a of SAP Documentation)	Meets GLA benchmark of 35kWh/m ² /year
SHD	3,279.40kWh/year generated from Heat Pump. 25.89kWh/year/m ²	Meets GLA benchmark of 15 kWh/m ² /year
Methodology used	SAP 10	SAP 10

3 Local & National Policies

This section investigates the relevant policies that are to be adopted within the proposed development. This includes national, regional, and local policies and regulations and are summarised below.

National Planning Policy Framework (NPPF)

The National Planning Policy Framework was published in February 2019 and outlines the Government's planning policies for England and how these are expected to be applied. It sets out the Government's requirements for the planning system only to the extent that it is relevant, proportionate, and necessary to do so. It provides a framework within which local people and their accountable councils can produce their own distinctive local and neighborhood plans, which reflect the needs and priorities of their communities. The NPPF was designed to consolidate all policy statements and guidance into a single and simpler framework, making the planning stage more user friendly. There are three dimensions to sustainable development.

Economic Objective

To help build a strong, responsive, and competitive economy, by ensuring that sufficient land of the right types is available in the right places and at the right time to support growth, innovation, and improved productivity; and by identifying and coordinating the provision of infrastructure.

Social Objective

To support strong, vibrant, and healthy communities, by ensuring that a sufficient number and range of homes can be provided to meet the needs of present and future generations; and by fostering a well-designed and safe built environment, with accessible services and open spaces that reflect current and future needs and support communities' health, social and cultural well-being; and

Environmental Objective

To contribute to protecting and enhancing our natural, built, and historic environment; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy. In determining applications, great weight should be given to outstanding or innovative designs which promote high levels of sustainability or help raise the standard of design more generally in an area, so long as they fit in with the overall form and layout of their surroundings.

Local planning authorities should expect all developments to comply with adopted Local Plan policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved and its design, that this is not feasible or viable; and take account of landform, layout, building orientation, massing, and landscaping to minimise energy consumption.

The London Plan

Whilst the proposals are considered a Minor Development under the London Plan Regulations, London Plan strategies have been integrated where possible.

The London Plan is the overall strategic plan for London, setting out an integrated economic, environmental, transport and social framework for the development of London over the next 20–25 years and requires all developments to actively tackle climate change,

through sustainable development. For the purposes of energy and sustainable design, Chapter 9: Sustainable Infrastructure should be used when assessing the energy design of the scheme, namely the following sections:

- Policy SI 1 Improving air quality.
- Policy SI 2 Minimising greenhouse gas emissions
- Policy SI 3 Energy infrastructure
- Policy SI 4 Managing heat risk
- Policy SI 5 Water infrastructure
- Policy SI 6 Digital connectivity infrastructure
- Policy SI 7 Reducing waste and supporting the circular economy.
- Policy SI 8 Waste capacity and net waste self-sufficiency

The London Plan requires that a concise energy assessment be conducted, explaining the undertaken strategy for reducing carbon emissions, based on the energy hierarchy. The plan also requires that the energy assessment demonstrates how the reductions of carbon emission are to be met within the framework of the hierarchy.

Policy SI 2 requires the reduction of CO2 emissions, in accordance with the Be Lean, Be Clean and Be Green methodology.

- Be Lean: Use Less Energy
- Be Clean: Supply Energy Efficiently
- Be Green: Use Renewable Energy

Policy SI 2 requires that developments look to provide a reduction in proposed CO2 emissions, using on-site, renewable energy generation where feasible. All renewable energy systems should be located and designed to minimise any potential adverse impacts on biodiversity, the natural environment, and historical assets, and to avoid any adverse impacts on air quality.

Policy SI 4 seeks to reduce the impact of the urban heat island effect in London and encourages the design of places and spaces to avoid overheating and excessive heat generation, and to reduce overheating due to the impacts of climate change and the urban heat island effect on an area wide basis.

The GLA's current guidance identifies that 'In most circumstances, it is the GLA's expectation that dynamic thermal modelling is undertaken to demonstrate compliance with London Plan Policy SI 4.' The overheating modelling recommend is CIBSE guide TM52 which looks at three design weather years.

- 1976 - a year with a prolonged period of sustained warmth.
- 1989 - a moderately warm summer (current design year for London).
- 2003 - A year with a very intense single warm spell.

To satisfy this requirement, a Part O model has been completed.

The Haringey Council Local Plan

Policy SP4 of the Haringey Local Plan focuses on the following requirements.

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 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

b. Establishing local networks of decentralised heat and energy facilities by requiring developers to prioritise connection to existing or planned networks where feasible;

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

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.

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

4 Be Lean – Reduced Demand

In accordance with the London Plan Policy SI 2, the initial priority is to reduce the baseline emissions through efficient design measures.

To ensure the proposed development complies with 2021 Building Regulations and improves upon the baseline compliance threshold, specific measures to make the building energy efficient must be incorporated within the scheme design and construction.

Element Description	Part L1a U-Value Limit	U-Value Assumed in Model
Floors: Ground Floors	0.18 W/m ² k	0.00 W/m ² k
Walls: External Walls	0.26 W/m ² k	0.15 W/m ² k
Roof: Flat Roofs	0.16 W/m ² k	0.10 W/m ² k
Roof: Terrace Roofs	0.16 W/m ² k	0.10 W/m ² k
Glazing: New Double Glazing	1.60 W/m ² k	1.30 W/m ² k
Glazing: Glazed Doors	1.60 W/m ² k	1.40 W/m ² k
Openings: Doors	1.60 W/m ² k	1.00 W/m ² k
Gg Value of Glazing	0.68	0.45
Air Pressure Testing	8 m ³ /(hm ²) @50Pa	4.00 m ³ /(hm ²) @50Pa
Thermal Bridging	None	Accredited Details

Integration With Existing Structure

The proposed additional floor of apartments will be integrated with the existing building structure in accordance with the thermal performance requirements set out in Approved Document Part L 2021. To ensure thermal continuity and avoid thermal bridging, the junctions between the new construction and the existing building fabric will be carefully detailed using thermally broken connections and continuous insulation. Existing roof elements will be upgraded or replaced as necessary to align with the thermal envelope of the new structure, ensuring a consistent U-value across the interface. High-performance insulation will be wrapped around structural penetrations, such as steel columns, to eliminate cold spots, and all junction details will be designed to meet or exceed the standards set out in the Building Regulations and the Accredited Construction Details (ACDs), where applicable. This approach will support overall compliance with the building's Target Emission Rate (TER) and Fabric Energy Efficiency Standard (FEES), helping to reduce heat loss and improve occupant comfort.

Cooling Load Reduction

With specific consideration to minimising solar gains, the building has a medium thermal mass. When dealing with any summer overheating risk, a detailed thermal comfort model will be produced to highlight a concise strategy in alleviating any risks. The initial model shows that there were minor overheating risks and that only section 1a of the Part O Criterion was failing, when applying a Simplified Part O method. This is due to the amount of glazing compared to floor area, window opening amount and site location. To allow compliance, a dynamic simulation is to be carried out at detailed design stage, to enable

an overheating strategy. A high level TM59 model was produced and shows several options to comply, including

- Providing additional fresh air to zones
- Adding fixed shading to external facades
- Adding blinds natural shading
- Adding a cooling coil to the MVHR system.

Our recommendation at this stage is to review the thermal mass and passive shading enhancements to reduce any overheating risks. Secondly, a building services strategy will ensure compliance with Part O via thermal comfort modelling. Please see the appendices for the detailed Part O Assessment.

Thermal Bridging

As legislation forces the use of ever improving U value, thermal bridging now represents a much greater proportion of heat loss of a building than it once did. As such it is becoming increasingly more critical to incorporate thermal bridging details to ensure a continuity of insulation at all junctions between fabric elements. The latest building regulations have also been developed in such a way that failure to address thermal bridging effectively carries significant penalty.

To this end, it is proposed that as a minimum Accredited Construction Details (ACD's), (or equivalent) are incorporated throughout the architectural design and implemented throughout the construction process on the new elements (top floor and rear extension.

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 the dwelling is tested for air tightness targeting an air permeability of 4.00m³/hr.m² at 50 Pa.

Ventilation

To minimize unnecessary heat loss through ventilation and provide enough background ventilation, it is proposed that a centralised ventilation system (MEV or MVHR) is installed. This will not only provide recirculated air and reduced heating costs but will allow any overheating designs to utilise the air flow and supply fresh air to the habitable zones.

Lighting

It is proposed that 100% of installed lighting exceeds the minimum performance criteria to be considered low energy, exceeding Part L 2021 minimum standards.

5 Be Clean – Use Energy Efficiently

Within this section three options have been considered for the Be Clean section. To ensure future proofing of the site, it is important to step away from fossil fuel heat sources.

