



WHITECODE
CONSULTING

Energy & Sustainability Strategy

Retirement scheme

Courthouse Farm Copthorne

Prepared for Option Two Development Ltd.

12647-WCL-ZZ-ZZ-RP-Y-0002

Rev 01

October 2025

Executive Summary

This energy and sustainability strategy has been prepared by Whitecode Consulting to accompany an application for outline planning permission for the development at Courthouse Farm, Copthorne. The planning application is submitted on behalf of Option Two Development Ltd.

It is completed in line with energy requirements for the site and the Mid Sussex District Plan, adopted March 2018, which set out long term energy and sustainability related standards for the area. The site description is as follows:

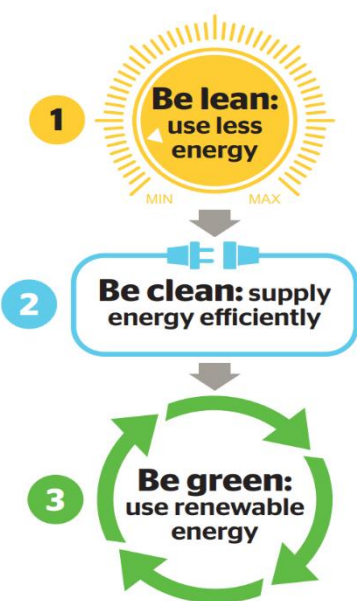
Outline planning application for the erection of an extra-care retirement community comprising around 101 dwellings (Use Class C2) and a community pavilion, including associated parking, outdoor amenity space, landscaping and drainage, and other associated works, with all matters reserved except for the new access proposed from Copthorne Common Road.

The new build retirement dwellings have been assessed against Part L1A 2021 of the Building Regulations using the Standard Assessment Procedure (SAP) 10.2 methodology along with the Simplified Building Energy Model for the Pavilion. The communal amenity spaces and heated corridors in the Pavilion (retirement living block) have been assessed under L2A. The strategy outlines the proposed energy strategy for the site following the energy hierarchy Be Lean – Be Clean – Be Green

Energy efficiency is the first stage of the energy hierarchy. Energy demand should be reduced as far as possible before the heating strategy and installation of low-carbon and renewable technologies is considered. This is important in protecting consumers from high prices.

This report concludes that the proposed **site-wide** development will achieve a 46% improvement over Part L 2021 of the Building Regulations.

Although the Mid Sussex District Plan does not require a specific carbon reduction, the scheme has been designed to use highly efficient Air Source Heat Pumps (ASHPs) and Photovoltaic (PV) panels to fall in line with the Future Homes Standard in 2026.



- **Be Lean** – improved building fabric specification to exceed that of the notional building, low air permeability target, thermal bridging details and selection of energy efficient services.
- **Be Clean** – connection to a district heat network and installation of Combined Heat and Power (CHP) have been investigated for the site and not been deemed either available or appropriate at this time.
- **Be Green** – Houses will be heated with ASHPs and apartments will have Electric Panels with heat pump hot water cylinders. There will be photovoltaic (PV) panels provided to each house types and apartments. The communal area will be heated with air source heat pump.

This report concludes that the proposed development will achieve a **46% improvement** over Part L 2021 of the Building Regulations.

The following table demonstrates the overall reduction in regulated carbon emissions of the development after each stage of the energy hierarchy.

	Carbon dioxide emissions (tonnes CO ₂ per annum)
	Site wide
Baseline: Part L 2021 of the Building Regulations compliant development	116.6
After fabric efficiency (Be Lean)	113.2
After renewable energy (Be Green)	63.0
% carbon reduction	46%

The scheme meets the sustainability requirements of the Mid Sussex District Plan for air quality, noise pollution, water use, flood risk, waste reduction, transport and ecology.

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Revisions:

Rev No:	Date:	Status/Comments:	Prepared by:	Checked by:
P01	29/10/25	First Issue	SR	EH

1. Introduction

The purpose of this report is to show how the client can address the relevant energy conditions for the proposed development located at Courthouse Farm, Copthorne. These conditions are highlighted below.

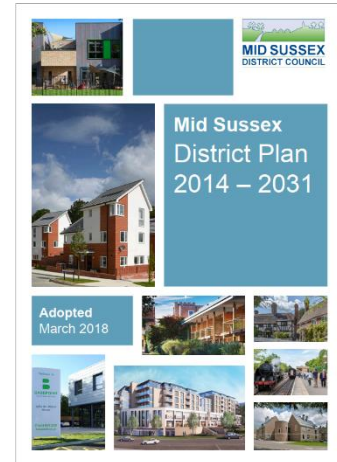
1.1. National Planning Policy and Targets

The proposed development will be constructed to be compliant with Part L 2021 of the Building Regulations. The proposed development consists of new build dwellings, under Part L1A 2021 of the Building Regulations and new build retirement Pavilion space under Part L2A 2021. They mandate that the design of the building demonstrably causes lower carbon dioxide (CO₂) emissions than a notional equivalent of given specifications.

The National Planning Policy Framework (NPPF) was updated in February 2025, which re-emphasises the Government's commitment to sustainable development and states the need for planning authorities to take an approach based on integrating the four aims of sustainable development. The document also refers to the Government's energy policies and objectives. It sets out key principles that regional planning bodies and local planning authorities should adhere to in their approach to planning for renewable energy.

1.2. Local Planning Policies

The proposed development lies in Mid Sussex, therefore, the applicable District Planning Policy is the Mid Sussex District Plan, adopted 2018.



The planning policies of relevance to energy and sustainability in the Local Plan are as follows:

- Policy DP39: Sustainable Design and Construction
- Policy DP40: Renewable Energy Schemes
- Policy DP41: Flood Risk and Drainage
- Policy DP42: Water Infrastructure and the Water Environment

Energy use should be prioritised in line with the Energy Hierarchy. The first priority is to be lean. This is to ensure less overall energy use with good building design and high energy efficiency using passive design measures, such as building orientation, internal and external building layout, tree planting (prioritising endemic and deciduous species) and the size and location of windows.

The second priority is to be clean; to use energy that is supplied efficiently. Developments should consider connecting to decentralised energy networks (energy generated off the energy grid). This can include technologies such as solar energy and water, heat pumps, biomass-fuelled energy generation and larger-scale schemes, such as Combined Heat and Power (CHP) systems.

The final priority is to be green and use renewable low or zero carbon energy sources. To reduce the impact on the environment and contribute towards the borough becoming carbon neutral, energy generation using sustainable sources is strongly encouraged.

1.3 The Development

The Development is for the construction of 14 houses and 87 apartment units along with a community centre. The dwellings have been modelled using the Standard Assessment Procedure (SAP) 10.2 methodology.



Figure 1.1 Proposed Site Plan

The site consists of:

- 16 1B2P flats
- 14 2B3P houses
- 55 2B4P flats
- 16 3B6P flats
- Community Centre "Pavilion"

2 Baseline Energy Consumption & Carbon Emissions

An assessment of the site's potential energy use was conducted in compliance with the minimum requirements of Part L1A 2021 of the Building Regulations.

The energy assessment must first establish the regulated CO₂ emissions baseline assuming the development complied with Part L 2021 of the Building Regulations using Building Regulations approved compliance software.

Regulated energy is calculated as follows:

Dwellings: Dwelling CO₂ Emissions Rates (DER) have been calculated through Part L 2021 of the Building Regulations methodology SAP 10.2. A representative sample of dwellings has been selected to model covering all unit types, orientations and floor levels.

Non-residential: a Building CO₂ Emissions Rate (BER) has been calculated through Part L 2021 of the Building Regulations methodology based on the National Calculation Methodology (NCM) and implemented through Simplified Building Energy Model (SBEM) v6.1.b

To determine the CO₂ emissions baseline, the Target Emission Rate (TER) from the Be Lean model is used.

Regulated carbon dioxide emissions (tonnes CO ₂ per annum)	Site wide
Baseline: Part L 2021 of the Building Regulations compliant development	116.6

Table 2.1 Baseline carbon emissions

Approved Document L1A also includes the fabric energy efficiency (FEE) which is a measure of the amount of energy which would normally be needed to maintain comfortable internal temperatures and can be influenced by fabric U-values, thermal bridging, air permeability and thermal mass.

Fabric Energy Efficiency	kWh/m ²
Part L1A Target Fabric Energy Efficiency Rate (TFEE)	36.05

Table 2.2 Target fabric energy efficiency

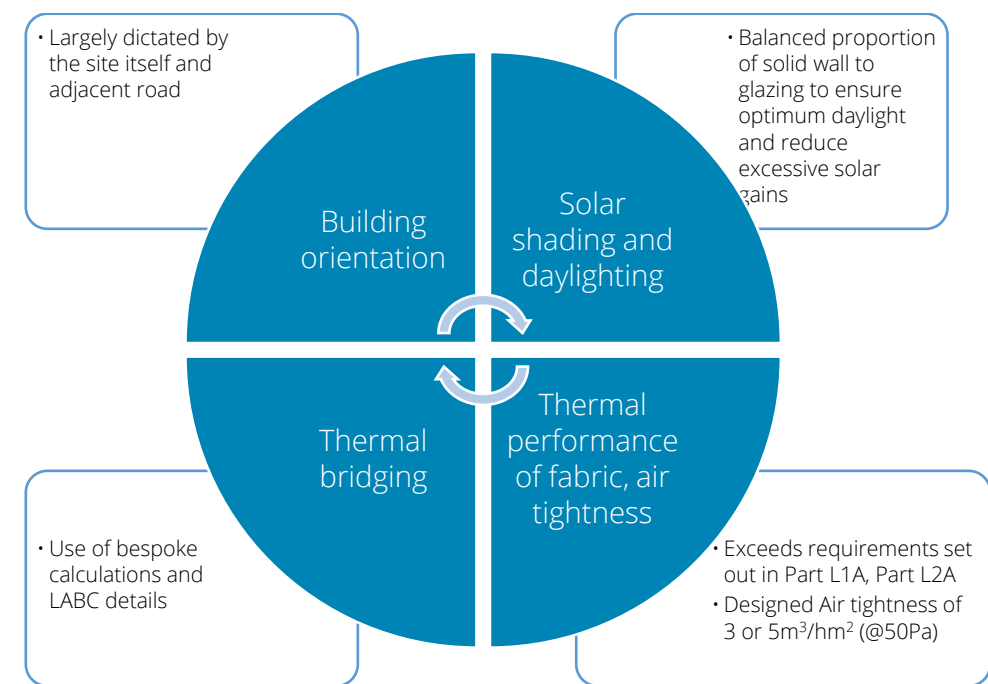
3 'Be Lean' – Energy Efficient Design

An assessment of the site's potential energy use was conducted in compliance with the minimum requirements of Part L1 2021 of the Building Regulations.

Local planning guidelines require a reduction in the CO₂ emissions of the proposed scheme by energy-efficient measures. A number of energy-efficient measures are considered below.

3.1 Passive Design Measures

Passive design measures involve adapting building massing, layout and glazing to best respond to the local climate and annual sun path in order to reduce energy demands.



The table below shows the proposed building fabric against Part L of the Building Regulations. Approximately 50% of heat is lost through the fabric of a building. This includes walls, floors, windows, roofs and the thermal bridging connecting them. The remaining 50% is lost through uncontrolled ventilation through gaps around doors, windows, and any service penetrations.

Element:	Part L 2021 Limiting Values:	Domestic design	Non-domestic design
Floors	0.25 W/m ² K	0.12 W/m ² K	0.11 W/m ² K
External Walls	0.30 W/m ² K	0.15 W/m ² K	0.18 W/m ² K
Roof	0.20 W/m ² K	0.12 W/m ² K	0.12 W/m ² K
Front Doors	2.00 W/m ² K	1.20 W/m ² K	1.60 W/m ² K
Windows	2.00 W/m ² K	1.20 W/m ² K	1.40 W/m ² K
Window g-value	N/A	0.63	0.30
Air Permeability Rate	10m ³ /hm ² (@50Pa)	House: 5 m ³ /hm ² (@50Pa) Apartments: 3 m ³ /hm ² (@50Pa)	3 m ³ /hm ² (@50Pa)

Table 3.1 Proposed U-values

A thermal bridge, also called a cold bridge, is an area of a building construction which has a significantly higher heat transfer than the surrounding materials. This is typically where there is either a break in the insulation, less insulation or the insulation is penetrated by an element with a higher thermal conductivity. Where the building is situated in a cold climate (such as the UK) this can result in additional heat loss at these points.

Around 30% of the total heat loss through a building's fabric can be caused by thermal bridging. Indications are that better detailing and improved air tightness can reduce a dwelling's annual CO₂ emissions by up to 10%.

This development will use a range of default construction details as well as bespoke calculations for the psi values.

3.2 Active design measures

After addressing the passive design measures the next step is to use energy efficient building services, lighting, and controls throughout the scheme to reduce fuel consumption.

Space heating and hot water

- Apartments: Electric panels heaters and heat pump hot water cylinders
- Houses: Monobloc ASHP
- Non domestic space 'Pavilion': Air Source Heat Pumps

Ventilation

- The apartments will be provided with mechanical ventilation with heat recovery (MVHR)
- The houses will have natural ventilation with intermittent extract fans
- The Pavilion has mechanical supply and extract

Building services insulation

- All building services, tanks, pipes and ducts will be insulated to a high standard.

Lighting

- Internal lighting has a significant impact on the Dwelling Emission Rate (DER). Therefore, it is recommended that 100% of all internal light fittings will be low energy in order to reduce CO₂ emissions and the overall energy used (typical tungsten bulbs can use up to 300% more energy).
- Lighting in residential has assumed to be LED / CFL (Lm/W = 100)
- Lighting in the Pavilion will be 110Lm/W with photoelectric controls in bar, swimming pool and gym room. Dimming and auto on-off for certain areas

3.3 Be Lean results

There has been a 3% reduction at Be Lean stage due fabric first approach including low U-values, air permeability and thermal bridging.