The following options have been modelled and the consequential energy, carbon and fabric compliance have been noted accordingly.

	EPC		TER	DER	%	TFEE	DFEE	%	TPER	DPER	%
Option 1: Air Source Heat Pump	C	77	14.2	6	57.75	35.54	32.44	8.72	75.57	63.61	15.83
Option 2: Exhaust Heat Pump	B	81	14.01	5.13	61.53	35.54	32.44	8.72	74.56	54.04	27.52
Option 3: High Retention Storage Heaters, System 4 ventilation and PV	B	83	14.01	6.34	54.75	35.54	32.44	8.72	74.56	69.68	6.54

The air source heat pump, and exhaust heat pump, offer a future proofed and highly efficient solution. This will need to be assessed alongside our design and/or planning objectives, i.e., acoustics and noise limitations. Option 2 has been confirmed as the recommended option.

Exhaust Air Source Heat Pump System

An exhaust air source heat pump (EAHP) is a compact and efficient heating system particularly well-suited to apartments and flats. It works by recovering heat from the warm, stale air extracted from wet rooms such as kitchens and bathrooms through a mechanical ventilation system. Instead of venting this air directly outside, the heat pump captures its thermal energy using a refrigerant circuit, even when the air feels cool to the touch. This recovered heat is then used to produce domestic hot water and, in some systems, to supplement space heating via underfloor heating or low-temperature radiators. By combining ventilation, heat recovery, and heating into one unit, EAHPs reduce energy demand and improve SAP (Standard Assessment Procedure) scores—critical for compliance with Part L 2021 of the Building Regulations.

In a flat, the EAHP system typically operates as a central unit located in a utility cupboard or similar service area, with ductwork distributing air to and from different rooms. Fresh air is drawn in from outside and pre-warmed before being supplied to living and sleeping areas, while extracted air passes through the heat pump for energy recovery. Because it uses heat that would otherwise be wasted, the EAHP significantly improves overall efficiency and reduces reliance on external heat sources like electric resistance heating or gas boilers. This makes it especially advantageous in urban apartment developments where space, carbon emissions, and energy efficiency are critical concerns. In all-electric residential schemes, EAHPs can be an effective strategy to meet both energy targets and residents' comfort needs. It is proposed that the EAHP supplied 100% of heating demand and hot water demand within the apartments.

The electric panel radiator option is a viable solution; however, this heating strategy would need to be implemented in conjunction with a heat pump hot water cylinder to be compliant. It also is anticipated the client will look to add PV or WWHRs technologies to attain an EPC 'B' rating.

Key:

EPC – Energy Performance Certificate

TER – Target Emission Rate

DER – Dwelling Emission Rate

TFEE – Target Fabric Energy Efficiency

DFEE – Dwelling Fabric Energy Efficiency

TPER – Target Primary Energy Rate

DPER – Dwelling Primary Energy Rate

6 Be Green – Use of Renewables

In line with Policy SI 2 of The London Plan, there is a requirement for a reduction in CO₂ emissions, using on-site renewables. This section reviews each of the technologies that are to be considered for the new development in line with The London Renewable Toolkit, with the most feasible method being selected.

The following renewable technologies have been considered to assess their potential to meet the renewable targets for proposed development.

Technology	Included in report		Reasoning
	YES	NO	
Solar Photovoltaics (Electric)	X		There is space to add a photovoltaic array to the new building, which has been explored in the following section.
Solar Thermal (Hot Water)		X	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.
Heat Pumps	X		Exhaust Air Heat pumps have been considered on the scheme
Ground Source Heat Pump		X	The use of horizontal ground source heat pumps is inhibited because of the areas required for the horizontal ground loop system. The site would also be difficult to accommodate both a vertical borehole system or plateau setup, regarding safe working area and lack of open available space. Ground Source Heat Pumps have therefore been discounted based on these potential constraints.
Biomass		X	Biomass technology 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. This system would also not work in a smoke control area and for future proofing purposes.
Wind Turbine		X	Due to noise, vibration, reflected light and shadow flicker it is not best practice to locate near built up areas. Wind turbines are therefore not practically feasible for this development.

Table 1 – Renewables viability options

Photovoltaic Array

Photovoltaic (PV) panels provide clean silent electricity. They generate electricity during most daylight conditions, although they are most efficient when exposed to direct sunlight or are orientated to face within 30 degrees from the south. PV panels can be integrated into distinct aspects of a development including roofs, walls, shading devices or architectural panels. The panels typically have an electrical warranty of 20-25 years and an expected system lifespan of 25-40 years.

PV systems convert energy from the sun into electricity through semi-conductor cells. A cell consists of a junction between two thin layers of dissimilar semiconducting materials, usually based on silicon. When light shines on the junction, a difference in energy is created – otherwise known as 'voltage' or 'potential difference.' This voltage is used to produce an electrical current or direct current (DC), which can be used directly or converted into alternating current (AC) depending upon the application. AC is most appropriate for household use or for exporting to the local electricity network/national grid. Individual PV cells only produce a small amount of power, so are usually connected to form a module. Modules can then be linked to form an array and sized to meet a particular load.

1. Design Considerations

- Optimise the PV array by designing with the best inclination and orientation.
- Ensure that the panels receive minimal over-shading.
- Ensure that the wiring from arrays is kept to a minimum, to reduce electrical losses.
- Provide safe and secure access for maintenance purposes.
- Ensure regular monitoring of performance.
-

Following an assessment of the possible renewable technologies available, a photovoltaic array is identified as being most effective in providing a CO2 reduction, when assessed in line with the energy hierarchy.

An initial study of the roof plan indicates that there is sufficient area available for photovoltaics on the main roof, outlined in the roof plan 718_01-03-0282 06. The assumptions are based on the panels having little or no shading and connection to the main incoming meter. The proposed Array is as follows.

Photovoltaic Array	
Number of Panels	9
Approximate Area per Panel	1.64
Approximate Surface Area Required	14.76
Panel Output (kWp)	0.45
Total Output (kWp)	4.050
Total Output (kWh/year)	3,604.50
SAP 2012 Carbon Factor (kg.CO2 /kWh)	0.156
CO2 Offset (kg.CO2 /year)	562.3
Approximate Install Cost (£) ¹	£4,500.00
Yearly Savings (£) ²	£829.03
Payback (Years)	5.42
Lifespan Profit (25 Years) (£)	£20,725.75
Energy Offset Per Year (%) – 9,105kWh/yr (Reg and Unreg)	39.58%

1. Approximate Market Cost

2. Based on £0.24/kWh

7 Sustainability

Water Efficiency

Low flow rate sanitaryware will be adopted in the units, to ensure daily water use, no more than 105 litres per person per day (including external water use). The following flow rates are recommended, to ensure compliance.

- Showers 9 l/min
- Baths 180 litres to overflow.
- Kitchen Tap 12 l/min.
- Other Taps 3 l/min
- Toilets Dual flush 3/6l
- Dishwashers 1.25l per place setting
- Washing Machines 8l/Kg dry load

Waste Management

A site waste management plan should be produced, to ensure minimal site waste during the construction phase, with minimal waste going to landfill. Any demolition work waste will be monitored via a pre demolition audit. Once the project is completed, the units will have dedicated bins, provided by, and governed by the local authority.

Preference will be given to the use of local materials & suppliers where viable to reduce the transport distances and to support the local economy. A full evaluation of these suppliers will be undertaken at the next stage of design.

In addition, timber would be sourced, where practical, certified by PEFC or an equivalent approved certification body and all site timber used within the construction process would be recycled.

All insulation materials will have zero-ozone depleting potential.

8 Conclusion

Subject to further liaison with the client and design team the recommended option of Exhaust air Heat Pump has been proposed, and the following figures have been used to conclude the energy performance. It is anticipated the client/developer will seek to achieve an EPC B which will be investigated during the RIBA Stage 3 design phase. The scheme has the potential to meet and exceed the planning requirements related to energy efficiency and carbon reduction targets.

SAP 10			
	Carbon dioxide emissions (Tonnes CO ₂ per annum)		
	Regulated	Unregulated	
Baseline: Part L 2021 of the Building Regulations Compliant Development	A	1.77	16.61
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Table 3 - Carbon Dioxide Emissions after each stage of the Energy Hierarchy for domestic buildings

	Regulated Carbon dioxide savings			
	(Tonnes CO ₂ per annum)		(%)	
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Savings from 'Be Clean'	B-C	0.63	(B-C)/A*100	35.69
Savings from 'Be Green'	C-D	0.00	(C-D)/A*100	0.00
Total Cumulative Savings	A-D = E	1.09	(A-D)/A*100	61.53

Table 4 - Regulated carbon dioxide savings from each stage of the Energy Hierarchy for non-domestic buildings

9. Appendices

1. Assessor Response to Objection (by Third Party)
2. Part L Sheets
3. GLA Worksheets

Assessor Response to Objection (By Third Party)

The following are responses to the formal objection letter and corresponding report, carried out by Cook and Cardenas Ltd. The report states "This objection raises formal concerns about the adequacy and regulatory compliance of the Energy Strategy submitted for the proposed rooftop extension at Harcourt House. Following detailed review of the Energy Statements PR1v (Ref: JF458-RP-Z-0001, dated 6th August 2024) and PR2v (Ref: JF458-RP-Z-0001, dated 19 March 2025), the proposal remains incomplete and materially non-compliant with the London Plan and Approved Document Part L (2021). The following points have been noted, in hopes of resolving these issues and/or explaining the methodology with regards to said points.