Regulated carbon dioxide emissions (tonnes of CO ₂ per annum)	Site wide tonnes CO ₂ per annum
Baseline: Part L 2021 of the Building Regulations compliant development	116.6
After energy demand reduction (be lean)	113.2
Carbon savings over baseline	3.4
Carbon reduction over baseline	3%

Table 3.2: Be Lean results

The reduction in fabric energy efficiency is 1% as the following table demonstrates:

Fabric energy efficiency	(kWh/m ² per annum)
Part L1A Target Fabric Energy Efficiency Rate (TFEE)	36.05
Dwelling Fabric Efficiency (DFEE)	35.76
Reduction over TFEE	1%

Table 3.3 Fabric energy efficiency

4 Cooling Due to Potential Summer Overheating

4.1 Cooling Hierarchy

The cooling hierarchy has been followed in order to reduce the demand for cooling. The following categories have been considered:

1. [Minimising internal heat generation through energy efficient design](#) – minimised heat distribution infrastructure within the buildings.
2. [Reducing the amount of heat entering the building during summer](#) – the location, proportion and specification of the glazing should aim to balance natural light and ‘beneficial’ solar gain whilst ensuring that levels of heat gain are not excessive.
3. [Use of thermal mass and high ceilings to manage heat within the building](#) – higher thermal mass construction enables heat to be absorbed in the day and then released at night, however, a balance must be struck. Lightweight structures without the energy-absorption potential are often at risk of overheating.
4. [Passive ventilation](#) – providing openable windows to allow natural ventilation and night-time cooling to comply with Part F of the Building Regulations. Low temperature air from external is allowed into the building during the night and circulates throughout the building cooling the building fabric.
5. [Mechanical ventilation](#) - this can be used to make use of free cooling when the outside air temperature is below that in the building during summer months, through the use of a summer by-pass on the MVHR.

Full overheating assessment will be completed at detailed application stage.

5 ‘Be Clean’ – Heating Infrastructure

5.1 District Heating – Connection to Existing Scheme

The site has been investigated for connection to an existing or proposed heat network, in line with the heating hierarchy.

There are no local heat networks in the area for connection.

5.2 ‘Be Clean’ Results

Since there are no changes proposed, the ‘be clean’ results are identical to those at the end of the ‘be lean’ stage.

6 'Be Green' – Renewable Energy

6.1 Heat Pumps

Heat pumps collect low-temperature heat from renewable sources and “concentrate” it to a usable temperature. Grid electricity is generally required to operate the pumps and the renewable component of the output is therefore by convention taken as the difference between the output energy and the input energy.

With the decarbonisation of the grid, the carbon factor associated with electricity is much lower, as we rely more heavily on renewable sources such as wind power, over fossil fuel fired power stations. This makes heat pumps a low carbon energy source.

The houses will receive monobloc air source heat pumps providing the heating and hot water. The Pavilion will also have an air source heat pump for heating and hot water.

Heat pump hot water cylinders have been proposed for the apartments for this scheme. A heat pump cylinder is a cylinder with a small heat pump on top. It's designed to provide all the hot water needed in the home for a fraction of the energy, normally consumed by an equivalent gas or electric system.

The units have been designed to ensure there are minimal heat losses through a fabric first approach and low air permeability target.

6.2 PV panels

PV systems convert energy from the sun into electricity via semi-conductor cells. There are a wide range of different panels available on the market, from less expensive amorphous silicon with low efficiencies to mono-crystalline silicon with much higher efficiencies (1kWp installation requires approximately 6m2 of free roof area).

Ideally PV panels need to be positioned within 30° South and at an angle of 30° to achieve optimum performance. It is essential that PV panels are unshaded, as even a small amount of shading dramatically reduces the output of the panel. The applicant will be selecting high performance PV panels of at least 400 watts per panel.

There is sufficient space on the roof to provide an array of PV panels. Allowing space for access hatching as well as maintenance and avoiding areas of roof which are shaded by other blocks, the available roof area has been maximised.

The following PV is proposed to be connected to landlord's supply for apartments and direct to houses:

Apartments	0.5kWp
Houses	2kWp

6.3 'Be Green' Results

A sample of SAP calculations for the dwellings have been completed using the 'Be Green' specification of electric panel heaters, heat pump hot water cylinders and PV panels, to achieve a 46% carbon reduction on site.

	Carbon dioxide emissions (tonnes CO ₂ per annum)
	Site wide
Baseline: Part L 2021 of the Building Regulations compliant development	116.6
After fabric efficiency (Be Lean)	113.2
After renewable energy (Be Green)	63.0
% carbon reduction	46%

Table 6.1 Sitewide carbon savings

The scheme has been designed to exceed the requirements of the Future Homes Standard which is currently in consultation and due to for release towards the end of 2025.

7 Waste Reduction and Recycling

This section will cover the following policies:

- Mid Sussex District Plan: DP39 – Sustainability Design and Construction

DP39: Sustainable Design and Construction expect all developments to maximise efficient use of resources, including minimising waste and maximising recycling/ re-use of materials through both construction and occupation.

7.1 Reuse and Recycling

Contractors will be held accountable for establishing take-back agreements with suppliers for any packaging materials associated with the project. This proactive approach will ensure that packaging is returned to the manufacturers for reuse or recycling, thereby promoting a circular economy and minimizing landfill contributions.

It is encouraged that contractors are to implement innovative on-site initiatives aimed at reusing materials when feasible. For instance, salvaged timber and other reusable materials can find new life in various applications, reducing the need for new materials and contributing to our sustainability goals. Not only does this practice support environmental stewardship, but it also often proves to be cost-effective in the long term.

In addition to these measures, we will ensure that suitable excavation waste is identified and repurposed for backfill wherever possible. This strategy not only helps in managing waste effectively but also preserves valuable resources by avoiding the need to source new fill materials.

7.2 Operational Waste

The development will emphasise the integration of best practices and relevant planning policies into its overall design and construction.

All waste storage facilities will be developed in strict accordance with the established Mid Sussex standards, ensuring that we meet local regulatory requirements for the management of general waste and recyclable materials.

All facilities designated for recyclable materials will be clearly labelled. This labelling will include detailed identification of the types of materials acceptable for recycling, such as plastics, paper, glass, and metals. By providing clear and concise information, it is intended to educate tenants on proper recycling practices, which will not only improve recycling rates but also contribute to a culture of environmental awareness within the community.

8 Pollution

This Section will cover the following policies:

- Mid Sussex District Plan: DP29 – Noise, Air and Light Pollution

DP29: Noise, Air and Light Pollution states that the environment, including nationally designated environmental sites, nationally protected landscapes, areas of nature conservation or geological interest, wildlife habitats, and the quality of people's life will be protected from unacceptable levels of noise, light and air pollution.

8.1 Noise

The Mid Sussex District Plan states that new developments must be designed, located and controlled to minimise the impact of noise on health and quality of life, neighbouring properties and the surrounding area. If it is likely to generate significant levels of noise, it incorporates appropriate noise attenuation measures.

Noise sensitive development, such as residential, will not be permitted in close proximity to existing or proposed development generating high levels of noise unless adequate sound insulation measures, as supported by a noise assessment are incorporated within the development.

A noise assessment has been completed by Entran Ltd. to consider the noise levels at the proposed residential development and the existing ambient noise and the suitability of the site for residential use. Ambient noise levels are considered to satisfy the criteria provided within BS 8233 and WHO with the incorporation of suitable glazing and attenuated ventilation. With consideration to the proposed layout and the frequency of night-time maximum events, no specific mitigation requirements are identified.

Typical insulated double glazing and attenuated trickle ventilation is calculated to be sufficient across the site. Whilst specific mitigation is not required, it would be prudent to ensure that glazing and ventilation at facades to the north of the site should be selected to achieve the reductions presented in Figure B3 as a minimum. Windows are not required to be sealed and may remain openable for rapid or purge ventilation or to be opened at the occupant's discretion.

8.2 Light Pollution

The District Plan further states that the impact on local amenity, intrinsically dark landscapes and nature conservation areas of artificial lighting proposals (including floodlighting) is minimised, in terms of intensity and number of fittings.

The applicant will demonstrate good design including fittings to restrict emissions from proposed lighting schemes.

8.3 Air Pollution

The District Plan states that the development should not cause unacceptable levels of air pollution, and ensure the development on land adjacent to an existing use which generates air pollution or odour would not cause any adverse effects on the proposed development or can be mitigated to reduce exposure to poor air quality to recognised and acceptable levels.

Entran Ltd have produced an air quality assessment. An assessment of the potential impacts during the construction phase has been carried out in accordance with the latest Institute of Air Quality Management Guidance. This has shown that for the Proposed Development, limited releases of dust and particulate matter are likely to be generated from on-site activities. However, through good site practice and the implementation of suitable mitigation measures, the impact of dust and particulate matter releases may be effectively mitigated and the resultant impacts are considered to be negligible.

ADMS Roads dispersion modelling has been carried out to assess the suitability of the Site for its proposed end use with regards to local air quality. The results indicate that predicted concentrations of relevant pollutants (NO₂, PM₁₀ and PM_{2.5}) concentrations are below the relevant objectives within the Proposed Development.

It is concluded that air quality does not pose a constraint to the Proposed Development, either during construction or once operational.

9 Sustainable Transport Methods

This section will cover the following:

- Mid Sussex District Plan: DP21 - Transport

The regional and local policies call for a reduction in the use of cars and increase in the use of suitable transport means such as public transport, cycling and walking. It encourages new developments to consider improvements to the pedestrian and cycling environment and promote the use of more sustainable modes of transport. Developments should seek to reduce dependence on car journeys through initiatives such as restricting parking, providing sufficient secure cycle parking spaces and enhancing the local environment to encourage walking and use of public transport.

9.1 Public Transport

The Transport Assessment completed by Transport Planning Associates shows the location of the site has been shown to be sustainable when considering access to and from the site by modes of travel other than the private car, mainly walking, cycling and public transport. It has been demonstrated that the local primary school, secondary school and local amenities are within nationally acceptable walking and cycling distances. The bus stops in the vicinity of the site provide connections to main urban centres making bus travel a viable option for some of the residents of the site. Rail services to a variety of destinations including London, Brighton, Cambridge and Portsmouth accessible via bus and cycle. The access strategy maximises access via sustainable modes and the proposal includes measures to encourage travel by non-car modes.

9.2 Local Amenities

The Proposed Development is ideally located within a close proximity to a wide range of amenities. Food stores, schools, parks and a pharmacy can all be accessed via pedestrian routes within 1700m from the Site.

9.3 Cycling

Numerous settlements including East Grinstead, Gatwick Airport and Crawley are located within an 8km cycle of the site, but it is acknowledged that there is limited cycle infrastructure in the vicinity of the site assisting the less proficient cyclists.

10 Water

This section will cover the following:

- Mid Sussex District Plan: DP41 – Flood Risk and Drainage
- Mid Sussex District Plan: DP42 – Water Infrastructure and the Water Environment

10.1 Flood Risk Management

A Flood Risk Management report has been prepared for planning application by BdR Civil & Structural Engineering Consultants and confirms that the chance of flooding is low to none. There is a low risk of flooding from land, groundwater and sewers.

Flood Risk can be mitigated to a negligible or low and acceptable level through the following approach.

- Ground floor finished floor levels will be set at a minimum 150mm above existing ground levels
- On-site surface water drainage design will meet the design standards required of Approved Document H of the Building Regulations, The National Standards for Sustainable Drainage Systems June 2025 and best practice guidance given in C753 the SUDS Manual 2015.

10.2 Water efficiency

The target for water consumption in the house has been targeted to the requirements of Part G as well as the targets of the Mid Sussex District Plan, to meet a target of 110 litres/person/day.

	Fitting
WC	6/4 l dual flush
Shower	8 l/min
Bath	150 litres
Basin taps	4 l/min
Kitchen sink taps	4 l/min
Dishwasher	4.5 l/place setting
Washing machine	17.16 l/kg

11 Ecology and biodiversity

This section will cover the following:

- Mid Sussex District Plan: DP38 - Biodiversity

The objective of this policy is to protect valued landscapes and create and maintain easily accessible green infrastructure, green corridors and spaces around and within the towns and villages to act as wildlife corridors, sustainable transport links and leisure and recreational routes.

11.1 Ecology

Lloyd Bore have provided an Ecological Impact Assessment (EclA) for the scheme. It identified important ecological features such as hedgerows, reptiles, birds, dormice and invertebrates. They have recommended suitable avoidance, mitigation, compensation and enhancement measures designed to minimise the significance of the potential impacts of development upon these important ecological features.

The applicant will commit to follow the recommendations in the report to avoid the potential adverse effects and reduce effects on habitats and species during the construction phase through a Construction Environment Management Plan. There will be long term beneficial effects of local significance upon habitats and species from habitat creation and enhancement measures.

The biodiversity matrix has been completed which shows that the total net change in area habitat units is an increase of 27.47%, with hedgerows increasing by 36.19%.

12 Conclusion

This energy strategy outlines the key features and strategies adopted by the design team to reduce energy use and carbon emissions for the scheme. It demonstrates compliance with the building regulations Part L1A, Part L2A as well as the Mid Sussex District Plan.

The strategy for reducing energy and associated carbon emissions follows the energy hierarchy:

- **Be Lean** – improved building fabric specification to exceed that of the notional building, low air permeability target, thermal bridging details and selection of energy efficient services
- **Be Clean** – connection to a district heat network and installation of Combined Heat and Power (CHP) have been investigated for the site and have not been deemed either available or appropriate at this time.
- **Be Green** – Electric panel heaters for heating and highly efficient heat pump hot water cylinders are to be installed to the apartments as well as ASHPs in the houses. Air Source Heat Pump for the Pavilion. Photovoltaic panels installed on the roof of the houses and apartments.

The scheme is compliant with the sustainability policies as set out in the Mid Sussex Local Plan.

This report concludes that the proposed development at Courthouse Farm will achieve a **46%** improvement over Part L1 2021 of the Building Regulations.

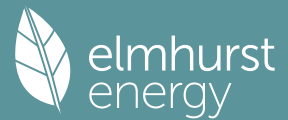
The final specification to meet the 46% carbon reduction on site is as follows:

	Apartment	Houses	Pavilion
Heating	Electric panel heater	ASHP	ASHP
Hot water	Heat pump hot water cylinder	From ASHP	From ASHP
Emitter	Panel heaters	Radiators	Fan Coil Units
Cooling	N/A	N/A	From ASHP
Ventilation	MVHR	Natural	Mechanical
Lighting	100% low energy 100lm/cW	100% low energy 100lm/cW	100% low energy 110lm/cW Photoelectric control Dimming
Renewable technology	PV panels 0.5kWp per apartment	PV panels 2kWp per house	

Table 12.1 Summary of specification to exceed the building regulations

Appendix A – SAP Outputs

Full SAP Calculation Printout



Property Reference	B-00-1B2P				Issued on Date	30/10/2025	
Assessment Reference	B-00-1B2P			Prop Type Ref	001 Egerton		
Property	001 , Egerton Avenue, Hextable						
SAP Rating	82 B		DER	4.52		TER	12.34
Environmental	97 A		% DER < TER				63.37
CO ₂ Emissions (t/year)	0.25		DFEE	31.92		TFEE	38.55
Compliance Check	See BREL		% DFEE < TFEE				17.22
% DPER < TPER	28.33		DPER	46.26		TPER	64.54
Assessor Details	Mrs. Ellen Huelin					Assessor ID	W281-0001
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)
Main dwelling			
Ground floor	70.5500 (1b)	2.5000 (2b)	176.3750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.5500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	176.3750 (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	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												55.2000 (23c)
Effective ac	0.3866	0.3834	0.3802	0.3642	0.3611	0.3451	0.3451	0.3419	0.3515	0.3611	0.3674	0.3738 (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
Main dwelling							
Window			12.0900	1.1450	13.8435		(27)
Door			2.1000	1.2000	2.5200		(26)
Heatloss Floor 1			70.5500	0.1200	8.4660	75.0000	5291.2500 (28a)
External Wall	46.5500	14.1900	32.3600	0.1500	4.8540	110.0000	3559.5999 (29a)
Corridor Wall	37.6000		37.6000	0.1800	6.7680	190.0000	7143.9997 (29a)
Total net area of external elements Aum(A, m ²)			154.7000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.4515		(33)
Main dwelling							
Party Ceiling 1			70.5500			30.0000	2116.5000 (32b)
Internal Wall 1			110.4000			75.0000	8280.0001 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 26391.3497 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							374.0801 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	

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E10 Eaves (insulation at ceiling level)	0.0000	0.0270	0.0000
P1 Party wall - Ground floor	0.0000	0.0360	0.0000
P4 Party wall - Roof (insulation at ceiling level)	0.0000	0.0330	0.0000
P2 Party wall - Intermediate floor within a dwelling	0.0000	0.0000	0.0000
E1 Steel lintel with perforated steel base plate	7.0100	0.0600	0.4206
E4 Jamb	19.2400	0.0190	0.3656
E3 Sill	2.2700	0.0110	0.0250
E16 Corner (normal)	10.0000	0.0310	0.3100
E17 Corner (inverted - internal area greater than external area)	0.0000	-0.0600	-0.0000
E18 Party wall between dwellings	0.0000	0.0650	0.0000
E5 Ground floor (normal)	33.6600	0.0460	1.5484
E12 Gable (insulation at ceiling level)	0.0000	0.0560	0.0000
E7 Party floor between dwellings (in blocks of flats)	33.6600	0.1400	4.7124
E14 Flat roof	0.0000	0.1600	0.0000
E20 Exposed floor (normal)	0.0000	0.3200	0.0000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			7.3819 (36)
Point Thermal bridges			0.0000
Total fabric heat loss	(33) + (36) + (36a) =		43.8334 (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	22.4994	22.3139	22.1283	21.2007	21.0152	20.0876	20.0876	19.9020	20.4586	21.0152	21.3862	21.7573	(38)
Average = Sum(39)m / 12 =	66.3328	66.1473	65.9617	65.0341	64.8486	63.9210	63.9210	63.7354	64.2920	64.8486	65.2196	65.5907	(39)
												64.9877	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.9402	0.9376	0.9350	0.9218	0.9192	0.9060	0.9060	0.9034	0.9113	0.9192	0.9244	0.9297	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	
												0.9212	
												31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2594 (42)
Hot water usage for mixer showers													
	62.1024	61.1691	59.8092	57.2071	55.2869	53.1454	51.9282	53.2779	54.7574	57.0566	59.7146	61.8645	(42a)
Hot water usage for baths													
	26.8293	26.4308	25.8697	24.8352	24.0605	23.2015	22.7375	23.2947	23.9013	24.8205	25.8764	26.7386	(42b)
Hot water usage for other uses													
	37.7685	36.3951	35.0217	33.6483	32.2749	30.9015	30.9015	32.2749	33.6483	35.0217	36.3951	37.7685	(42c)
Average daily hot water use (litres/day)													116.4664 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	126.7003	123.9951	120.7006	115.6906	111.6223	107.2484	105.5673	108.8475	112.3071	116.8989	121.9861	126.3716	(44)
Energy conte	200.6622	176.5674	185.5124	158.3747	150.2650	131.8745	127.6744	134.7760	138.4859	158.6307	173.7916	197.8674	(45)
Energy content (annual)										Total = Sum(45)m =		1934.4822	
Distribution loss (46)m = 0.15 x (45)m													
	30.0993	26.4851	27.8269	23.7562	22.5398	19.7812	19.1512	20.2164	20.7729	23.7946	26.0687	29.6801	(46)
Water storage loss:													
Store volume													201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.6100 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8694 (55)
Total storage loss													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(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													
	227.6136	200.9106	212.4638	184.4567	177.2164	157.9565	154.6258	161.7274	164.5679	185.5821	199.8736	224.8188	(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													
	227.6136	200.9106	212.4638	184.4567	177.2164	157.9565	154.6258	161.7274	164.5679	185.5821	199.8736	224.8188	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2251.8132	(64)
Electric shower(s)												2252	(64)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
												0.0000	(64a)
Heat gains from water heating, kWh/month													
	66.7202	58.7087	61.6829	52.6596	49.9631	43.8483	42.4518	44.8130	46.0465	52.7447	57.7857	65.7909	(65)

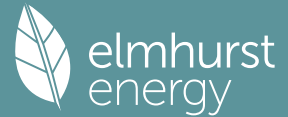
5. Internal gains (see Table 5 and 5a)

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	112.9702	112.9702	112.9702	112.9702	112.9702	112.9702	112.9702	112.9702	112.9702	112.9702	112.9702	112.9702	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	100.5017	111.2698	100.5017	103.8518	100.5017	103.8518	100.5017	100.5017	103.8518	100.5017	103.8518	100.5017	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	198.5773	200.6379	195.4453	184.3907	170.4362	157.3210	148.5593	146.4987	151.6913	162.7459	176.7004	189.8156	(68)
Pumps, fans	34.2970	34.2970	34.2970	34.2970	34.2970	34.2970	34.2970	34.2970	34.2970	34.2970	34.2970	34.2970	(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)
	-90.3761	-90.3761	-90.3761	-90.3761	-90.3761	-90.3761	-90.3761	-90.3761	-90.3761	-90.3761	-90.3761	-90.3761	(71)
Water heating gains (Table 5)													
	89.6777	87.3641	82.9071	73.1383	67.1547	60.9004	57.0588	60.2325	63.9535	70.8934	80.2579	88.4287	(72)
Total internal gains	445.6478	456.1628	435.7451	418.2718	394.9838	378.9643	363.0109	364.1240	376.3877	391.0321	417.7011	435.6370	(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
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Northeast			3.0800		11.2829		0.6300		0.8500		0.7700		12.8963 (75)
Southeast			9.0100		36.7938		0.6300		0.8500		0.7700		123.0248 (77)

Solar gains	135.9211	235.8075	334.0202	432.9387	502.3350	506.3593	484.9979	432.0546	368.0926	263.6854	163.5822	115.8153 (83)
Total gains	581.5689	691.9704	769.7654	851.2105	897.3187	885.3236	848.0088	796.1786	744.4803	654.7175	581.2834	551.4523 (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	110.5174	110.8274	111.1391	112.7244	113.0469	114.6874	114.6874	115.0212	114.0255	113.0469	112.4037	111.7678	
alpha	8.3678	8.3885	8.4093	8.5150	8.5365	8.6458	8.6458	8.6681	8.6017	8.5365	8.4936	8.4512	
util living area	0.9978	0.9904	0.9639	0.8565	0.6645	0.4618	0.3316	0.3682	0.5930	0.9079	0.9916	0.9986 (86)	
MIT	20.4082	20.5739	20.7592	20.9349	20.9923	20.9997	21.0000	21.0000	20.9976	20.9100	20.6288	20.3806 (87)	
Th 2	20.1334	20.1357	20.1379	20.1490	20.1512	20.1624	20.1624	20.1646	20.1579	20.1512	20.1468	20.1423 (88)	
util rest of house	0.9968	0.9862	0.9494	0.8159	0.6072	0.4015	0.2685	0.3014	0.5222	0.8686	0.9872	0.9979 (89)	
MIT 2	19.4559	19.6670	19.8947	20.0955	20.1466	20.1623	20.1624	20.1646	20.1569	20.0781	19.7470	19.4280 (90)	
Living area fraction									fLA = Living area / (4) =			0.4693 (91)	
MIT	19.9028	20.0926	20.3004	20.4894	20.5435	20.5553	20.5555	20.5566	20.5515	20.4685	20.1608	19.8751 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.9028	20.0926	20.3004	20.4894	20.5435	20.5553	20.5555	20.5566	20.5515	20.4685	20.1608	19.8751 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9965	0.9860	0.9525	0.8330	0.6340	0.4298	0.2981	0.3327	0.5555	0.8846	0.9873	0.9976 (94)	
Useful gains	579.5111	682.2582	733.2098	709.0251	568.8940	380.5198	252.8325	264.9129	413.5737	579.1931	573.8982	550.1265 (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	1034.9787	1004.9508	910.2998	753.7084	573.4897	380.6668	252.8376	264.9256	414.7773	639.9578	851.8231	1028.1391 (97)	
Space heating kWh	338.8679	216.8494	131.7550	32.1720	3.4192	0.0000	0.0000	0.0000	0.0000	45.2090	200.1059	355.6413 (98a)	
Space heating requirement - total per year (kWh/year)												1324.0197	
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	338.8679	216.8494	131.7550	32.1720	3.4192	0.0000	0.0000	0.0000	0.0000	45.2090	200.1059	355.6413 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												1324.0197	
Space heating per m2										(98c) / (4) =		18.7671 (99)	

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Fraction of main heating from main system 2													0.0000 (203)
Fraction of total heating from main system 1													1.0000 (204)
Fraction of total heating from main system 2													0.0000 (205)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	338.8679	216.8494	131.7550	32.1720	3.4192	0.0000	0.0000	0.0000	0.0000	45.2090	200.1059	355.6413 (98)	
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)	
Space heating fuel (main heating system)	338.8679	216.8494	131.7550	32.1720	3.4192	0.0000	0.0000	0.0000	0.0000	45.2090	200.1059	355.6413 (211)	
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)	
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)	
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)	
Space heating fuel used, main system 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)	
Water heating													
Water heating requirement	227.6136	200.9106	212.4638	184.4567	177.2164	157.9565	154.6258	161.7274	164.5679	185.5821	199.8736	224.8188 (64)	
Efficiency of water heater (217)m	344.2590	344.2590	344.2590	344.2590	344.2590	344.2590	344.2590	344.2590	344.2590	344.2590	344.2590	344.2590 (216)	
Fuel for water heating, kWh/month	66.1170	58.3603	61.7163	53.5808	51.4777	45.8830	44.9156	46.9784	47.8035	53.9077	58.0591	65.3051 (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	20.2125	18.2565	20.2125	19.5605	20.2125	19.5605	20.2125	20.2125	19.5605	20.2125	19.5605	20.2125 (231)	
Lighting	20.2791	16.2686	14.6481	10.7318	8.2896	6.7727	7.5620	9.8294	12.7674	16.7516	18.9208	20.8427 (232)	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-10.9613	-17.1500	-26.9761	-32.5554	-37.3763	-35.8823	-35.4196	-32.0078	-26.4719	-20.1363	-12.5332	-9.2852 (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												1324.0197 (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	344.2590
Water heating fuel used	654.1044 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1060)	
mechanical ventilation fans (SFP = 1.1060)	237.9863 (230a)
Total electricity for the above, kWh/year	237.9863 (231)
Electricity for lighting (calculated in Appendix L)	163.6639 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-296.7554 (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	2083.0189 (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	1324.0197	0.1582	209.4758 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	654.1044	0.1412	92.3427 (264)
Space and water heating			301.8185 (265)
Pumps, fans and electric keep-hot	237.9863	0.1387	33.0116 (267)
Energy for lighting	163.6639	0.1443	23.6218 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-296.7554	0.1329	-39.4436
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-39.4436 (269)
Total CO2, kg/year			319.0083 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.5200 (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	1324.0197	1.5856	2099.4148 (275)
Space heating - main system 2	0.0000	0.0000	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	654.1044	1.5220	995.5632 (278)
Space and water heating			3094.9780 (279)
Pumps, fans and electric keep-hot	237.9863	1.5128	360.0257 (281)
Energy for lighting	163.6639	1.5338	251.0331 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-296.7554	1.4911	-442.5049
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-442.5049 (283)
Total Primary energy kWh/year			3263.5319 (286)
Dwelling Primary energy Rate (DPER)			46.2600 (287)

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

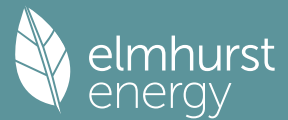
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	70.5500	2.5000	176.3750
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.5500		
Dwelling volume			

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1701 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4201 (18)

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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) = 0.3571 (21)

Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4553	0.4463	0.4374	0.3928	0.3839	0.3392	0.3392	0.3303	0.3571	0.3839	0.4017	0.4196 (22b)
Effective ac	0.6036	0.5996	0.5957	0.5771	0.5737	0.5575	0.5575	0.5545	0.5638	0.5737	0.5807	0.5880 (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
Main dwelling							
TER Opaque door			2.1000	1.0000	2.1000		(26)
TER Opening Type			12.0900	1.1450	13.8435		(27)
Heatloss Floor 1			70.5500	0.1300	9.1715		(28a)
External Wall	46.5500	14.1900	32.3600	0.1800	5.8248		(29a)
Corridor Wall	37.6000		37.6000	0.1800	6.7680		(29a)
Total net area of external elements Aum(A, m2)			154.7000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	37.7078		(33)