Verification Required	Assessor Response
Submit updated SAP worksheets consistent with current architectural plans (Rev C).	The SAP assessment for the two no. apartments were calculated in line with Revision C of the working drawings. The figures have been adjusted to allow for the correct areas, which were out by 6m2
Confirm if the proposed Exhaust Air Heat Pump (EAHP) provides 100% of the heating and hot water load, and whether the system is individual or communal.	This has been clearly stated in the Be Clean section. The exhaust system will be individually installed to the 2 no apartments. The scheme number does not pose a feasible option for a communal scheme, with regards to cost, maintenance, infrastructure and space.
Provide an Overheating Risk Assessment in line with CIBSE TM52	This is not required for a minor development, although Part O has been carried out.
Confirm if Mechanical Ventilation with Heat Recovery (MVHR) is proposed and clarify the full ventilation strategy	Clearly outlined in the report, Page 12. It is not conceivable to conduct or produce a full ventilation strategy at this early a stage. This will be picked up at Stage 3
Provide detailed psi-value and U-value calculations supported by build-up specifications.	We have adopted U value targets at this stage and proposed bespoke thermal bridging details, clearly outlined in the SAP documentation. As the design is almost certain to be altered at Stage 4, it is not viable to produce such details at stages 1-2. The concept of the planning stage report is to outline the aspirations of the design
Describe how the proposed structure interfaces with the existing fabric to ensure thermal continuity and avoid thermal bridging.	As above. Within the report, we have specified that the floor between existing and new structure will be insulated to 0.18W/m2k (Part L compliance figures for heat loss floors)
Justify the omission of floor insulation where proposed above heated spaces, and confirm detailing for thermal continuity	As above.

Summary for Input Data



Property Reference	Unit 1 - Harcourt House		Issued on Date	01/08/2024
Assessment Reference	Unit 1 - Harcourt House - GREE	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
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 m²	0.00 m
Ground floor:	30.08 m	63.31 m²	2.50 m
1st Storey:	26.38 m	49.04 m²	2.85 m
2nd Storey:	0.00 m	0.00 m²	0.00 m
3rd Storey:	0.00 m	0.00 m²	0.00 m
4th Storey:	0.00 m	0.00 m²	0.00 m
5th Storey:	0.00 m	0.00 m²	0.00 m
6th Storey:	0.00 m	0.00 m²	0.00 m
7th Storey:	0.00 m	0.00 m²	0.00 m

8.0 Living Area	23.20	m²
-----------------	-------	----

9.0 External Walls									
Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings Area Calculation Type
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/m²K)	Kappa (kJ/m²K)	Area (m²)	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/m²K)	Area (m²)						
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	LED	Efficacy	Power	Capacity	Count
		15.00	5.00	75.00	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	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

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

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
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Recommendations

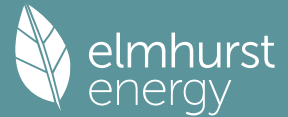
Lower cost measures

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

Full SAP Calculation Printout



Property Reference	Unit 1 - Harcourt House				Issued on Date	01/08/2024
Assessment Reference	Unit 1 - Harcourt House - GREE		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

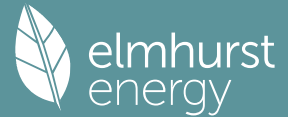
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
New Window (Uw = 1.30)			8.1000	1.2357	10.0095		(27)
Main External Wall	71.3700	8.1000	63.2700	0.1500	9.4905	60.0000	3796.2000 (29a)
External Flat Roof	65.5200		65.5200	0.1000	6.5520	9.0000	589.6800 (30)
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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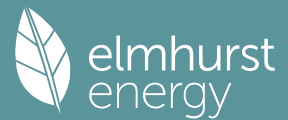
R11 Upstands or kerbs of rooflights	5.7600	0.0800	0.4608
P1 Party wall - Ground floor	3.8720	0.0800	0.3098
P2 Party wall - Intermediate floor within a dwelling	3.8720	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	4.7060	0.1200	0.5647
E20 Exposed floor (normal)	10.4080	0.3200	3.3306
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
Heat transfer coeff	28.0324	27.9580	27.8850
Average = Sum(39)m / 12 =	67.9321	67.9321	67.9321
	Jun	Jul	Aug
HLP	1.0818	1.0806	1.0794
HLP (average)	1.0740	1.0730	1.0721
Days in mont	31	28	31
	Apr	May	Jun
	30	31	30
	Jul	Aug	Sep
	31	31	30
	Oct	Nov	Dec
	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												
Hot water usage for other uses												
Average daily hot water use (litres/day)												131.0128 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	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 conte	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)
Energy content (annual)												Total = Sum(45)m = 2176.1358
Distribution loss (46)m = 0.15 x (45)m												
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												
Combi loss												
Total heat required for water heating calculated for each month												
WWHRS												
PV diverter												
Solar input												
FGHRS												
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		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	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												
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)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												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:												0.0000 (231)
Total electricity for the above, kWh/year												463.7731 (232)
Electricity for lighting (calculated in Appendix L)												

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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)

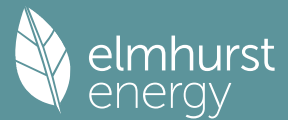
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour
Pressure test		20.0000 / (5) = 0.1264 (8)
Pressure Test Method		Yes
Measured/design AP50		Blower Door
Infiltration rate		5.0000 (17)
Number of sides sheltered		0.3764 (18)
		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3199 (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)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	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)
Average = Sum(39)m / 12 =	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)
												71.6212	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	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)
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	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 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)
												110.6193	(43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	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 content (annual)	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)
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)												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)

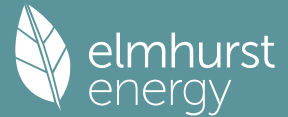
Heat gains from water heating, kWh/month	100.6464	89.4298	95.8621	86.0894	84.7308	77.7205	77.5965	79.8391	79.8082	87.3726	90.9580	99.7638	(65)
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5. Internal gains (see Table 5 and 5a)

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	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)
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	3.3675	3.3675	3.3675	3.3675	3.3675	3.3675	3.3675	3.3675	3.3675	3.3675	3.3675	3.3675	(69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Water heating gains (Table 5)	-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	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)
	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)

6. Solar gains

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[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)
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) =											
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)

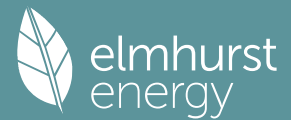
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	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 (217)m	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												
(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)

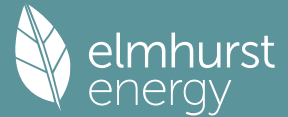
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	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)

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Property Reference	Unit 1 - Harcourt House				Issued on Date	01/08/2024
Assessment Reference	Unit 1 - Harcourt House - GREE		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 FABRIC ENERGY EFFICIENCY

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

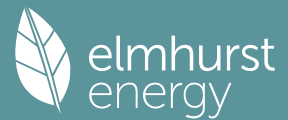
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	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)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5832	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
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	

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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			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	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)
Average = Sum(39)m / 12 =	70.9141	70.7454	70.5800	69.8033	69.6579	68.9814	68.9814	68.8561	69.2420	69.6579	69.9519	70.2593 (39)
												69.8026
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1201	1.1174	1.1148	1.1026	1.1003	1.0896	1.0896	1.0876	1.0937	1.1003	1.1049	1.1098 (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												0.0000 (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)												56.2366 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	61.3537	59.6710	57.8338	55.5467	53.5065	51.3863	50.9455	52.7790	54.6595	56.8369	59.1443	61.2676 (44)
Energy content (annual)	97.1693	84.9707	88.8883	76.0407	72.0301	63.1854	61.6141	65.3514	67.4007	77.1272	84.2618	95.9302 (45)
Distribution loss (46)m = 0.15 x (45)m												933.9701
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
If cylinder contains dedicated solar storage												
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Total heat required for water heating calculated for each month												
WWHRS	82.5939	72.2251	75.5551	64.6346	61.2256	53.7076	52.3720	55.5487	57.2906	65.5581	71.6226	81.5407 (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	82.5939	72.2251	75.5551	64.6346	61.2256	53.7076	52.3720	55.5487	57.2906	65.5581	71.6226	81.5407 (64)
12Total per year (kWh/year)												793.8745 (64)
Electric shower(s)	47.2376	42.0891	45.9596	43.8587	44.6817	42.6220	44.0428	44.6817	43.8587	45.9596	45.0954	47.2376 (64a)
Heat gains from water heating, kWh/month	32.4579	28.5785	30.3787	27.1233	26.4768	24.0824	24.1037	25.0576	25.2873	27.8794	29.1795	32.1946 (65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												794 (64)