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

384.0801 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E10 Eaves (insulation at ceiling level)	0.0000	0.0600	0.0000
P1 Party wall - Ground floor	0.0000	0.0800	0.0000
P4 Party wall - Roof (insulation at ceiling level)	0.0000	0.1200	0.0000
P2 Party wall - Intermediate floor within a dwelling	0.0000	0.0000	0.0000
E1 Steel lintel with perforated steel base plate	7.0100	0.0500	0.3505
E4 Jamb	19.2400	0.0500	0.9620
E3 Sill	2.2700	0.0500	0.1135
E16 Corner (normal)	10.0000	0.0900	0.9000
E17 Corner (inverted - internal area greater than external area)	0.0000	-0.0900	-0.0000
E18 Party wall between dwellings	0.0000	0.0600	0.0000
E5 Ground floor (normal)	33.6600	0.1600	5.3856
E12 Gable (insulation at ceiling level)	0.0000	0.0600	0.0000
E7 Party floor between dwellings (in blocks of flats)	33.6600	0.0700	2.3562
E14 Flat roof	0.0000	0.0800	0.0000
E20 Exposed floor (normal)	0.0000	0.3200	0.0000

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

10.0678 (36)

Point Thermal Bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 47.7756 (37)

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

(38)m	Jan 35.1340	Feb 34.8997	Mar 34.6701	Apr 33.5917	May 33.3900	Jun 32.4507	Jul 32.4507	Aug 32.2768	Sep 32.8125	Oct 33.3900	Nov 33.7981	Dec 34.2249 (38)
Heat transfer coeff	82.9096	82.6754	82.4458	81.3674	81.1656	80.2263	80.2263	80.0524	80.5881	81.1656	81.5738	82.0005 (39)
Average = Sum(39)m / 12 =												81.3664

HLP	Jan 1.1752	Feb 1.1719	Mar 1.1686	Apr 1.1533	May 1.1505	Jun 1.1372	Jul 1.1372	Aug 1.1347	Sep 1.1423	Oct 1.1505	Nov 1.1563	Dec 1.1623 (40)
HLP (average)												1.1533
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2594 (42)
Hot water usage for mixer showers	62.1024	61.1691	59.8092	57.2071	55.2869	53.1454	51.9282	53.2779	54.7574	57.0566	59.7146	61.8645 (42a)
Hot water usage for baths	26.8293	26.4308	25.8697	24.8352	24.0605	23.2015	22.7375	23.2947	23.9013	24.8205	25.8764	26.7386 (42b)
Hot water usage for other uses	37.7685	36.3951	35.0217	33.6483	32.2749	30.9015	30.9015	32.2749	33.6483	35.0217	36.3951	37.7685 (42c)
Average daily hot water use (litres/day)												116.4664 (43)

Daily hot water use	Jan 126.7003	Feb 123.9951	Mar 120.7006	Apr 115.6906	May 111.6223	Jun 107.2484	Jul 105.5673	Aug 108.8475	Sep 112.3071	Oct 116.8989	Nov 121.9861	Dec 126.3716 (44)
Energy conte	200.6622	176.5674	185.5124	158.3747	150.2650	131.8745	127.6744	134.7760	138.4859	158.6307	173.7916	197.8674 (45)
Energy content (annual)										Total = Sum(45)m =		1934.4822

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

30.0993 26.4851 27.8269 23.7562 22.5398 19.7812 19.1512 20.2164 20.7729 23.7946 26.0687 29.6801 (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

247.2571 218.6531 232.1073 203.4665 196.8600 176.9663 174.2693 181.3709 183.5777 205.2256 218.8834 244.4623 (62)

WWHRS -28.3906 -25.1089 -26.2926 -21.7713 -20.2901 -17.3624 -16.2745 -17.3062 -17.9638 -21.1773 -23.9913 -27.8649 (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 (64d)

Output from w/h 218.8665 193.5442 205.8147 181.6952 176.5699 159.6039 157.9949 164.0646 165.6139 184.0483 194.8921 216.5974 (64)

Total per year (kWh/year) = Sum(64)m = 2219.3058 (64)

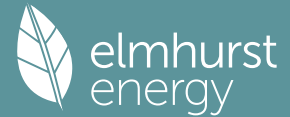
12Total per year (kWh/year)

Electric shower(s) 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (64a)

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

Heat gains from water heating, kWh/month 103.9961 92.3772 98.9588 88.7331 87.2391 79.9217 79.7277 82.0889 82.1200 90.0206 93.8592 103.0668 (65)

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	112.9702	112.9702	112.9702	112.9702	112.9702	112.9702	112.9702	112.9702	112.9702	112.9702	112.9702	112.9702 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	103.1527	114.2048	103.1527	106.5911	103.1527	106.5911	103.1527	103.1527	106.5911	103.1527	106.5911	103.1527 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	198.5773	200.6379	195.4453	184.3907	170.4362	157.3210	148.5593	146.4987	151.6913	162.7459	176.7004	189.8156 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2970	34.2970	34.2970	34.2970	34.2970	34.2970	34.2970	34.2970	34.2970	34.2970	34.2970	34.2970 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-90.3761	-90.3761	-90.3761	-90.3761	-90.3761	-90.3761	-90.3761	-90.3761	-90.3761	-90.3761	-90.3761	-90.3761 (71)
Water heating gains (Table 5)	139.7797	137.4661	133.0091	123.2403	117.2568	111.0024	107.1609	110.3346	114.0556	120.9955	130.3600	138.5307 (72)
Total internal gains	501.4008	512.1999	491.4981	474.1132	450.7368	431.8056	415.7639	416.8770	429.2291	446.7851	473.5425	491.3900 (73)

6. Solar gains

[Jan]	Area m ²		Solar flux Table 6a W/m ²		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W	
Northeast	3.0800		11.2829		0.6300		0.7000		0.7700		10.6205 (75)	
Southeast	9.0100		36.7938		0.6300		0.7000		0.7700		101.3145 (77)	
Solar gains	111.9350	194.1944	275.0755	356.5378	413.6876	417.0018	399.4101	355.8097	303.1351	217.1527	134.7148	95.3773 (83)
Total gains	613.3358	706.3943	766.5736	830.6509	864.4244	848.8074	815.1739	772.6867	732.3642	663.9378	608.2573	586.7673 (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, n _{l,m} (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	90.7845	91.0417	91.2952	92.5052	92.7351	93.8208	93.8208	94.0247	93.3997	92.7351	92.2711	91.7910
alpha	7.0523	7.0694	7.0863	7.1670	7.1823	7.2547	7.2547	7.2683	7.2266	7.1823	7.1514	7.1194
util living area	0.9982	0.9946	0.9842	0.9384	0.8108	0.5986	0.4325	0.4754	0.7314	0.9557	0.9946	0.9987 (86)
MIT	20.1785	20.3313	20.5305	20.7813	20.9425	20.9943	20.9995	20.9991	20.9782	20.7764	20.4361	20.1566 (87)
Th 2	19.9399	19.9426	19.9452	19.9575	19.9598	19.9706	19.9706	19.9726	19.9665	19.9598	19.9552	19.9503 (88)
util rest of house	0.9973	0.9920	0.9762	0.9096	0.7435	0.5058	0.3316	0.3700	0.6356	0.9283	0.9914	0.9980 (89)
MIT 2	19.0050	19.2013	19.4532	19.7602	19.9219	19.9685	19.9705	19.9724	19.9565	19.7635	19.3455	18.9852 (90)
Living area fraction	f _{LA} = Living area / (4) =											
MIT	19.5557	19.7316	19.9588	20.2394	20.4009	20.4499	20.4534	20.4542	20.4360	20.2389	19.8573	19.5350 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.5557	19.7316	19.9588	20.2394	20.4009	20.4499	20.4534	20.4542	20.4360	20.2389	19.8573	19.5350 (93)

8. Space heating requirement

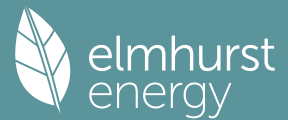
Utilisation	0.9969	0.9913	0.9763	0.9185	0.7737	0.5495	0.3790	0.4196	0.6808	0.9370	0.9910	0.9976 (94)
Useful gains	611.4125	700.2542	748.4222	762.9138	668.7914	466.4429	308.9779	324.2069	498.5768	622.0934	602.7582	585.3881 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1264.8469	1226.2080	1109.6216	922.6591	706.2101	469.3148	309.1471	324.5512	510.6044	782.3460	1040.6608	1257.4762 (97)
Space heating kWh	486.1552	353.4410	268.7323	115.0166	27.8395	0.0000	0.0000	0.0000	0.0000	119.2279	315.2899	500.0336 (98a)
Space heating requirement - total per year (kWh/year)	2185.7359											
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	486.1552	353.4410	268.7323	115.0166	27.8395	0.0000	0.0000	0.0000	0.0000	119.2279	315.2899	500.0336 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2185.7359											
Space heating per m ²	(98c) / (4) = 30.9814 (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	486.1552	353.4410	268.7323	115.0166	27.8395	0.0000	0.0000	0.0000	0.0000	119.2279	315.2899	500.0336 (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)	526.7120	382.9263	291.1509	124.6117	30.1620	0.0000	0.0000	0.0000	0.0000	129.1744	341.5925	541.7482 (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

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Efficiency of water heater (217)m	218.8665	193.5442	205.8147	181.6952	176.5699	159.6039	157.9949	164.0646	165.6139	184.0483	194.8921	216.5974 (64)
Fuel for water heating, kWh/month	85.7961	85.3923	84.6590	83.0634	80.9169	79.8000	79.8000	79.8000	79.8000	83.1115	85.1322	79.8000 (216)
Space cooling fuel requirement (221)m	255.1007	226.6530	243.1104	218.7429	218.2113	200.0049	197.9886	205.5948	207.5362	221.4473	228.9287	252.2306 (219)
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 (221)
Lighting	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)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	21.4331	17.1944	15.4817	11.3425	8.7613	7.1581	7.9924	10.3888	13.4940	17.7048	19.9976	22.0288 (232)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	-33.1231	-46.7589	-67.3074	-75.8020	-81.8590	-76.4659	-75.5333	-71.2536	-63.7093	-53.5348	-36.4416	-28.6307 (233a)
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 (234a)
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 (235a)
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 (235c)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	-18.5264	-38.9962	-77.5455	-116.5183	-154.1077	-154.8441	-153.0095	-129.5240	-94.9077	-55.7710	-24.7378	-14.6475 (233b)
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 (234b)
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 (235b)
Annual totals kWh/year												
Space heating fuel - main system 1												2368.0779 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.8000
Water heating fuel used												2675.5495 (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)												172.9773 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-1743.5553 (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												3559.0494 (238)

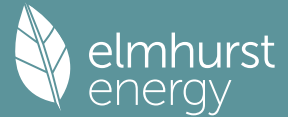
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2368.0779	0.2100	497.2964 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2675.5495	0.2100	561.8654 (264)
Space and water heating			1059.1618 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	172.9773	0.1443	24.9660 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-710.4196	0.1345	-95.5869
PV Unit electricity exported	-1033.1357	0.1259	-130.0567
Total			-225.6435 (269)
Total CO2, kg/year			870.4134 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.3400 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2368.0779	1.1300	2675.9281 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2675.5495	1.1300	3023.3709 (278)
Space and water heating			5699.2990 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	172.9773	1.5338	265.3184 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-710.4196	1.4973	-1063.6910
PV Unit electricity exported	-1033.1357	0.4621	-477.3972
Total			-1541.0882 (283)
Total Primary energy kWh/year			4553.6300 (286)
Target Primary Energy Rate (TPER)			64.5400 (287)

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Property Reference	F-00-3B6P				Issued on Date	30/10/2025	
Assessment Reference	F-00-3B6P			Prop Type Ref	001 Egerton		
Property	001 , Egerton Avenue, Hextable						
SAP Rating	80 C		DER	4.33		TER	9.77
Environmental	96 A		% DER < TER				55.68
CO ₂ Emissions (t/year)	0.39		DFEE	30.78		TFEE	36.85
Compliance Check	See BREL		% DFEE < TFEE				16.46
% DPER < TPER	12.96		DPER	44.32		TPER	50.92
Assessor Details	Mrs. Ellen Huelin				Assessor ID	W281-0001	
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)
Main dwelling			
Ground floor	115.1300 (1b)	2.5000 (2b)	287.8250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	115.1300		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	287.8250 (5)

2. Ventilation rate

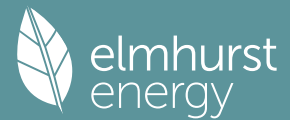
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1388 (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	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												55.2000 (23c)
Effective ac	0.4009	0.3974	0.3940	0.3766	0.3732	0.3558	0.3558	0.3523	0.3628	0.3732	0.3801	0.3870 (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
Main dwelling							
Window			20.1900	1.1450	23.1183		(27)
Door			2.1000	1.2000	2.5200		(26)
Heatloss Floor 1			115.1300	0.1200	13.8156	75.0000	8634.7500 (28a)
External Wall	76.4200	20.1900	56.2300	0.1500	8.4345	110.0000	6185.2998 (29a)
Corridor Wall	3.7800	2.1000	1.6800	0.1800	0.3024	190.0000	319.2000 (29a)
Total net area of external elements Aum(A, m ²)			195.3300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	48.1908		(33)
Main dwelling							
Party Wall 1			47.0500	0.0000	0.0000	180.0000	8468.9999 (32)
Party Ceiling 1			115.1300			30.0000	3453.9000 (32b)
Internal Wall 1			220.1500			75.0000	16511.2495 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		43573.3992 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							378.4713 (35)
List of Thermal Bridges							

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K1 Element	Length	Psi-value	Total
E10 Eaves (insulation at ceiling level)	0.0000	0.0270	0.0000
P1 Party wall - Ground floor	18.8200	0.0360	0.6775
P4 Party wall - Roof (insulation at ceiling level)	0.0000	0.0330	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	18.8200	0.0000	0.0000
E1 Steel lintel with perforated steel base plate	10.8700	0.0600	0.6522
E4 Jamb	31.5800	0.0190	0.6000
E3 Sill	3.4100	0.0110	0.0375
E16 Corner (normal)	5.0000	0.0310	0.1550
E17 Corner (inverted - internal area greater than external area)	0.0000	-0.0600	-0.0000
E18 Party wall between dwellings	5.0000	0.0650	0.3250
E5 Ground floor (normal)	32.0800	0.0460	1.4757
E12 Gable (insulation at ceiling level)	0.0000	0.0560	0.0000
E7 Party floor between dwellings (in blocks of flats)	32.0800	0.1400	4.4912
E14 Flat roof	0.0000	0.1600	0.0000
E20 Exposed floor (normal)	0.0000	0.3200	0.0000
E25 Staggered party wall between dwellings	5.0000	0.2400	1.2000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			9.6141 (36)
Point Thermal bridges			0.0000 (36a) =
Total fabric heat loss		(33) + (36) + (36a) =	57.8050 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	38.0790	37.7495	37.4200	35.7727	35.4432	33.7959	33.7959	33.4664	34.4548	35.4432	36.1022	36.7611	(38)
Heat transfer coeff	95.8839	95.5545	95.2250	93.5776	93.2482	91.6008	91.6008	91.2714	92.2598	93.2482	93.9071	94.5660	(39)
Average = Sum(39)m / 12 =												93.4953	
HLP	0.8328	0.8300	0.8271	0.8128	0.8099	0.7956	0.7956	0.7928	0.8014	0.8099	0.8157	0.8214	(40)
HLP (average)												0.8121	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8424 (42)
Hot water usage for mixer showers													
71.8768	70.7967	69.2227	66.2111	63.9886	61.5101	60.1013	61.6634	63.3758	66.0369	69.1132	71.6015	71.6015	(42a)
Hot water usage for baths													
31.0326	30.5717	29.9227	28.7261	27.8300	26.8364	26.2998	26.9442	27.6460	28.7091	29.9304	30.9277	30.9277	(42b)
Hot water usage for other uses													
43.7386	42.1481	40.5576	38.9671	37.3766	35.7861	35.7861	37.3766	38.9671	40.5576	42.1481	43.7386	43.7386	(42c)
Average daily hot water use (litres/day)												134.8025	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	146.6481	143.5165	139.7030	133.9043	129.1952	124.1327	122.1872	125.9843	129.9888	135.3036	141.1917	146.2678	(44)
Energy conte	232.2547	204.3656	214.7183	183.3082	173.9216	152.6356	147.7748	155.9948	160.2892	183.6058	201.1535	229.0200	(45)
Energy content (annual)										Total = Sum(45)m =		2239.0422	
Distribution loss (46)m = 0.15 x (45)m													
34.8382	30.6548	32.2077	27.4962	26.0882	22.8953	22.1662	23.3992	24.0434	27.5409	30.1730	34.3530	34.3530	(46)
Water storage loss:													
Store volume												201.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss													
26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage													
26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(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													
259.2061	228.7088	241.6697	209.3902	200.8730	178.7176	174.7262	182.9462	186.3712	210.5572	227.2355	255.9714	255.9714	(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													
259.2061	228.7088	241.6697	209.3902	200.8730	178.7176	174.7262	182.9462	186.3712	210.5572	227.2355	255.9714	255.9714	(64)
12Total per year (kWh/year)												2556.3732	(64)
Electric shower(s)												2556	(64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month													
77.2247	67.9516	71.3938	60.9500	57.8289	50.7513	49.1351	51.8683	53.2962	61.0489	66.8835	76.1491	76.1491	(65)

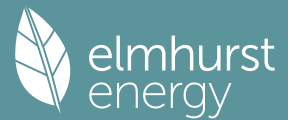
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	142.1180	142.1180	142.1180	142.1180	142.1180	142.1180	142.1180	142.1180	142.1180	142.1180	142.1180	142.1180	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
140.8459	155.9365	140.8459	145.5407	140.8459	145.5407	140.8459	140.8459	145.5407	140.8459	145.5407	140.8459	140.8459	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
278.7302	281.6226	274.3339	258.8173	239.2304	220.8214	208.5231	205.6308	212.9194	228.4360	248.0229	266.4319	266.4319	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
37.2118	37.2118	37.2118	37.2118	37.2118	37.2118	37.2118	37.2118	37.2118	37.2118	37.2118	37.2118	37.2118	(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)													
-113.6944	-113.6944	-113.6944	-113.6944	-113.6944	-113.6944	-113.6944	-113.6944	-113.6944	-113.6944	-113.6944	-113.6944	-113.6944	(71)
Water heating gains (Table 5)													
103.7966	101.1184	95.9595	84.6528	77.7271	70.4880	66.0418	69.7154	74.0225	82.0550	92.8938	102.3510	102.3510	(72)
Total internal gains													
589.0081	604.3129	576.7747	554.6462	523.4387	502.4855	481.0462	481.8275	498.1180	516.9723	552.0929	575.2642	575.2642	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W
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				W/m2		or Table 6b		or Table 6c		Table 6d			
North				9.6300	10.6334		0.6300		0.8500		0.7700		38.0006 (74)
East				4.8200	19.6403		0.6300		0.8500		0.7700		35.1307 (76)
South				5.7400	46.7521		0.6300		0.8500		0.7700		99.5876 (78)
Solar gains	172.7190	304.4432	444.3374	598.0888	713.9916	728.4045	694.0993	604.5149	497.0267	343.9092	208.7279	146.6219	(83)
Total gains	761.7271	908.7560	1021.1120	1152.7351	1237.4303	1230.8900	1175.1455	1086.3423	995.1447	860.8815	760.8207	721.8860	(84)
7. Mean internal temperature (heating season)													
Temperature during heating periods in the living area from Table 9, Th1 (C)													
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	126.2331	126.6683	127.1066	129.3442	129.8012	132.1355	132.1355	132.6125	131.1918	129.8012	128.8904	127.9923	
alpha	9.4155	9.4446	9.4738	9.6229	9.6534	9.8090	9.8090	9.8408	9.7461	9.6534	9.5927	9.5328	
util living area	0.9995	0.9972	0.9844	0.8976	0.6939	0.4761	0.3430	0.3865	0.6367	0.9505	0.9976	0.9997	(86)
MIT	20.4201	20.5633	20.7405	20.9324	20.9941	20.9999	21.0000	21.0000	20.9979	20.8951	20.6219	20.4004	(87)
Th 2	20.2250	20.2274	20.2299	20.2423	20.2447	20.2571	20.2571	20.2596	20.2522	20.2447	20.2398	20.2348	(88)
util rest of house	0.9993	0.9958	0.9772	0.8643	0.6406	0.4209	0.2851	0.3243	0.5693	0.9247	0.9963	0.9996	(89)
MIT 2	19.5465	19.7314	19.9554	20.1844	20.2411	20.2571	20.2571	20.2596	20.2512	20.1529	19.8171	19.5296	(90)
Living area fraction									fLA =	Living area / (4) =			0.4170 (91)
MIT	19.9108	20.0783	20.2828	20.4963	20.5551	20.5668	20.5669	20.5683	20.5626	20.4624	20.1527	19.8927	(92)
Temperature adjustment													0.0000
adjusted MIT	19.9108	20.0783	20.2828	20.4963	20.5551	20.5668	20.5669	20.5683	20.5626	20.4624	20.1527	19.8927	(93)
8. Space heating requirement													
Utilisation	0.9992	0.9954	0.9778	0.8762	0.6628	0.4440	0.3092	0.3502	0.5975	0.9331	0.9961	0.9995	(94)
Useful gains	761.0798	904.6212	998.4579	1010.0564	820.1127	546.4593	363.3692	380.4425	594.6107	803.3126	757.8268	721.5007	(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	1496.8225	1450.3516	1312.4654	1085.1584	825.7206	546.5651	363.3718	380.4506	596.2400	919.6500	1225.7438	1483.9971	(97)
Space heating kWh	547.3926	366.7308	233.6216	54.0735	4.1722	0.0000	0.0000	0.0000	0.0000	86.5550	336.9002	567.2973	(98a)
Space heating requirement - total per year (kWh/year)												2196.7432	
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	547.3926	366.7308	233.6216	54.0735	4.1722	0.0000	0.0000	0.0000	0.0000	86.5550	336.9002	567.2973	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2196.7432	
Space heating per m2										(98c) / (4) =		19.0805	(99)
9a. Energy requirements - Individual heating systems, including micro-CHP													
Fraction of space heat from secondary/supplementary system (Table 11)													
Fraction of space heat from main system(s)													0.0000 (201)
Fraction of main heating from main system 2													1.0000 (202)
Fraction of total heating from main system 1													0.0000 (203)
Fraction of total heating from main system 2													1.0000 (204)
Efficiency of main space heating system 1 (in %)													0.0000 (205)
Efficiency of main space heating system 2 (in %)													100.0000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (207)
													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	547.3926	366.7308	233.6216	54.0735	4.1722	0.0000	0.0000	0.0000	0.0000	86.5550	336.9002	567.2973	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	547.3926	366.7308	233.6216	54.0735	4.1722	0.0000	0.0000	0.0000	0.0000	86.5550	336.9002	567.2973	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	259.2061	228.7088	241.6697	209.3902	200.8730	178.7176	174.7262	182.9462	186.3712	210.5572	227.2355	255.9714	(64)
Efficiency of water heater	338.4525	338.4525	338.4525	338.4525	338.4525	338.4525	338.4525	338.4525	338.4525	338.4525	338.4525	338.4525	(216)
(217)m	338.4525	338.4525	338.4525	338.4525	338.4525	338.4525	338.4525	338.4525	338.4525	338.4525	338.4525	338.4525	(217)
Fuel for water heating, kWh/month	76.5857	67.5749	71.4043	61.8669	59.3504	52.8043	51.6250	54.0537	55.0657	62.2117	67.1396	75.6299	(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	32.9847	29.7926	32.9847	31.9207	32.9847	31.9207	32.9847	32.9847	31.9207	32.9847	31.9207	32.9847	(231)
Lighting	28.4197	22.7993	20.5283	15.0399	11.6172	9.4914	10.5976	13.7752	17.8926	23.4761	26.5162	29.2095	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-11.2308	-17.7891	-28.3541	-34.5287	-39.8971	-38.4419	-37.9444	-34.1164	-27.9965	-21.1090	-12.9284	-9.4906	(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)

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Annual totals kWh/year	
Space heating fuel - main system 1	2196.7432 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	338.4525
Water heating fuel used	755.3122 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.1060)	
mechanical ventilation fans (SFP = 1.1060)	388.3680 (230a)
Total electricity for the above, kWh/year	388.3680 (231)
Electricity for lighting (calculated in Appendix L)	229.3630 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-313.8270 (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	3255.9595 (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	2196.7432	0.1580	347.0421 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	755.3122	0.1412	106.6670 (264)
Space and water heating			453.7091 (265)
Pumps, fans and electric keep-hot	388.3680	0.1387	53.8714 (267)
Energy for lighting	229.3630	0.1443	33.1042 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-313.8270	0.1327	-41.6505
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-41.6505 (269)
Total CO2, kg/year			499.0342 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.3300 (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	2196.7432	1.5848	3481.3944 (275)
Space heating - main system 2	0.0000	0.0000	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	755.3122	1.5222	1149.7402 (278)
Space and water heating			4631.1346 (279)
Pumps, fans and electric keep-hot	388.3680	1.5128	587.5231 (281)
Energy for lighting	229.3630	1.5338	351.8046 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-313.8270	1.4904	-467.7280
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-467.7280 (283)
Total Primary energy kWh/year			5102.7344 (286)
Dwelling Primary energy Rate (DPER)			44.3200 (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)
Main dwelling	115.1300 (1b)	x 2.5000 (2b)	= 287.8250 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	115.1300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	287.8250 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1390 (8)
Pressure test	Yes

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Pressure Test Method
Measured/design AP50
Infiltration rate
Number of sides sheltered

Blower Door
5.0000 (17)
0.3890 (18)
1 (19)

Shelter factor
Infiltration rate adjusted to include shelter factor
(20) = 1 - [0.075 x (19)] = 0.9250 (20)
(21) = (18) x (20) = 0.3598 (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	0.4587	0.4498	0.4408	0.3958	0.3868	0.3418	0.3418	0.3328	0.3598	0.3868	0.4048	0.4228	(22b)
Effective ac	0.6052	0.6011	0.5971	0.5783	0.5748	0.5584	0.5584	0.5554	0.5647	0.5748	0.5819	0.5894	(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	
Main dwelling								
TER Opaque door			2.1000	1.0000	2.1000			(26)
TER Opening Type			20.1900	1.1450	23.1183			(27)
Heatloss Floor 1			115.1300	0.1300	14.9669			(28a)
External Wall	76.4200	20.1900	56.2300	0.1800	10.1214			(29a)
Corridor Wall	3.7800	2.1000	1.6800	0.1800	0.3024			(29a)
Total net area of external elements Aum(A, m2)			195.3300					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	50.6090		(33)
Main dwelling								
Party Wall 1			47.0500	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							388.4713	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E10 Eaves (insulation at ceiling level)	0.0000	0.0600	0.0000	
P1 Party wall - Ground floor	18.8200	0.0800	1.5056	
P4 Party wall - Roof (insulation at ceiling level)	0.0000	0.1200	0.0000	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	18.8200	0.0000	0.0000	
E1 Steel lintel with perforated steel base plate	10.8700	0.0500	0.5435	
E4 Jamb	31.5800	0.0500	1.5790	
E3 Sill	3.4100	0.0500	0.1705	
E16 Corner (normal)	5.0000	0.0900	0.4500	
E17 Corner (inverted - internal area greater than external area)	0.0000	-0.0900	-0.0000	
E18 Party wall between dwellings	5.0000	0.0600	0.3000	
E5 Ground floor (normal)	32.0800	0.1600	5.1328	
E12 Gable (insulation at ceiling level)	0.0000	0.0600	0.0000	
E7 Party floor between dwellings (in blocks of flats)	32.0800	0.0700	2.2456	
E14 Flat roof	0.0000	0.0800	0.0000	
E20 Exposed floor (normal)	0.0000	0.3200	0.0000	
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				12.2270 (36)
Point Thermal bridges				(36a) = 0.0000
Total fabric heat loss				(33) + (36) + (36a) = 62.8360 (37)