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	43.6262	42.5276	40.8316	37.6713	35.5871	33.4478	32.3974	33.6796	35.1213	37.4724	40.5271	43.2723 (72)
	376.0814	387.2712	370.4286	360.4186	342.3623	331.4928	319.2089	318.6106	328.0289	337.2298	356.2566	367.7319 (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	513.4280	613.4594	661.4159	693.4469	692.7813	670.1089	649.4787	636.8785	633.4966	582.0239	519.3007	486.2483 (84)

7. Mean internal temperature (heating season)

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Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	47.4780	47.5912	47.7027	48.2335	48.3342	48.8082	48.8082	48.8970	48.6245	48.3342	48.1310	47.9205
alpha	4.1652	4.1727	4.1802	4.2156	4.2223	4.2539	4.2539	4.2598	4.2416	4.2223	4.2087	4.1947
util living area	0.9823	0.9636	0.9363	0.8787	0.7805	0.6159	0.4574	0.4842	0.6816	0.8855	0.9654	0.9856 (86)
MIT	19.5777	19.8533	20.1536	20.5058	20.7749	20.9395	20.9864	20.9824	20.9033	20.5607	20.0114	19.5299 (87)
Th 2	19.9844	19.9866	19.9887	19.9987	20.0006	20.0094	20.0094	20.0110	20.0060	20.0006	19.9968	19.9929 (88)
util rest of house	0.9781	0.9553	0.9215	0.8502	0.7293	0.5354	0.3590	0.3860	0.6058	0.8529	0.9560	0.9821 (89)
MIT 2	18.7082	18.9792	19.2713	19.6099	19.8473	19.9791	20.0051	20.0051	19.9530	19.6678	19.1452	18.6676 (90)
Living area fraction									fLA = Living area / (4) =			0.3665 (91)
MIT	19.0268	19.2995	19.5947	19.9382	20.1872	20.3310	20.3647	20.3633	20.3012	19.9950	19.4626	18.9836 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0268	19.2995	19.5947	19.9382	20.1872	20.3310	20.3647	20.3633	20.3012	19.9950	19.4626	18.9836 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9729	0.9483	0.9147	0.8483	0.7396	0.5626	0.3950	0.4218	0.6296	0.8527	0.9498	0.9775 (94)
Useful gains	499.5123	581.7583	604.9994	588.2495	512.3852	377.0146	256.5120	268.6266	398.8239	496.3095	493.2180	475.3218 (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	1044.3409	1018.6982	924.2206	770.5039	591.2025	395.3343	259.6946	272.8945	429.3845	654.4348	864.7890	1038.6854 (97)
Space heating kWh	405.3525	293.6236	237.5006	131.2232	58.6401	0.0000	0.0000	0.0000	0.0000	117.6452	267.5311	419.1426 (98a)
Space heating requirement - total per year (kWh/year)												1930.6589
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	405.3525	293.6236	237.5006	131.2232	58.6401	0.0000	0.0000	0.0000	0.0000	117.6452	267.5311	419.1426 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1930.6589
Space heating per m2										(98c) / (4) =		30.4953 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	648.4253	510.4624	523.3066	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8604	0.9197	0.9096	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	557.9049	469.4647	476.0149	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	742.9899	720.9350	708.1361	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	133.2612	187.0939	172.6981	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fc = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	33.3153	46.7735	43.1745	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												123.2633 (107)
Energy for space heating												30.4953 (99)
Energy for space cooling												1.9470 (108)
Total												32.4423 (109)
Fabric Energy Efficiency (DFEE)												32.4 (109)

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

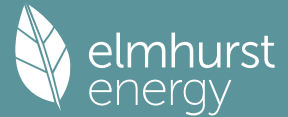
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	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

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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)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	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)
Adj infilt rate	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)
	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)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
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

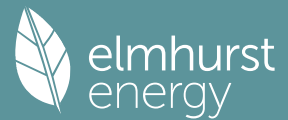
Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opening Type (Uw = 1.20)			8.1000	1.1450	9.2748		(27)
Main External Wall	71.3700	8.1000	63.2700	0.1800	11.3886		(29a)
External Flat Roof	65.5200		65.5200	0.1100	7.2072		(30)
Total net area of external elements 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)

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.0735 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	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)													56.2366 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy content (annual)	61.3537	59.6710	57.8338	55.5467	53.5065	51.3863	50.9455	52.7790	54.6595	56.8369	59.1443	61.2676	(44)
Distribution loss (46)m = 0.15 x (45)m	97.1693	84.9707	88.8883	76.0407	72.0301	63.1854	61.6141	65.3514	67.4007	77.1272	84.2618	95.9302	(45)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	933.9701
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
If cylinder contains dedicated solar storage													
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
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	0.0000 (57)
Total heat required for water heating calculated for each month	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 (59)
	82.5939	72.2251	75.5551	64.6346	61.2256	53.7076	52.3720	55.5487	57.2906	65.5581	71.6226	81.5407	0.0000 (61)
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	0.0000 (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	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	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	0.0000 (63c)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
	82.5939	72.2251	75.5551	64.6346	61.2256	53.7076	52.3720	55.5487	57.2906	65.5581	71.6226	81.5407	(64)
12Total per year (kWh/year)													793.8745 (64)
Electric shower(s)	47.2376	42.0891	45.9596	43.8587	44.6817	42.6220	44.0428	44.6817	43.8587	45.9596	45.0954	47.2376	(64a)
													537.3246 (64a)
Heat gains from water heating, kWh/month	32.4579	28.5785	30.3787	27.1233	26.4768	24.0824	24.1037	25.0576	25.2873	27.8794	29.1795	32.1946	(65)

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

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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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-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)	43.6262	42.5276	40.8316	37.6713	35.5871	33.4478	32.3974	33.6796	35.1213	37.4724	40.5271	43.2723	(72)
Total internal gains	378.9592	390.4574	373.3064	363.3923	345.2401	334.4665	322.0867	321.4884	331.0026	340.1076	359.2303	370.6098	(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)
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	490.3009	573.8195	609.1987	633.3656	629.3114	608.9697	589.8238	579.4960	578.6336	538.5529	491.4040	466.6864 (84)		

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)														
tau	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	0.9852	0.9715	0.9519	0.9080	0.8269	0.6732	0.5101	0.5378	0.7343	0.9103	0.9720	0.9877	(86)	
MIT	19.4794	19.7297	20.0223	20.3916	20.6986	20.9097	20.9777	20.9718	20.8632	20.4716	19.9155	19.4377	(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	0.9816	0.9647	0.9400	0.8840	0.7798	0.5897	0.4007	0.4296	0.6586	0.8824	0.9640	0.9847	(89)	
MIT 2	18.5939	18.8413	19.1284	19.4884	19.7666	19.9394	19.9789	19.9779	19.9054	19.5700	19.0345	18.5590	(90)	
Living area fraction									FLA = Living area / (4) =			0.3665	(91)	
MIT	18.9184	19.1669	19.4559	19.8194	20.1081	20.2950	20.3449	20.3422	20.2564	19.9004	19.3574	18.8810	(92)	
Temperature adjustment												0.0000		
adjusted MIT	18.9184	19.1669	19.4559	19.8194	20.1081	20.2950	20.3449	20.3422	20.2564	19.9004	19.3574	18.8810	(93)	

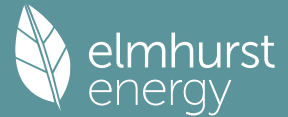
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	478.9011	549.7811	568.2863	557.2127	494.9389	375.5120	259.8532	271.6585	393.7973	473.8739	470.7533	457.5584	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1063.2356	1035.2613	937.9923	782.0688	600.9844	403.2044	265.1388	278.6104	437.4760	664.7609	879.7181	1058.1726	(97)
Space heating kWh	434.7449	326.2427	275.0613	161.8964	78.8978	0.0000	0.0000	0.0000	0.0000	142.0199	294.4547	446.8569	(98a)
Space heating requirement - total per year (kWh/year)												2160.1745	
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	434.7449	326.2427	275.0613	161.8964	78.8978	0.0000	0.0000	0.0000	0.0000	142.0199	294.4547	446.8569	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2160.1745	
Space heating per m2										(98c) / (4) =		34.1206	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b													
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	665.5201	523.9201	537.1280	0.0000	0.0000	0.0000	0.0000	(100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.8083	0.8817	0.8693	0.0000	0.0000	0.0000	0.0000	(101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	537.9184	461.9403	466.9488	0.0000	0.0000	0.0000	0.0000	(102)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	668.3044	648.1169	638.0556	0.0000	0.0000	0.0000	0.0000	(103)
Cooled fraction						93.8780	138.5154	127.3035	0.0000	0.0000	0.0000	0.0000	(104)
Intermittency factor (Table 10b)									fc = cooled area / (4) =			1.0000	(105)
Space cooling kWh	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling requirement	0.0000	0.0000	0.0000	0.0000	0.0000	23.4695	34.6288	31.8259	0.0000	0.0000	0.0000	0.0000	(107)
Energy for space heating												89.9242	(107)
Energy for space cooling												34.1206	(99)
Total												1.4204	(108)
Fabric Energy Efficiency (TFEE)												35.5410	(109)
												35.5	(109)

Full SAP Calculation Printout



Property Reference	Unit 1 - Harcourt House				Issued on Date	01/08/2024
Assessment Reference	Unit 1 - Harcourt House - GREE		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)	2.5000 (2b)	158.2750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.3100		
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

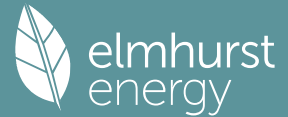
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
New Window (Uw = 1.30)			8.1000	1.2357	10.0095		(27)
Main External Wall	71.3700	8.1000	63.2700	0.1500	9.4905	60.0000	3796.2000 (29a)
External Flat Roof	65.5200		65.5200	0.1000	6.5520	9.0000	589.6800 (30)
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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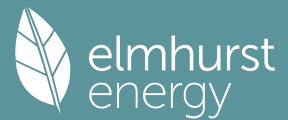
R11 Upstands or kerbs of rooflights	5.7600	0.0800	0.4608
P1 Party wall - Ground floor	3.8720	0.0800	0.3098
P2 Party wall - Intermediate floor within a dwelling	3.8720	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	4.7060	0.1200	0.5647
E20 Exposed floor (normal)	10.4080	0.3200	3.3306
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
Heat transfer coeff	28.0324	27.9580	27.8850
Average = Sum(39)m / 12 =	67.9962	67.9321	67.6336
	Jun	Jul	Aug
	27.1797	27.1797	27.1244
	Sep	Oct	Nov
	27.2946	27.4782	27.6079
	Dec		
	27.7435		
	68.1975 (39)		
	67.9959		
HLP	Jan	Feb	Mar
HLP (average)	1.0818	1.0806	1.0794
Days in mont	31	28	31
	Apr	May	Jun
	1.0740	1.0730	1.0683
	Jul	Aug	Sep
	1.0683	1.0674	1.0701
	Oct	Nov	Dec
	1.0730	1.0751	1.0772 (40)
			1.0740
			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												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												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	26.1144	23.5872	26.1144	25.2720	26.1144	25.2720	26.1144	26.1144	25.2720	26.1144	25.2720	26.1144 (56)
If cylinder contains dedicated solar storage	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)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	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)
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	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)
12Total per year (kWh/year)												2483.6118 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	75.0186	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	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	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)
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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-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)	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)
Total internal gains	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 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		0.6800		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)

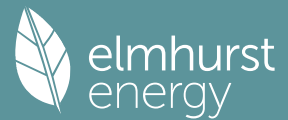
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1264 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3764	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 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)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	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)
Average = Sum(39)m / 12 =	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)
												71.6212	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	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)
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	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 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)
												110.6193	(43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	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 content (annual)	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)
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)												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)

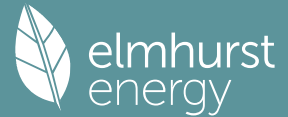
Heat gains from water heating, kWh/month	100.6464	89.4298	95.8621	86.0894	84.7308	77.7205	77.5965	79.8391	79.8082	87.3726	90.9580	99.7638	(65)
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5. Internal gains (see Table 5 and 5a)

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	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)
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	3.3675	3.3675	3.3675	3.3675	3.3675	3.3675	3.3675	3.3675	3.3675	3.3675	3.3675	3.3675	(69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Water heating gains (Table 5)	-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	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)
	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)

6. Solar gains

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[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)
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) =											
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)

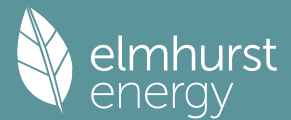
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	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 (217)m	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												
(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)

Energy Report



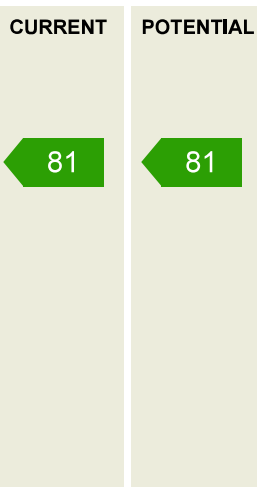
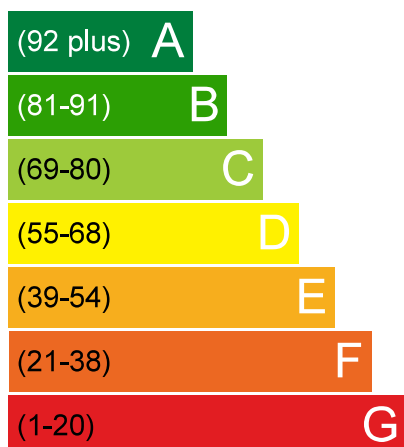
Dwelling Address	
Reference	Unit 1 - Harcourt House-Unit 1 - Harcourt House - GREE
Assessment Date	20/03/2024
Submission Date	
Property Type	Flat, Semi-Detached
Total Floor Area	63

This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

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

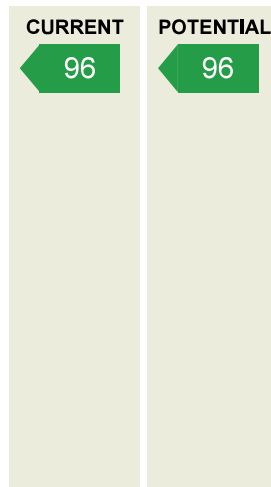
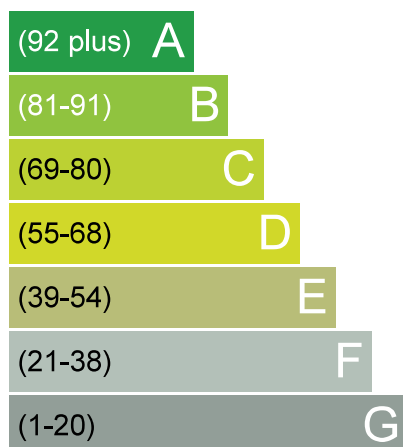
Energy Efficiency Rating

Most energy efficient - lower running costs

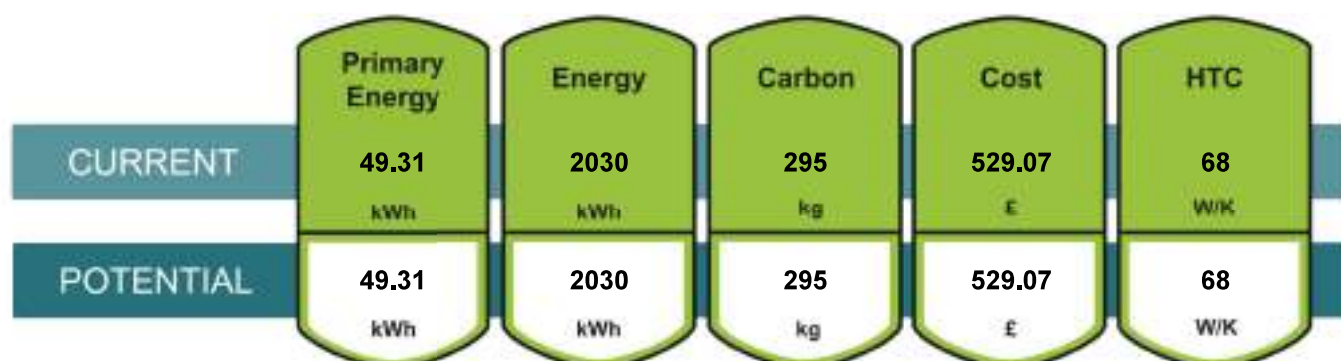


Carbon Dioxide (CO2) Emissions Rating

Very environmentally friendly - lower CO2 emissions



Additional ratings for your home



Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor	Poor	Average	Good	Very Good
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Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.15 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

Recommendations

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

Recommended measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating
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The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

Estimated energy cost for
this property over a year

£529

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.