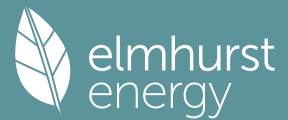
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	57.4855	57.0974	56.7170	54.9302	54.5959	53.0397	53.0397	52.7515	53.6391	54.5959	55.2722	55.9792	(38)
Heat transfer coeff	120.3215	119.9334	119.5530	117.7663	117.4320	115.8757	115.8757	115.5875	116.4752	117.4320	118.1082	118.8153	(39)
Average = Sum(39)m / 12 =												117.7647	
HLP	1.0451	1.0417	1.0384	1.0229	1.0200	1.0065	1.0065	1.0040	1.0117	1.0200	1.0259	1.0320	(40)
HLP (average)												1.0229	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8424 (42)
Hot water usage for mixer showers													
71.8768	70.7967	69.2227	66.2111	63.9886	61.5101	60.1013	61.6634	63.3758	66.0369	69.1132	71.6015	71.6015	(42a)
Hot water usage for baths													
31.0326	30.5717	29.9227	28.7261	27.8300	26.8364	26.2998	26.9442	27.6460	28.7091	29.9304	30.9277	30.9277	(42b)
Hot water usage for other uses													
43.7386	42.1481	40.5576	38.9671	37.3766	35.7861	35.7861	37.3766	38.9671	40.5576	42.1481	43.7386	43.7386	(42c)
Average daily hot water use (litres/day)												134.8025	(43)
Daily hot water use													
146.6481	143.5165	139.7030	133.9043	129.1952	124.1327	122.1872	125.9843	129.9888	135.3036	141.1917	146.2678	146.2678	(44)
Energy conte	232.2547	204.3656	214.7183	183.3082	173.9216	152.6356	147.7748	155.9948	160.2892	183.6058	201.1535	229.0200	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
34.8382	30.6548	32.2077	27.4962	26.0882	22.8953	22.1662	23.3992	24.0434	27.5409	30.1730	34.3530	34.3530	(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	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	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	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													
278.8496	246.4513	261.3132	228.4001	220.5165	197.7274	194.3697	202.5898	205.3811	230.2007	246.2454	275.6149	275.6149	(62)
WWHRS	-32.8591	-29.0609	-30.4308	-25.1979	-23.4836	-20.0951	-18.8359	-20.0301	-20.7911	-24.5104	-27.7674	-32.2506	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
245.9905	217.3905	230.8824	203.2021	197.0329	177.6324	175.5338	182.5596	184.5900	205.6902	218.4780	243.3643	243.3643	(64)
Total per year (kWh/year) = Sum(64)m =												2482.3467	(64)
12Total per year (kWh/year)												2482	(64)

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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	114.5006	101.6201	108.6698	97.0235	95.1049	86.8248	86.4111	89.1442	89.3696	98.3248	102.9570	113.4251 (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	142.1180	142.1180	142.1180	142.1180	142.1180	142.1180	142.1180	142.1180	142.1180	142.1180	142.1180	142.1180 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	144.2085	159.6594	144.2085	149.0155	144.2085	149.0155	144.2085	144.2085	149.0155	144.2085	149.0155	144.2085 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	278.7302	281.6226	274.3339	258.8173	239.2304	220.8214	208.5231	205.6308	212.9194	228.4360	248.0229	266.4319 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.2118	37.2118	37.2118	37.2118	37.2118	37.2118	37.2118	37.2118	37.2118	37.2118	37.2118	37.2118 (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)	-113.6944	-113.6944	-113.6944	-113.6944	-113.6944	-113.6944	-113.6944	-113.6944	-113.6944	-113.6944	-113.6944	-113.6944 (71)
Water heating gains (Table 5)	153.8987	151.2205	146.0615	134.7548	127.8291	120.5900	116.1439	119.8175	124.1245	132.1570	142.9959	152.4530 (72)
Total internal gains	645.4728	661.1378	633.2394	611.2230	579.9034	556.0623	534.5109	535.2922	551.6948	573.4370	608.6697	631.7289 (73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W
North	9.6300	10.6334	0.6300	0.7000	0.7700	31.2946 (74)
East	4.8200	19.6403	0.6300	0.7000	0.7700	28.9312 (76)
South	5.7400	46.7521	0.6300	0.7000	0.7700	82.0133 (78)

Solar gains	142.2392	250.7179	365.9249	492.5438	587.9931	599.8625	571.6112	497.8358	409.3161	283.2194	171.8935	120.7474 (83)
Total gains	787.7120	911.8558	999.1642	1103.7667	1167.8965	1155.9248	1106.1221	1033.1279	961.0109	856.6563	780.5632	752.4763 (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	103.2527	103.5869	103.9165	105.4931	105.7934	107.2142	107.2142	107.4815	106.6625	105.7934	105.1876	104.5617
alpha	7.8835	7.9058	7.9278	8.0329	8.0529	8.1476	8.1476	8.1654	8.1108	8.0529	8.0125	7.9708
util living area	0.9996	0.9986	0.9946	0.9678	0.8575	0.6353	0.4605	0.5135	0.7963	0.9821	0.9986	0.9997 (86)
MIT	20.1981	20.3301	20.5141	20.7652	20.9403	20.9952	20.9997	20.9992	20.9747	20.7498	20.4328	20.1823 (87)
Th 2	20.0459	20.0487	20.0514	20.0643	20.0667	20.0779	20.0779	20.0800	20.0736	20.0667	20.0618	20.0567 (88)
util rest of house	0.9994	0.9979	0.9916	0.9504	0.7993	0.5473	0.3643	0.4116	0.7086	0.9689	0.9978	0.9996 (89)
MIT 2	19.1134	19.2846	19.5210	19.8399	20.0253	20.0761	20.0779	20.0799	20.0611	19.8288	19.4269	19.1020 (90)
Living area fraction	19.5657	19.7206	19.9351	20.2258	20.4068	20.4594	20.4623	20.4633	20.4421	20.2128	19.8464	19.5525 (92)
MIT	19.5657	19.7206	19.9351	20.2258	20.4068	20.4594	20.4623	20.4633	20.4421	20.2128	19.8464	19.5525 (93)
Temperature adjustment												0.0000
adjusted MIT	19.5657	19.7206	19.9351	20.2258	20.4068	20.4594	20.4623	20.4633	20.4421	20.2128	19.8464	19.5525 (93)

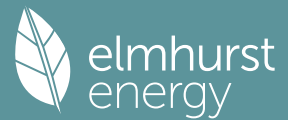
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9993	0.9975	0.9911	0.9540	0.8221	0.5842	0.4045	0.4542	0.7455	0.9715	0.9975	0.9995 (94)
Ext temp.	787.1436	909.5814	990.2734	1052.9706	960.1311	675.2611	447.3763	469.2516	716.4436	832.2590	778.6109	752.0957 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Space heating kWh	1836.7957	1777.4841	1606.2093	1333.7917	1022.4620	678.9590	447.5438	469.6620	738.6957	1128.8557	1505.4509	1824.1115 (97)
Space heating requirement - total per year (kWh/year)	780.9412	583.2306	458.2563	202.1912	46.3742	0.0000	0.0000	0.0000	0.0000	220.6679	523.3248	797.5797 (98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)	780.9412	583.2306	458.2563	202.1912	46.3742	0.0000	0.0000	0.0000	0.0000	220.6679	523.3248	797.5797 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3612.5660
Space heating per m ²												31.3781 (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)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
780.9412	583.2306	458.2563	202.1912	46.3742	0.0000	0.0000	0.0000	0.0000	0.0000	220.6679	523.3248	797.5797 (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)	846.0902	631.8858	496.4857	219.0587	50.2429	0.0000	0.0000	0.0000	0.0000	239.0769	566.9824	864.1167 (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)

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Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	245.9905	217.3905	230.8824	203.2021	197.0329	177.6324	175.5338	182.5596	184.5900	205.6902	218.4780	243.3643 (64)
Efficiency of water heater	86.4641	86.1614	85.5668	84.0486	81.3712	79.8000	79.8000	79.8000	79.8000	84.2177	85.9452	79.8000 (216)
Fuel for water heating, kWh/month	284.5001	252.3060	269.8270	241.7674	242.1407	222.5969	219.9672	228.7715	231.3157	244.2363	254.2062	86.5187 (217)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685 (231)
Lighting	29.9637	24.0380	21.6435	15.8570	12.2484	10.0070	11.1734	14.5236	18.8647	24.7515	27.9568	30.7965 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-51.8673	-72.1245	-102.2536	-113.3110	-120.7522	-112.1303	-110.6632	-105.1174	-95.1939	-81.6082	-56.6335	-44.9535 (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	-32.4192	-67.8186	-134.1308	-200.5350	-264.3199	-265.3425	-262.2939	-222.5299	-163.6520	-96.7671	-43.2047	-25.6718 (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												3913.9393 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.8000
Water heating fuel used												2972.9203 (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)												241.8241 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2845.2943 (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												4369.3894 (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	3913.9393	0.2100	821.9273 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2972.9203	0.2100	624.3133 (264)
Space and water heating			1446.2405 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	241.8241	0.1443	34.9027 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1066.6086	0.1349	-143.8857
PV Unit electricity exported	-1778.6857	0.1260	-224.1589
Total			-368.0446 (269)
Total CO2, kg/year			1125.0279 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.7700 (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	3913.9393	1.1300	4422.7514 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2972.9203	1.1300	3359.3999 (278)
Space and water heating			7782.1513 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	241.8241	1.5338	370.9178 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1066.6086	1.4986	-1598.4046
PV Unit electricity exported	-1778.6857	0.4626	-822.8268
Total			-2421.2314 (283)
Total Primary energy kWh/year			5861.9386 (286)
Target Primary Energy Rate (TPER)			50.9200 (287)

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Property Reference	Terraces 2B3P End			Issued on Date	30/10/2025
Assessment Reference	Terraces 2B3P End	Prop Type Ref	001 Egerton		
Property	001 , Egerton Avenue, Hextable				
SAP Rating	82 B	DER	3.63	TER	10.05
Environmental	97 A	% DER < TER			63.88
CO ₂ Emissions (t/year)	0.16	DFEE	27.53	TFEE	40.42
Compliance Check	See BREL	% DFEE < TFEE			31.89
% DPER < TPER	33.14	DPER	35.98	TPER	53.81
Assessor Details	Mrs. Ellen Huelin			Assessor ID	W281-0001
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)
Main dwelling	64.1500 (1b)	2.4000 (2b)	153.9600 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.1500		153.9600 (4)
Dwelling volume			153.9600 (5)

2. Ventilation rate

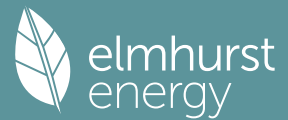
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.1299 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3799 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3514 (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	0.4480	0.4393	0.4305	0.3866	0.3778	0.3338	0.3338	0.3251	0.3514	0.3778	0.3953	0.4129 (22b)
Effective ac	0.6004	0.5965	0.5927	0.5747	0.5714	0.5557	0.5557	0.5528	0.5617	0.5714	0.5781	0.5852 (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
Main dwelling							
Window			8.3300	1.1450	9.5382		(27)
Door			2.1000	1.2000	2.5200		(26)
Heatloss Floor 1			64.1500	0.1200	7.6980	75.0000	4811.2500 (28a)
External Wall	56.5700	10.4300	46.1400	0.1500	6.9210	110.0000	5075.4000 (29a)
External Roof 1	64.1500		64.1500	0.0000	0.0000	9.0000	577.3500 (30)
Total net area of external elements Aum(A, m ²)			120.7200				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 26.6772		(33)
Main dwelling							
Party Wall			20.4700	0.0000	0.0000	110.0000	2251.6999 (32)
Internal Wall 1			107.9000			75.0000	8092.5001 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) = 20808.2000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							324.3679 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E10 Eaves (insulation at ceiling level)				15.0400	0.0270	0.4061	
P1 Party wall - Ground floor				8.5300	0.0360	0.3071	
P4 Party wall - Roof (insulation at ceiling level)				8.5300	0.0330	0.2815	
P2 Party wall - Intermediate floor within a dwelling				0.0000	0.0000	0.0000	
E1 Steel lintel with perforated steel base plate				7.5000	0.0600	0.4500	

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E4 Jamb	16.6800	0.0190	0.3169	
E3 Sill	5.0000	0.0110	0.0550	
E16 Corner (normal)	4.8000	0.0310	0.1488	
E17 Corner (inverted - internal area greater than external area)	0.0000	-0.0600	-0.0000	
E18 Party wall between dwellings	4.8000	0.0650	0.3120	
E5 Ground floor (normal)	23.5700	0.0460	1.0842	
E12 Gable (insulation at ceiling level)	8.5300	0.0560	0.4777	
E6 Intermediate floor within a dwelling	0.0000	0.0050	0.0000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				3.8393 (36)
Point Thermal bridges				0.0000
Total fabric heat loss		(33) + (36) + (36a) =		30.5164 (37)

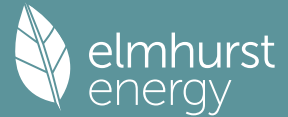
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 30.5031	Feb 30.3051	Mar 30.1110	Apr 29.1992	May 29.0287	Jun 28.2346	Jul 28.2346	Aug 28.0875	Sep 28.5405	Oct 29.0287	Nov 29.3737	Dec 29.7345 (38)
Heat transfer coeff	61.0195	60.8215	60.6274	59.7157	59.5451	58.7510	58.7510	58.6040	59.0569	59.5451	59.8902	60.2509 (39)
Average = Sum(39)m / 12 =												59.7149
HLP	Jan 0.9512	Feb 0.9481	Mar 0.9451	Apr 0.9309	May 0.9282	Jun 0.9158	Jul 0.9158	Aug 0.9135	Sep 0.9206	Oct 0.9282	Nov 0.9336	Dec 0.9392 (40)
HLP (average)												0.9309
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.0962 (42)
Hot water usage for mixer showers												
59.2663	58.4741	57.1741	54.6866	52.8510	50.8039	49.6403	50.9305	52.3448	54.5428	57.0837	59.1388 (42a)	
Hot water usage for baths												
25.6527	25.2717	24.7352	23.7460	23.0053	22.1840	21.7403	22.2731	22.8531	23.7320	24.7415	25.5659 (42b)	
Hot water usage for other uses												
36.0974	34.7847	33.4721	32.1595	30.8468	29.5342	29.5342	30.8468	32.1595	33.4721	34.7847	36.0974 (42c)	
Average daily hot water use (litres/day)												111.3335 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	121.1163	118.5305	115.3813	110.5921	106.7031	102.5221	100.9148	104.0504	107.3574	111.7469	116.6099	120.8021 (44)
Energy conte	191.8186	168.7859	177.3368	151.3950	143.6429	126.0628	122.0478	128.8362	132.3825	151.6394	166.1322	189.1469 (45)
Energy content (annual)										Total = Sum(45)m =		1849.2270
Distribution loss (46)m = 0.15 x (45)m												
28.7728	25.3179	26.6005	22.7093	21.5464	18.9094	18.3072	19.3254	19.8574	22.7459	24.9198	28.3720 (46)	
Water storage loss:												
Store volume												201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8694 (55)
Total storage loss												
26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (56)
If cylinder contains dedicated solar storage												
26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514 (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												
218.7700	193.1291	204.2882	177.4770	170.5943	152.1448	148.9992	155.7876	158.4645	178.5908	192.2142	216.0983 (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	218.7700	193.1291	204.2882	177.4770	170.5943	152.1448	148.9992	155.7876	158.4645	178.5908	192.2142	216.0983 (64)
12Total per year (kWh/year)												2166.5580 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month												
63.7797	56.1213	58.9645	50.3389	47.7613	41.9159	40.5809	42.8380	44.0172	50.4201	55.2390	62.8913 (65)	