Estimated energy use and potential savings



Space Heating

441

kWh per year



Water Heating

1125

kWh per year

About this document

Created by:

Company/Trading name:

Phone number:

Email address:

Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g. heating system) is working correctly.

This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.

This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.

The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO ₂)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.

Summary for Input Data

Property Reference	Unit 1 - Harcourt House		Issued on Date	01/08/2024
Assessment Reference	Unit 2 - Harcourt House - GREE	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
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 m²	0.00 m
Ground floor:	30.08 m	63.31 m²	2.50 m
1st Storey:	26.38 m	49.04 m²	2.85 m
2nd Storey:	0.00 m	0.00 m²	0.00 m
3rd Storey:	0.00 m	0.00 m²	0.00 m
4th Storey:	0.00 m	0.00 m²	0.00 m
5th Storey:	0.00 m	0.00 m²	0.00 m
6th Storey:	0.00 m	0.00 m²	0.00 m
7th Storey:	0.00 m	0.00 m²	0.00 m

8.0 Living Area	23.20	m²
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9.0 External Walls									
Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings Area Calculation Type
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/m²K)	Kappa (kJ/m²K)	Area (m²)	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/m²K)	Area (m²)						
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	LED	Efficacy	Power	Capacity	Count
		15.00	5.00	75.00	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 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

Full SAP Calculation Printout



Property Reference	Unit 1 - Harcourt House			Issued on Date	01/08/2024
Assessment Reference	Unit 2 - Harcourt House - GREE	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

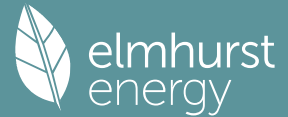
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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)						(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



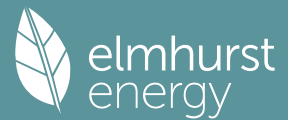
R11 Upstands or kerbs of rooflights	5.7600	0.0800	0.4608
P1 Party wall - Ground floor	3.8720	0.0800	0.3098
P2 Party wall - Intermediate floor within a dwelling	3.8720	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	4.7060	0.1200	0.5647
E20 Exposed floor (normal)	10.4080	0.3200	3.3306
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
Heat transfer coeff	28.0324	27.9580	27.8850
Average = Sum(39)m / 12 =	67.9962	67.9321	67.6336
	Jun	Jul	Aug
	27.1797	27.1797	27.1244
	Sep	Oct	Nov
	27.2946	27.4782	27.6079
	Dec		
	27.7435		
	68.1975 (39)		
	67.9959		
HLP	Jan	Feb	Mar
HLP (average)	1.0818	1.0806	1.0794
Days in mont	31	28	31
	Apr	May	Jun
	1.0740	1.0730	1.0683
	Jul	Aug	Sep
	1.0683	1.0674	1.0701
	Oct	Nov	Dec
	1.0730	1.0751	1.0772 (40)
			1.0740
			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												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												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	26.1144	23.5872	26.1144	25.2720	26.1144	25.2720	26.1144	26.1144	25.2720	26.1144	25.2720	26.1144 (56)
If cylinder contains dedicated solar storage	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)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	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)
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	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)
12Total per year (kWh/year)												2483.6118 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	75.0186	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	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	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)
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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-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)	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)
Total internal gains	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	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	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)

Full SAP Calculation Printout



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												
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												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 (216)
(217)m	220.6850	220.6850	220.6850	220.6850	220.6850	220.6850	220.6850	220.6850	220.6850	220.6850	220.6850	220.6850 (217)
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)

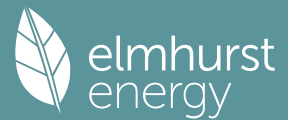
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour
Pressure test		20.0000 / (5) = 0.1264 (8)
Pressure Test Method		Yes
Measured/design AP50		Blower Door
Infiltration rate		5.0000 (17)
Number of sides sheltered		0.3764 (18)
		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3199 (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)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	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)
Average = Sum(39)m / 12 =	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)
												71.6212	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	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)
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	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 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)
												110.6193	(43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	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 content (annual)	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)
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)												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)

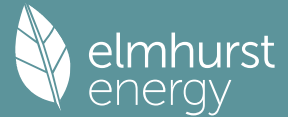
Heat gains from water heating, kWh/month	100.6464	89.4298	95.8621	86.0894	84.7308	77.7205	77.5965	79.8391	79.8082	87.3726	90.9580	99.7638	(65)
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5. Internal gains (see Table 5 and 5a)

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	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)
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	3.3675	3.3675	3.3675	3.3675	3.3675	3.3675	3.3675	3.3675	3.3675	3.3675	3.3675	3.3675	(69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Water heating gains (Table 5)	-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	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)
	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)

6. Solar gains

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[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)
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) =											
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)

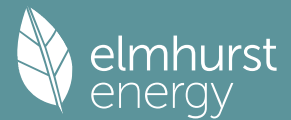
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	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 (217)m	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												
(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)

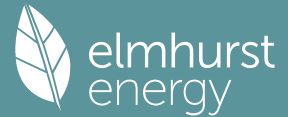
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	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)

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Property Reference	Unit 1 - Harcourt House				Issued on Date	01/08/2024
Assessment Reference	Unit 2 - Harcourt House - GREE		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 FABRIC ENERGY EFFICIENCY

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

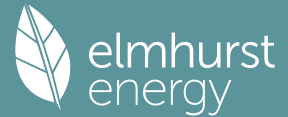
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	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)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5832	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
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	

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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			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	30.4601	30.2914	30.1261	29.3493	29.2040	28.5275	28.5275	28.4022	28.7881	29.2040	29.4980	29.8053
Average = Sum(39)m / 12 =	70.9141	70.7454	70.5800	69.8033	69.6579	68.9814	68.9814	68.8561	69.2420	69.6579	69.9519	70.2593
												69.8026
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1201	1.1174	1.1148	1.1026	1.1003	1.0896	1.0896	1.0876	1.0937	1.1003	1.1049	1.1098
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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	25.4889	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)												56.2366 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	61.3537	59.6710	57.8338	55.5467	53.5065	51.3863	50.9455	52.7790	54.6595	56.8369	59.1443	61.2676 (44)
Energy content (annual)	97.1693	84.9707	88.8883	76.0407	72.0301	63.1854	61.6141	65.3514	67.4007	77.1272	84.2618	95.9302 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	82.5939	72.2251	75.5551	64.6346	61.2256	53.7076	52.3720	55.5487	57.2906	65.5581	71.6226	81.5407 (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	82.5939	72.2251	75.5551	64.6346	61.2256	53.7076	52.3720	55.5487	57.2906	65.5581	71.6226	81.5407 (64)
12Total per year (kWh/year)												793.8745 (64)
Electric shower(s)	47.2376	42.0891	45.9596	43.8587	44.6817	42.6220	44.0428	44.6817	43.8587	45.9596	45.0954	47.2376 (64a)
Heat gains from water heating, kWh/month	32.4579	28.5785	30.3787	27.1233	26.4768	24.0824	24.1037	25.0576	25.2873	27.8794	29.1795	32.1946 (65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												537.3246 (64a)

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	43.6262	42.5276	40.8316	37.6713	35.5871	33.4478	32.3974	33.6796	35.1213	37.4724	40.5271	43.2723 (72)
	376.0814	387.2712	370.4286	360.4186	342.3623	331.4928	319.2089	318.6106	328.0289	337.2298	356.2566	367.7319 (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	0.6800	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	513.4280	613.4594	661.4159	693.4469	692.7813	670.1089	649.4787	636.8785	633.4966	582.0239	519.3007	486.2483 (84)