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts												
(66)m	Jan 104.8108	Feb 104.8108	Mar 104.8108	Apr 104.8108	May 104.8108	Jun 104.8108	Jul 104.8108	Aug 104.8108	Sep 104.8108	Oct 104.8108	Nov 104.8108	Dec 104.8108 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
96.7252	107.0886	96.7252	99.9494	96.7252	99.9494	96.7252	96.7252	99.9494	96.7252	99.9494	96.7252 (67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
183.2791	185.1810	180.3884	170.1854	157.3060	145.2012	137.1144	135.2126	140.0052	150.2082	163.0875	175.1924 (68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
33.4811	33.4811	33.4811	33.4811	33.4811	33.4811	33.4811	33.4811	33.4811	33.4811	33.4811	33.4811 (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)												
-83.8487	-83.8487	-83.8487	-83.8487	-83.8487	-83.8487	-83.8487	-83.8487	-83.8487	-83.8487	-83.8487	-83.8487 (71)	
Water heating gains (Table 5)												
85.7254	83.5138	79.2533	69.9151	64.1952	58.2165	54.5442	57.5780	61.1350	67.7690	76.7208	84.5314 (72)	
Total internal gains	420.1729	430.2267	410.8101	394.4931	372.6697	357.8103	342.8271	343.9590	355.5328	369.1456	394.2009	410.8922 (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	8.3300		19.6403		0.6300		0.8500		0.7700		60.7135 (76)	
Solar gains	60.7135	118.7684	195.5947	285.2632	349.6007	357.8785	340.7150	292.6691	227.4847	140.9287	75.7026	49.9278 (83)
Total gains	480.8864	548.9951	606.4048	679.7562	722.2704	715.6888	683.5420	636.6281	583.0174	510.0743	469.9035	460.8200 (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	94.7247	95.0331	95.3374	96.7929	97.0702	98.3822	98.3822	98.6291	97.8727	97.0702	96.5109	95.9330	
alpha	7.3150	7.3355	7.3558	7.4529	7.4713	7.5588	7.5588	7.5753	7.5248	7.4713	7.4341	7.3955	
util living area	0.9978	0.9936	0.9789	0.9068	0.7392	0.5234	0.3780	0.4231	0.6840	0.9487	0.9937	0.9984 (86)	
MIT	20.2485	20.3952	20.6017	20.8516	20.9722	20.9981	20.9999	20.9997	20.9878	20.8107	20.4892	20.2291 (87)	
Th 2	20.1242	20.1268	20.1293	20.1413	20.1436	20.1541	20.1541	20.1560	20.1500	20.1436	20.1390	20.1343 (88)	
util rest of house	0.9969	0.9911	0.9704	0.8761	0.6813	0.4553	0.3054	0.3457	0.6068	0.9238	0.9907	0.9977 (89)	
MIT 2	19.2547	19.4433	19.7036	20.0054	20.1244	20.1532	20.1540	20.1559	20.1437	19.9694	19.5735	19.2379 (90)	
Living area fraction									fLA = Living area / (4) =				0.2999 (91)
MIT	19.5528	19.7288	19.9730	20.2592	20.3787	20.4066	20.4077	20.4090	20.3969	20.2217	19.8482	19.5352 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.5528	19.7288	19.9730	20.2592	20.3787	20.4066	20.4077	20.4090	20.3969	20.2217	19.8482	19.5352 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9961	0.9896	0.9686	0.8808	0.6978	0.4757	0.3272	0.3689	0.6298	0.9265	0.9894	0.9971 (94)
Useful gains	479.0230	543.2729	587.3618	598.7051	503.9694	340.4830	223.6744	234.8643	367.2033	472.5760	464.9240	459.4694 (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	930.7166	901.9090	816.8305	678.3232	516.7726	341.1440	223.7068	234.9422	371.8730	572.9254	763.4898	923.9593 (97)
Space heating kWh	336.0601	241.0034	170.7248	57.3250	9.5256	0.0000	0.0000	0.0000	0.0000	74.6599	214.9674	345.5804 (98a)
Space heating requirement - total per year (kWh/year)												1449.8466
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	336.0601	241.0034	170.7248	57.3250	9.5256	0.0000	0.0000	0.0000	0.0000	74.6599	214.9674	345.5804 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1449.8466
Space heating per m2										(98c) / (4) =		22.6009 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Fraction of main heating from main system 2													0.0000 (203)
Fraction of total heating from main system 1													1.0000 (204)
Fraction of total heating from main system 2													0.0000 (205)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	336.0601	241.0034	170.7248	57.3250	9.5256	0.0000	0.0000	0.0000	0.0000	74.6599	214.9674	345.5804	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	336.0601	241.0034	170.7248	57.3250	9.5256	0.0000	0.0000	0.0000	0.0000	74.6599	214.9674	345.5804	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2													(213)
Water heating													
Water heating requirement	218.7700	193.1291	204.2882	177.4770	170.5943	152.1448	148.9992	155.7876	158.4645	178.5908	192.2142	216.0983	(64)
Efficiency of water heater													(216)
(217)m	345.8844	345.8844	345.8844	345.8844	345.8844	345.8844	345.8844	345.8844	345.8844	345.8844	345.8844	345.8844	(217)
Fuel for water heating, kWh/month	63.2495	55.8363	59.0626	51.3111	49.3212	43.9872	43.0777	45.0404	45.8143	51.6331	55.5718	62.4770	(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	19.5171	15.6573	14.0977	10.3286	7.9781	6.5182	7.2779	9.4600	12.2877	16.1221	18.2099	20.0595	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-37.8688	-55.6741	-81.0243	-86.4845	-88.4218	-81.2314	-80.0706	-75.3733	-66.6281	-59.7656	-41.7359	-32.4722	(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													1449.8466 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													345.8844
Water heating fuel used													626.3821 (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)													157.5139 (232)

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

PV generation	-786.7504 (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	1446.9922 (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	1449.8466	0.1572	227.8575 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (273)
Water heating (other fuel)	626.3821	0.1412	88.4191 (264)
Space and water heating			316.2766 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	157.5139	0.1443	22.7341 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-786.7504	0.1353	-106.4454
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-106.4454 (269)
Total CO2, kg/year			232.5653 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.6300 (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	1449.8466	1.5818	2293.3737 (275)
Space heating - main system 2	0.0000	0.0000	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	626.3821	1.5220	953.3319 (278)
Space and water heating			3246.7056 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	157.5139	1.5338	241.6000 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-786.7504	1.5001	-1180.2029
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-1180.2029 (283)
Total Primary energy kWh/year			2308.1026 (286)
Dwelling Primary energy Rate (DPER)			35.9800 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	64.1500 (1b)	x 2.4000 (2b)	= 153.9600 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	64.1500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 153.9600 (5)

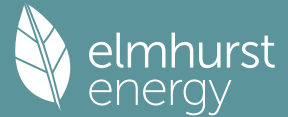
2. Ventilation rate

	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) =	0.1299 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3799	(18)
Number of sides sheltered		1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.3514 (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												

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Effective ac	0.4480	0.4393	0.4305	0.3866	0.3778	0.3338	0.3338	0.3251	0.3514	0.3778	0.3953	0.4129 (22b)
	0.6004	0.5965	0.5927	0.5747	0.5714	0.5557	0.5557	0.5528	0.5617	0.5714	0.5781	0.5852 (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
Main dwelling							
TER Opaque door			2.1000	1.0000	2.1000		(26)
TER Opening Type			8.3300	1.1450	9.5382		(27)
Heatloss Floor 1			64.1500	0.1300	8.3395		(28a)
External Wall	56.5700	10.4300	46.1400	0.1800	8.3052		(29a)
External Roof 1	64.1500		64.1500	0.1100	7.0565		(30)
Total net area of external elements Aum(A, m2)			184.8700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		35.3394		(33)
Main dwelling							
Party Wall			20.4700	0.0000	0.0000		(32)

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

324.3679 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E10 Eaves (insulation at ceiling level)	15.0400	0.0600	0.9024
P1 Party wall - Ground floor	8.5300	0.0800	0.6824
P4 Party wall - Roof (insulation at ceiling level)	8.5300	0.1200	1.0236
P2 Party wall - Intermediate floor within a dwelling	0.0000	0.0000	0.0000
E1 Steel lintel with perforated steel base plate	7.5000	0.0500	0.3750
E4 Jamb	16.6800	0.0500	0.8340
E3 Sill	5.0000	0.0500	0.2500
E16 Corner (normal)	4.8000	0.0900	0.4320
E17 Corner (inverted - internal area greater than external area)	0.0000	-0.0900	-0.0000
E18 Party wall between dwellings	4.8000	0.0600	0.2880
E5 Ground floor (normal)	23.5700	0.1600	3.7712
E12 Gable (insulation at ceiling level)	8.5300	0.0600	0.5118
E6 Intermediate floor within a dwelling	0.0000	0.0000	0.0000

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

9.0704 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 44.4098 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	30.5031	30.3051	30.1110	29.1992	29.0287	28.2346	28.2346	28.0875	28.5405	29.0287	29.3737	29.7345 (38)
Heat transfer coeff	74.9129	74.7148	74.5207	73.6090	73.4384	72.6444	72.6444	72.4973	72.9502	73.4384	73.7835	74.1443 (39)
Average = Sum(39)m / 12 =												73.6082

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1678	1.1647	1.1617	1.1475	1.1448	1.1324	1.1324	1.1301	1.1372	1.1448	1.1502	1.1558 (40)
HLP (average)												1.1474
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

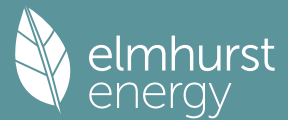
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.0962 (42)
Hot water usage for mixer showers	59.3663	58.4741	57.1741	54.6866	52.8510	50.8039	49.6403	50.9305	52.3448	54.5428	57.0837	59.1388	(42a)
Hot water usage for baths	25.6527	25.2717	24.7352	23.7460	23.0053	22.1840	21.7403	22.2731	22.8531	23.7320	24.7415	25.5659	(42b)
Hot water usage for other uses	36.0974	34.7847	33.4721	32.1595	30.8468	29.5342	29.5342	30.8468	32.1595	33.4721	34.7847	36.0974	(42c)
Average daily hot water use (litres/day)													111.3335 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	121.1163	118.5305	115.3813	110.5921	106.7031	102.5221	100.9148	104.0504	107.3574	111.7469	116.6099	120.8021	(44)
Energy content (annual)	191.8186	168.7859	177.3368	151.3950	143.6429	126.0628	122.0478	128.8362	132.3825	151.6394	166.1322	189.1469	(45)
Distribution loss (46)m = 0.15 x (45)m	28.7728	25.3179	26.6005	22.7093	21.5464	18.9094	18.3072	19.3254	19.8574	22.7459	24.9198	28.3720	(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													
WWHRS	238.4135	210.8716	223.9317	196.4869	190.2378	171.1547	168.6427	175.4311	177.4743	198.2344	211.2241	235.7418	(62)
PV diverter	-27.1398	-24.0026	-25.1342	-20.8121	-19.3961	-16.5974	-15.5574	-16.5438	-17.1723	-20.2443	-22.9343	-26.6372	(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	211.2737	186.8690	198.7975	175.6748	170.8417	154.5573	153.0852	158.8873	160.3020	177.9901	188.2898	209.1046	(64)
12Total per year (kWh/year)													(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)
													(64a)
Heat gains from water heating, kWh/month	101.0556	89.7899	96.2404	86.4123	85.0372	77.9894	77.8568	80.1139	80.0906	87.6960	91.3124	100.1673	(65)

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

Metabolic gains (Table 5), Watts												
(66)m	104.8108	104.8108	104.8108	104.8108	104.8108	104.8108	104.8108	104.8108	104.8108	104.8108	104.8108	104.8108 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	100.8292	111.6323	100.8292	104.1901	100.8292	104.1901	100.8292	100.8292	104.1901	100.8292	104.1901	100.8292 (67)

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Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	183.2791	185.1810	180.3884	170.1854	157.3060	145.2012	137.1144	135.2126	140.0052	150.2082	163.0875	175.1924 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.4811	33.4811	33.4811	33.4811	33.4811	33.4811	33.4811	33.4811	33.4811	33.4811	33.4811	33.4811 (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)	-83.8487	-83.8487	-83.8487	-83.8487	-83.8487	-83.8487	-83.8487	-83.8487	-83.8487	-83.8487	-83.8487	-83.8487 (71)
Water heating gains (Table 5)	135.8274	133.6159	129.3554	120.0171	114.2973	108.3186	104.6462	107.6800	111.2370	117.8710	126.8228	134.6334 (72)
Total internal gains	477.3790	487.8724	468.0162	451.8359	429.8757	412.1531	397.0331	398.1650	409.8756	426.3516	451.5437	468.0982 (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	8.3300		19.6403		0.6300		0.7000		0.7700		49.9993 (76)	
Solar gains	49.9993	97.8093	161.0780	234.9226	287.9065	294.7235	280.5888	241.0216	187.3403	116.0590	62.3433	41.1170 (83)
Total gains	527.3783	585.6817	629.0941	686.7585	717.7822	706.8766	677.6219	639.1866	597.2159	542.4105	513.8870	509.2152 (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	77.1571	77.3616	77.5631	78.5237	78.7061	79.5665	79.5665	79.7279	79.2329	78.7061	78.3380	77.9569
alpha	6.1438	6.1574	6.1709	6.2349	6.2471	6.3044	6.3044	6.3152	6.2822	6.2471	6.2225	6.1971
util living area	0.9971	0.9939	0.9849	0.9466	0.8397	0.6409	0.4695	0.5176	0.7793	0.9627	0.9932	0.9977 (86)
MIT	20.0215	20.1619	20.3774	20.6744	20.8913	20.9839	20.9980	20.9964	20.9486	20.6729	20.3030	20.0030 (87)
Th 2	19.9459	19.9484	19.9508	19.9623	19.9644	19.9744	19.9744	19.9763	19.9706	19.9644	19.9601	19.9555 (88)
util rest of house	0.9959	0.9913	0.9782	0.9236	0.7805	0.5464	0.3614	0.4048	0.6895	0.9416	0.9898	0.9967 (89)
MIT 2	18.8259	19.0064	19.2802	19.6496	19.8833	19.9671	19.9740	19.9754	19.9420	19.6569	19.1959	18.8096 (90)
Living area fraction	FLA = Living area / (4) =											
MIT	19.1845	19.3530	19.6092	19.9570	20.1856	20.2721	20.2811	20.2816	20.2439	19.9616	19.5279	19.1675 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.1845	19.3530	19.6092	19.9570	20.1856	20.2721	20.2811	20.2816	20.2439	19.9616	19.5279	19.1675 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9947	0.9893	0.9754	0.9234	0.7944	0.5747	0.3940	0.4389	0.7153	0.9415	0.9878	0.9957 (94)
Useful gains	524.5711	579.4068	613.6195	634.1629	570.1739	406.2112	266.9511	280.5199	427.1706	510.6803	507.6398	507.0013 (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	1115.0368	1079.8517	976.9103	813.8933	623.1691	412.0447	267.4124	281.4078	448.1959	687.5048	916.9752	1109.7571 (97)
Space heating kWh	439.3065	336.2990	270.2884	129.4059	39.4284	0.0000	0.0000	0.0000	0.0000	131.5574	294.7214	448.4503 (98a)
Space heating requirement - total per year (kWh/year)												2089.4572
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	439.3065	336.2990	270.2884	129.4059	39.4284	0.0000	0.0000	0.0000	0.0000	131.5574	294.7214	448.4503 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2089.4572
Space heating per m2	(98c) / (4) =											32.5714 (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	439.3065	336.2990	270.2884	129.4059	39.4284	0.0000	0.0000	0.0000	0.0000	131.5574	294.7214	448.4503 (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)	475.9550	364.3543	292.8368	140.2014	42.7176	0.0000	0.0000	0.0000	0.0000	142.5324	319.3082	485.8616 (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	211.2737	186.8690	198.7975	175.6748	170.8417	154.5573	153.0852	158.8873	160.3020	177.9901	188.2898	209.1046 (64)
Efficiency of water heater (217)m	85.6626	85.3613	84.7493	83.3847	81.3460	79.8000	79.8000	79.8000	79.8000	83.3920	85.0603	79.8000 (216)
Fuel for water heating, kWh/month	246.6348	218.9154	234.5714	210.6798	210.0186	193.6808	191.8361	199.1069	200.8797	213.4377	221.3603	243.9236 (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	20.9503	16.8071	15.1329	11.0870	8.5640	6.9968	7.8123	10.1548	13.1900	17.3060	19.5471	21.5326 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-50.2854	-66.4413	-89.5920	-94.3427	-96.7195	-88.6145	-87.5694	-85.0787	-80.0190	-72.8804	-53.7059	-44.0246 (233a)

Full SAP Calculation Printout



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	-43.6428	-89.5103	-173.8330	-255.4051	-332.4019	-332.0384	-328.0513	-280.0490	-208.4369	-125.8997	-57.5531	-34.6797	(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												2263.7673	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2585.0452	(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)												169.0810	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-3170.7745	(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												1933.1189	(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	2263.7673	0.2100	475.3911 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2585.0452	0.2100	542.8595 (264)
Space and water heating			1018.2506 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	169.0810	0.1443	24.4036 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-909.2734	0.1360	-123.6351
PV Unit electricity exported	-2261.5012	0.1266	-286.2205
Total			-409.8556 (269)
Total CO2, kg/year			644.7279 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.0500 (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	2263.7673	1.1300	2558.0571 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2585.0452	1.1300	2921.1011 (278)
Space and water heating			5479.1581 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	169.0810	1.5338	259.3420 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-909.2734	1.5026	-1366.2761
PV Unit electricity exported	-2261.5012	0.4646	-1050.6938
Total			-2416.9699 (283)
Total Primary energy kWh/year			3451.6311 (286)
Target Primary Energy Rate (TPER)			53.8100 (287)

Appendix B – BRUKL Output

Project name

Courthouse Farm Pavillion**As designed****Date:** Thu Oct 23 10:31:36 2025**Administrative information****Building Details****Address:****Certifier details****Name:** Name**Telephone number:** Phone**Address:** Street Address, City, Postcode**Certification tool****Calculation engine:** Apache**Calculation engine version:** 7.0.29**Interface to calculation engine:** IES Virtual Environment**Interface to calculation engine version:** 7.0.29**BRUKL compliance module version:** v6.1.e.1**Foundation area [m²]:** 1079.05**The CO₂ emission and primary energy rates of the building must not exceed the targets**

Target CO ₂ emission rate (TER), kgCO ₂ /m ² annum	19.06
Building CO ₂ emission rate (BER), kgCO ₂ /m ² annum	18.66
Target primary energy rate (TPER), kWh _{PE} /m ² annum	207.99
Building primary energy rate (BPER), kWh _{PE} /m ² annum	203.75
Do the building's emission and primary energy rates exceed the targets?	BER ≤ TER BPER ≤ TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	U _a -Limit	U _a -Calc	U _i -Calc	First surface with maximum value
Walls*	0.26	0.18	0.18	0000001B:Surf[4]
Floors	0.18	0.11	0.11	00000008:Surf[0]
Pitched roofs	0.16	-	-	No pitched roofs in building
Flat roofs	0.18	0.12	0.12	0000001B:Surf[1]
Windows** and roof windows	1.6	1.4	1.4	0000001B:Surf[2]
Rooflights***	2.2	-	-	No roof lights in building
Personnel doors^	1.6	1.6	1.6	0000002F:Surf[1]
Vehicle access & similar large doors	1.3	-	-	No vehicle access doors in building
High usage entrance doors	3	-	-	No high usage entrance doors in building
U _a -Limit = Limiting area-weighted average U-values [W/(m ² K)] U _a -Calc = Calculated area-weighted average U-values [W/(m ² K)] U _i -Calc = Calculated maximum individual element U-values [W/(m ² K)] * Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows. ** Display windows and similar glazing are excluded from the U-value check. *** Values for rooflights refer to the horizontal position. ^ For fire doors, limiting U-value is 1.8 W/m ² K NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.				

Air permeability	Limiting standard	This building
m ³ /(h.m ²) at 50 Pa	8	3

Building services

For details on the standard values listed below, system-specific guidance, and additional regulatory requirements, refer to the Approved Documents.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	<0.9

1- 001| Main System - VRF

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.5	6.5	0	1.6	0.85
Standard value	2.5*	N/A	N/A	2^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					
^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.					

2- 001| Main System - ASHP UFH

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.5	-	0.2	-	0.85
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

"No HWS in project, or hot water is provided by HVAC system"

Zone-level mechanical ventilation, exhaust, and terminal units

ID	System type in the Approved Documents
A	Local supply or extract ventilation units
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal balanced supply and extract ventilation system
E	Local balanced supply and extract ventilation units
F	Other local ventilation units
G	Fan assisted terminal variable air volume units
H	Fan coil units
I	Kitchen extract with the fan remote from the zone and a grease filter
NB: Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.	

Zone name	SFP [W/(l/s)]										HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		Zone	Standard
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1			
P.00 - Swimming Pool	-	-	-	1.6	-	-	-	-	-	-	-	N/A

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
Standard value		95	80	0.3
P.00 - Admin/Sales		110	-	-
P.00 - CAC 1		110	-	-
P.00 - CAC 2		110	80	1.875

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m ²]
	Standard value	95	80	0.3
P.00 - CAC 3		110	80	1.875
P.00 - Care Office		110	-	-
P.00 - Commercial Kitchen		110	-	-
P.00 - Comms		110	-	-
P.00 - Entrance Lobby		110	-	-
P.00 - Female Changing Room		110	-	-
P.00 - GYM		110	-	-
P.00 - Hair Salon		110	80	1.875
P.00 - Hair Salon		110	80	1.875
P.00 - Kitchen AHU		110	-	-
P.00 - Laundry		110	-	-
P.00 - Lift Lobby		110	-	-
P.00 - Lift Supply		110	-	-
P.00 - Lobby 1		110	-	-
P.00 - Lobby 2		110	-	-
P.00 - Male Changing Room		110	-	-
P.00 - Members Lounge		110	80	1.875
P.00 - Nail Salon		110	80	1.875
P.00 - Office		110	-	-
P.00 - Private Dining 1		110	80	1.875
P.00 - Private Dining 2		110	80	1.875
P.00 - Restaurant/ Bar		110	80	1.875
P.00 - Sauna Room		110	-	-
P.00 - Staff Bathroom		110	-	-
P.00 - Staff Room		110	-	-
P.00 - Staircore 1		110	-	-
P.00 - Staircore 2		110	-	-
P.00 - Steam Room		110	-	-
P.00 - Store 1		110	-	-
P.00 - Store 2		110	-	-
P.00 - Store 3		110	-	-
P.00 - Store 4		110	-	-
P.00 - Store 5		110	-	-
P.00 - Store 6		110	-	-
P.00 - Store 7		110	-	-
P.00 - Store 8		110	-	-
P.00 - Store 9		110	-	-
P.00 - Store 10		110	-	-
P.00 - Store 11		110	-	-
P.00 - Store 12		110	-	-
P.00 - Store 13		110	-	-
P.00 - Store 14		110	-	-
P.00 - Store 15		110	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m ²]
	Standard value	95	80	0.3
P.00 - Store 16		110	-	-
P.00 - Store 17		110	-	-
P.00 - Store 18		110	-	-
P.00 - Swimming Pool		110	-	-
P.00 - Switch Room		110	-	-
P.00 - Treatment Room 1		110	-	-
P.00 - Treatment Room 2		110	-	-
P.00 - Water Tank		110	-	-
P.00 - WC 1		110	-	-
P.00 - WC 2		110	-	-
P.00 - WC 3		110	-	-
P.00 - WC 4		110	-	-
P.00 - WC 5		110	-	-
P.00 - WC 6		110	-	-
P.00 - WC 7		110	-	-
P.00 - WC 8		110	-	-
P.00 - WC 9		110	-	-
P.00 - WC 10		110	-	-
P.00 - WC 11		110	-	-
P.00 - WC 12		110	-	-
P.00 - Yoga Room		110	-	-

The spaces in the building should have appropriate passive control measures to limit solar gains in summer

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
P.00 - Admin/Sales	N/A	N/A
P.00 - CAC 2	N/A	N/A
P.00 - CAC 3	NO (-31.3%)	NO
P.00 - Care Office	NO (-18.7%)	NO
P.00 - Commercial Kitchen	N/A	N/A
P.00 - Female Changing Room	N/A	N/A
P.00 - GYM	NO (-31.2%)	NO
P.00 - Hair Salon	NO (-44.9%)	NO
P.00 - Hair Salon	N/A	N/A
P.00 - Laundry	N/A	N/A
P.00 - Lobby 1	N/A	N/A
P.00 - Male Changing Room	N/A	N/A
P.00 - Members Lounge	NO (-29%)	NO
P.00 - Nail Salon	N/A	N/A
P.00 - Office	NO (-21.1%)	NO
P.00 - Private Dining 1	NO (-28.5%)	NO
P.00 - Private Dining 2	NO (-20.8%)	NO
P.00 - Restaurant/ Bar	NO (-33.6%)	NO
P.00 - Sauna Room	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
P.00 - Staff Bathroom	N/A	N/A
P.00 - Staff Room	NO (-56.6%)	NO
P.00 - Steam Room	N/A	N/A
P.00 - Store 5	N/A	N/A
P.00 - Store 6	N/A	N/A
P.00 - Store 7	N/A	N/A
P.00 - Store 12	N/A	N/A
P.00 - Store 13	N/A	N/A
P.00 - Store 14	N/A	N/A
P.00 - Store 15	N/A	N/A
P.00 - Store 16	N/A	N/A
P.00 - Store 17	N/A	N/A
P.00 - Store 18	N/A	N/A
P.00 - Swimming Pool	NO (-34.6%)	NO
P.00 - Treatment Room 1	N/A	N/A
P.00 - Treatment Room 2	N/A	N/A
P.00 - WC 7	N/A	N/A
P.00 - WC 8	N/A	N/A
P.00 - WC 9	N/A	N/A
P.00 - WC 10	N/A	N/A
P.00 - WC 11	N/A	N/A
P.00 - WC 12	N/A	N/A
P.00 - Yoga Room	NO (-19.3%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m ²]	1318.8	1318.8
External area [m ²]	2391.7	2391.7
Weather	LON	LON
Infiltration [m ³ /hm ² @ 50Pa]	3	3
Average conductance [W/K]	720.9	685.32
Average U-value [W/m ² K]	0.3	0.29
Alpha value* [%]	9.99	10

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area	Building Type
2	Retail/Financial and Professional Services
41	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
	Storage or Distribution
56	Hotels
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
	Residential Spaces
	Non-residential Institutions: Community/Day Centre
	Non-residential Institutions: Libraries, Museums, and Galleries
	Non-residential Institutions: Education
	Non-residential Institutions: Primary Health Care Building
	Non-residential Institutions: Crown and County Courts
	General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger Terminals
	Others: Emergency Services
	Others: Miscellaneous 24hr Activities
	Others: Car Parks 24 hrs
	Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	6.91	8.19
Cooling	9.41	8.59
Auxiliary	12.98	16.06
Lighting	20.46	21.83
Hot water	85.01	86.38
Equipment*	97.75	97.75
TOTAL**	134.78	141.06

* Energy used by equipment does not count towards the total for consumption or calculating emissions.

** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	0	0

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	233.59	225.24
Primary energy [kWh _{PE} /m ²]	203.76	207.99
Total emissions [kg/m ²]	18.66	19.06

HVAC Systems Performance										
System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER	
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	28.5	218.9	1.8	14	16.2	4.41	4.34	4.5	6.5
	Notional	15.7	213.6	1.6	12.8	20.8	2.78	4.63	----	----
[ST] Central heating using water: floor heating, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	458.6	0	38.7	0	14.2	3.29	0	3.5	0
	Notional	485	0	48.5	0	8.6	2.78	0	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----

Key to terms

Heat dem [MJ/m2]	= Heating energy demand
Cool dem [MJ/m2]	= Cooling energy demand
Heat con [kWh/m2]	= Heating energy consumption
Cool con [kWh/m2]	= Cooling energy consumption
Aux con [kWh/m2]	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type



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