7. Mean internal temperature (heating season)

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Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	47.4780	47.5912	47.7027	48.2335	48.3342	48.8082	48.8082	48.8970	48.6245	48.3342	48.1310	47.9205
alpha	4.1652	4.1727	4.1802	4.2156	4.2223	4.2539	4.2539	4.2598	4.2416	4.2223	4.2087	4.1947
util living area	0.9823	0.9636	0.9363	0.8787	0.7805	0.6159	0.4574	0.4842	0.6816	0.8855	0.9654	0.9856 (86)
MIT	19.5777	19.8533	20.1536	20.5058	20.7749	20.9395	20.9864	20.9824	20.9033	20.5607	20.0114	19.5299 (87)
Th 2	19.9844	19.9866	19.9887	19.9987	20.0006	20.0094	20.0094	20.0110	20.0060	20.0006	19.9968	19.9929 (88)
util rest of house	0.9781	0.9553	0.9215	0.8502	0.7293	0.5354	0.3590	0.3860	0.6058	0.8529	0.9560	0.9821 (89)
MIT 2	18.7082	18.9792	19.2713	19.6099	19.8473	19.9791	20.0051	20.0051	19.9530	19.6678	19.1452	18.6676 (90)
Living area fraction									fLA = Living area / (4) =			0.3665 (91)
MIT	19.0268	19.2995	19.5947	19.9382	20.1872	20.3310	20.3647	20.3633	20.3012	19.9950	19.4626	18.9836 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0268	19.2995	19.5947	19.9382	20.1872	20.3310	20.3647	20.3633	20.3012	19.9950	19.4626	18.9836 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9729	0.9483	0.9147	0.8483	0.7396	0.5626	0.3950	0.4218	0.6296	0.8527	0.9498	0.9775 (94)
Useful gains	499.5123	581.7583	604.9994	588.2495	512.3852	377.0146	256.5120	268.6266	398.8239	496.3095	493.2180	475.3218 (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	1044.3409	1018.6982	924.2206	770.5039	591.2025	395.3343	259.6946	272.8945	429.3845	654.4348	864.7890	1038.6854 (97)
Space heating kWh	405.3525	293.6236	237.5006	131.2232	58.6401	0.0000	0.0000	0.0000	0.0000	117.6452	267.5311	419.1426 (98a)
Space heating requirement - total per year (kWh/year)												1930.6589
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	405.3525	293.6236	237.5006	131.2232	58.6401	0.0000	0.0000	0.0000	0.0000	117.6452	267.5311	419.1426 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1930.6589
Space heating per m2										(98c) / (4) =		30.4953 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W												
	0.0000	0.0000	0.0000	0.0000	0.0000	648.4253	510.4624	523.3066	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8604	0.9197	0.9096	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	557.9049	469.4647	476.0149	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	742.9899	720.9350	708.1361	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	133.2612	187.0939	172.6981	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fc = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	33.3153	46.7735	43.1745	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												123.2633 (107)
Energy for space heating												30.4953 (99)
Energy for space cooling												1.9470 (108)
Total												32.4423 (109)
Fabric Energy Efficiency (DFEE)												32.4 (109)

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

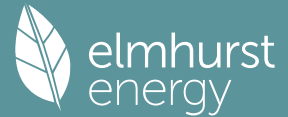
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	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)
Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1264 (8)
Pressure test	Yes
Pressure Test Method	Blower Door

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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)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	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)
Adj infilt rate	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)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	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)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23b)
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 (23c)
												(25)

3. Heat losses and heat loss parameter

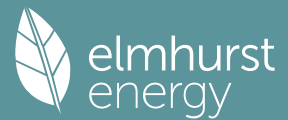
Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opening Type (Uw = 1.20)			8.1000	1.1450	9.2748		(27)
Main External Wall	71.3700	8.1000	63.2700	0.1800	11.3886		(29a)
External Flat Roof	65.5200		65.5200	0.1100	7.2072		(30)
Total net area of external elements 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)

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.0735 (42)
Hot water usage for mixer showers													0.0000 (42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	25.4889 (42b)
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	35.8648 (42c)
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	56.2366 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	61.3537	59.6710	57.8338	55.5467	53.5065	51.3863	50.9455	52.7790	54.6595	56.8369	59.1443	61.2676 (44)	
Energy content (annual)	97.1693	84.9707	88.8883	76.0407	72.0301	63.1854	61.6141	65.3514	67.4007	77.1272	84.2618	95.9302 (45)	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)	
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)	
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)	
Total heat required for water heating calculated for each month	82.5939	72.2251	75.5551	64.6346	61.2256	53.7076	52.3720	55.5487	57.2906	65.5581	71.6226	81.5407 (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	82.5939	72.2251	75.5551	64.6346	61.2256	53.7076	52.3720	55.5487	57.2906	65.5581	71.6226	81.5407 (64)	
12Total per year (kWh/year)													794 (64)
Electric shower(s)	47.2376	42.0891	45.9596	43.8587	44.6817	42.6220	44.0428	44.6817	43.8587	45.9596	45.0954	47.2376 (64a)	
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													537.3246 (64a)
Heat gains from water heating, kWh/month	32.4579	28.5785	30.3787	27.1233	26.4768	24.0824	24.1037	25.0576	25.2873	27.8794	29.1795	32.1946 (65)	

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

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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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-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)	43.6262	42.5276	40.8316	37.6713	35.5871	33.4478	32.3974	33.6796	35.1213	37.4724	40.5271	43.2723	(72)
Total internal gains	378.9592	390.4574	373.3064	363.3923	345.2401	334.4665	322.0867	321.4884	331.0026	340.1076	359.2303	370.6098	(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)
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	490.3009	573.8195	609.1987	633.3656	629.3114	608.9697	589.8238	579.4960	578.6336	538.5529	491.4040	466.6864 (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	0.9852	0.9715	0.9519	0.9080	0.8269	0.6732	0.5101	0.5378	0.7343	0.9103	0.9720	0.9877	(86)	
MIT	19.4794	19.7297	20.0223	20.3916	20.6986	20.9097	20.9777	20.9718	20.8632	20.4716	19.9155	19.4377	(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	0.9816	0.9647	0.9400	0.8840	0.7798	0.5897	0.4007	0.4296	0.6586	0.8824	0.9640	0.9847	(89)	
MIT 2	18.5939	18.8413	19.1284	19.4884	19.7666	19.9394	19.9789	19.9779	19.9054	19.5700	19.0345	18.5590	(90)	
Living area fraction									FLA = Living area / (4) =			0.3665	(91)	
MIT	18.9184	19.1669	19.4559	19.8194	20.1081	20.2950	20.3449	20.3422	20.2564	19.9004	19.3574	18.8810	(92)	
Temperature adjustment												0.0000		
adjusted MIT	18.9184	19.1669	19.4559	19.8194	20.1081	20.2950	20.3449	20.3422	20.2564	19.9004	19.3574	18.8810	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains	478.9011	549.7811	568.2863	557.2127	494.9389	375.5120	259.8532	271.6585	393.7973	473.8739	470.7533	457.5584	(94)	
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)	
Heat loss rate W	1063.2356	1035.2613	937.9923	782.0688	600.9844	403.2044	265.1388	278.6104	437.4760	664.7609	879.7181	1058.1726	(97)	
Space heating kWh	434.7449	326.2427	275.0613	161.8964	78.8978	0.0000	0.0000	0.0000	0.0000	142.0199	294.4547	446.8569	(98a)	
Space heating requirement - total per year (kWh/year)												2160.1745		
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	434.7449	326.2427	275.0613	161.8964	78.8978	0.0000	0.0000	0.0000	0.0000	142.0199	294.4547	446.8569	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												2160.1745		
Space heating per m2										(98c) / (4) =		34.1206	(99)	

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000		
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	665.5201	523.9201	537.1280	0.0000	0.0000	0.0000	0.0000	(100)	
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8083	0.8817	0.8693	0.0000	0.0000	0.0000	0.0000	(101)	
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	537.9184	461.9403	466.9488	0.0000	0.0000	0.0000	0.0000	(102)	
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	668.3044	648.1169	638.0556	0.0000	0.0000	0.0000	0.0000	(103)	
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	93.8780	138.5154	127.3035	0.0000	0.0000	0.0000	0.0000	(104)	
Cooled fraction									fc = cooled area / (4) =			1.0000	(105)	
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)	
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	23.4695	34.6288	31.8259	0.0000	0.0000	0.0000	0.0000	(107)	
Space cooling requirement												89.9242	(107)	
Energy for space heating												34.1206	(99)	
Energy for space cooling												1.4204	(108)	
Total												35.5410	(109)	
Fabric Energy Efficiency (TFEE)												35.5	(109)	

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Property Reference	Unit 1 - Harcourt House			Issued on Date	01/08/2024
Assessment Reference	Unit 2 - Harcourt House - GREE	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)

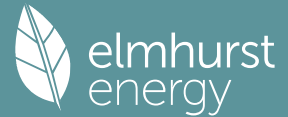
3. Heat losses and heat loss parameter

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	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

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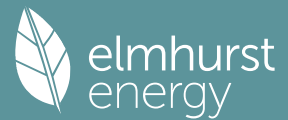
R11 Upstands or kerbs of rooflights	5.7600	0.0800	0.4608
P1 Party wall - Ground floor	3.8720	0.0800	0.3098
P2 Party wall - Intermediate floor within a dwelling	3.8720	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	4.7060	0.1200	0.5647
E20 Exposed floor (normal)	10.4080	0.3200	3.3306
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
Heat transfer coeff	28.0324	27.9580	27.8850
Average = Sum(39)m / 12 =	67.9962	67.9321	67.6336
	Jun	Jul	Aug
	27.1797	27.1797	27.1244
	Sep	Oct	Nov
	27.2946	27.4782	27.6079
	Dec		
	27.7435		
	68.1975 (39)		
	67.9959		
HLP	Jan	Feb	Mar
HLP (average)	1.0818	1.0806	1.0794
Days in mont	31	28	31
	Apr	May	Jun
	1.0740	1.0730	1.0683
	Jul	Aug	Sep
	1.0683	1.0674	1.0701
	Oct	Nov	Dec
	1.0730	1.0751	1.0772 (40)
			1.0740
			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												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	26.1144	23.5872	26.1144	25.2720	26.1144	25.2720	26.1144	26.1144	25.2720	26.1144	25.2720	26.1144 (56)
If cylinder contains dedicated solar storage	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)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	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)
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	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)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2483.6118 (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	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	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	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 (216)
(217)m	220.6850	220.6850	220.6850	220.6850	220.6850	220.6850	220.6850	220.6850	220.6850	220.6850	220.6850	220.6850 (217)
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)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	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)
Average = Sum(39)m / 12 =	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)
												71.6212	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	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)
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	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	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	35.8648	(42c)
Average daily hot water use (litres/day)												110.6193	(43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
120.3393	117.7701	114.6411	109.8826	106.0186	101.8644	100.2674	103.3829	106.6687	111.0299	115.8618	120.0271	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)													
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	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	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)												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)

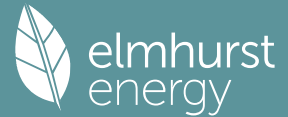
Heat gains from water heating, kWh/month	100.6464	89.4298	95.8621	86.0894	84.7308	77.7205	77.5965	79.8391	79.8082	87.3726	90.9580	99.7638	(65)
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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
103.6754	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	103.3533	(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	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	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	-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	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)

6. Solar gains

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[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)
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) =											
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)

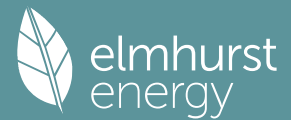
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	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 (217)m	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												
(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)											

Full SAP Calculation Printout



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)

Energy Report

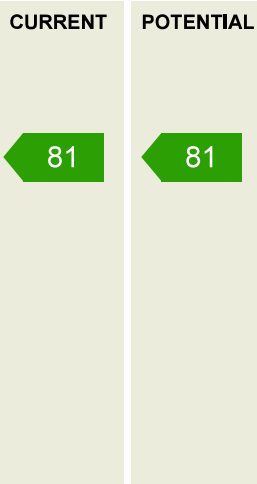
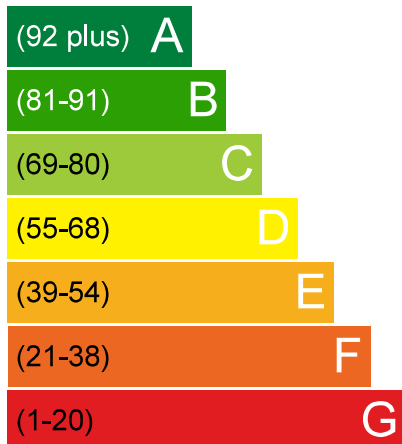
Dwelling Address	
Reference	Unit 1 - Harcourt House-Unit 2 - Harcourt House - GREE
Assessment Date	01/08/2024
Submission Date	
Property Type	Flat, Semi-Detached
Total Floor Area	63

This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

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

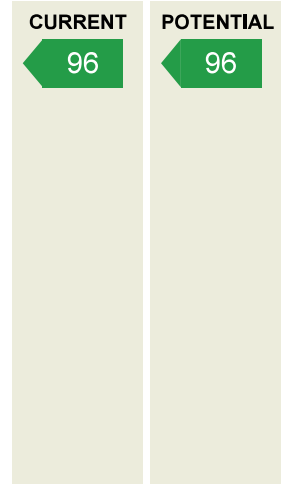
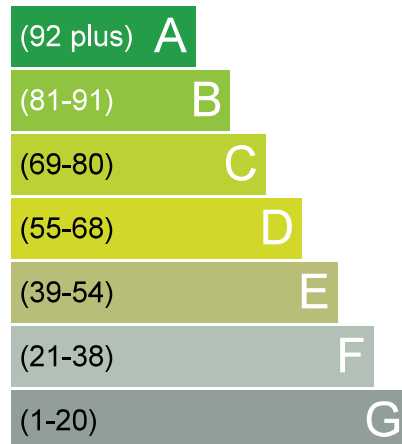
Energy Efficiency Rating

Most energy efficient - lower running costs

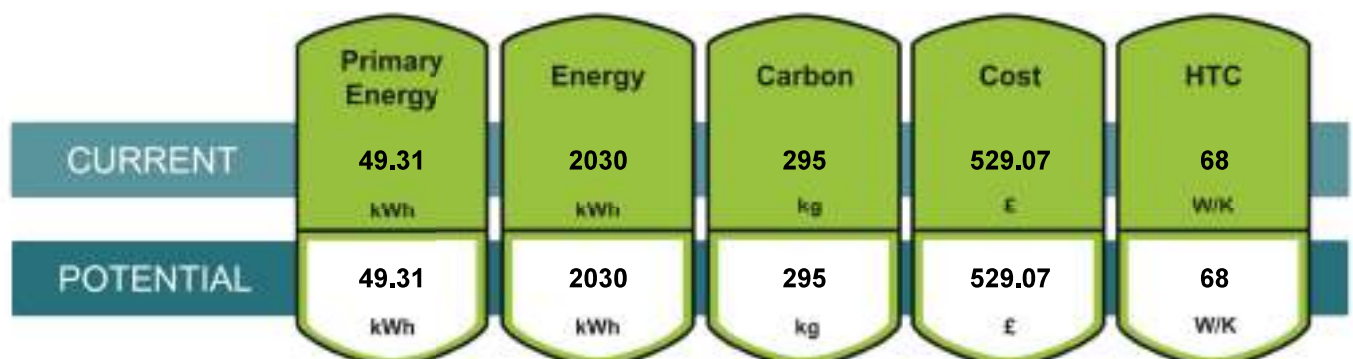


Carbon Dioxide (CO2) Emissions Rating

Very environmentally friendly - lower CO2 emissions



Additional ratings for your home



Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor	Poor	Average	Good	Very Good
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Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.15 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

Recommendations

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

Recommended measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating
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The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

Estimated energy cost for
this property over a year

£529

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.

Estimated energy use and potential savings



Space Heating

441

kWh per year



Water Heating

1125

kWh per year

About this document

Created by:

Company/Trading name:

Phone number:

Email address:

Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g. heating system) is working correctly.

This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.

This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.

The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO ₂)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.

SAP 2021

	Carbon dioxide emissions (Tonnes CO2 per annum)		
	Regulated	Unregulated	
Baseline: Part L 2013 of the Building Regulations Compliant Development	A	1.49	16.61
After Energy Demand Reduction (Be Lean)	B	1.11	16.61
After Energy Efficient Features (Be Clean)	C	0.57	16.61
After Renewable Energy (Be Green)	D	0.55	16.61

Table 3: Carbon Dioxide Emissions after each stage of the Energy Hierarchy for domestic buildings

	Regulated Carbon dioxide savings			
	(Tonnes CO2 per annum)		(%)	
Savings from Be Lean Measures	A-B	0.39	$(A-B)/A*100$	25.84
Savings from Be Clean Measures	B-C	0.53	$(B-C)/A*100$	35.69
Savings from Be Green Measures	C-D	0.03	$(C-D)/A*100$	1.86
Total Cumulative Savings	A-D = E	0.95	$(A-D)/A*100$	63.38

1. Dimensions given in millimetres unless stated otherwise.
2. All levels are in metres above AOD unless stated otherwise.
3. All dimensions to be verified on site prior to proceeding, and all discrepancies to be notified in writing to the Client.
4. The Client is to be informed of any inaccuracies of the existing works or surroundings.

Notes

Revisions		
Rev.	Description	Date
A	Planning Application	27.03.2024
B	Planning Application - Revision	12.11.2024
C	Planning Application - Revision	06.04.2025
D	Planning Application - Revision	10.06.2025

Project 214-HAR
Roof extension and internal refurbishment

Client
Upspace Construction Services Ltd.

Architect
COOKE 1-2 Herbal Hill
FAWCETT London, EC1R 5EF
ARCHITECTS +44 (0)20 7078 4030

Scale
1:50 NOT FOR
at A1 size CONSTRUCTION

Drawing Title
Proposed Roof Plan

Drawing No.
CF-214-DR-1140-D

Harcourt House
No.09
(New dwelling)
GIA : 54.2m²

Harcourt House
No.10
(New dwelling)
GIA : 53.4m²

No.15

No.18

HARINGEY PARK

1 ROOF PLAN
PROPOSED