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Energy Statement

The Drapers' Almshouse Charity

Edmansons Close

Final

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Executive Summary

The energy strategy for the proposed development at Edmansons Close in the London Borough of Haringey has been formulated following the London Plan energy hierarchy: **Be Lean**, **Be Clean** and **Be Green**. The overriding objective is the formulation of a strategy which effectively balances a number of key elements, including CO₂ emissions, affordability of heat, and the provision of high-quality buildings. These elements need to work with the regulatory and planning requirements for the development.

The proposed development will apply appropriate treatment to 44 existing almshouses and convert them to provide 26 houses. These are listed buildings and there are sensitive heritage conditions to consider. In addition the development will include a new apartment building comprising of 16 flats, two corner pavilion buildings with an additional four apartments, and one new build house.

The proposed development will be built to Part L 2021 Building Regulations. Part O of building regulations will also influence the energy strategy.

For the new build development, a range of **Be Lean** energy efficiency measures are proposed. They allow the new build part of the development to achieve a **19%** reduction in site wide regulated CO₂ emissions, over a Part L 2021 baseline.

For the refurbished dwellings there are limitations to the improvements that can be made due to the listed status of the buildings. A baseline assessment has been undertaken based on the GLA's Energy Assessment Guidance notional specification for existing dwellings (Table 12). Improvements are then proposed where possible to estimate the CO₂ reduction achieved over the existing building. The proposed fabric improvements include draught proofing, adding internal wall insulation, plus floor and roof insulation, as well as upgrading the performance of the glazing. A **28%** reduction in CO₂ emissions is estimated over the baseline from fabric energy improvements.

In line with the London Plan, the feasibility of decentralised energy production has been considered at the **Be Clean** stage. There are no existing heat networks in close proximity to the development. Due to the small scale of the development it is not proposed to install a site wide heat network as it would result in high running costs to the residents, and high lifecycle costs. An individual heating system for each dwelling is proposed.

A range of **Be Green** renewable energy technologies has been considered. It is proposed that the heating and hot water demand for the new build dwellings will be provided by individual air source heat pumps. The available roof space on the apartment building and corner pavilions will also be used to provide 16 kWp of solar PV. This delivers a further CO₂ reduction of **56%** for the new build dwellings.

Individual ASHPs are also proposed to provide heating and hot water to the larger refurbished almshouses. The small, 1 bed almshouses do not have sufficient space for a hot water cylinder within the dwelling, therefore, individual electric combi boilers are proposed for these units. These measures result in a further **34%** reduction in CO₂ emissions for the refurbished dwellings at the **Be Green** stage.

Tables *i*, *ii* and *iii* below, summarise the anticipated site wide CO₂ emissions for the Proposed Development. The combination of the **Be Lean** and **Be Green** measures as outlined above result in an overall **75%** reduction over the Part L 2021 baseline for the new build development, and **62%** reduction for the refurbished elements.

In line with the GLA guidance, the new build parts of the development will commit to offset the remaining CO₂ emissions through a payment to the London Borough of Haringey. The remaining CO₂ emissions to be offset are estimated as **4.3 Tonnes CO₂ per annum**, resulting in the estimated offset payment of **£12,136**.

Table i: New Build Carbon Dioxide Emissions and Savings after each stage of the Energy Hierarchy

Stage	Carbon Dioxide Emissions (Tonnes CO ₂ per Annum)	
	Regulated	Unregulated
Part L 2021 Baseline	17.1	20.6
After <i>Be Lean</i> Measures	13.9	20.6
After <i>Be Clean</i> Measures	13.9	20.6
After <i>Be Green</i> Measures	4.3	20.6
Stage	Regulated Carbon Dioxide Savings	
	Tonnes CO ₂ per Annum	Percentage
Savings from <i>Be Lean</i> Measures	3.2	19%
Savings from <i>Be Clean</i> Measures	0.00	0%
Savings from <i>Be Green</i> Measures	9.6	56%
Cumulative On-Site Savings	12.8	75%

Table ii: Refurbishment Carbon Dioxide Emissions and Savings after each stage of the Energy Hierarchy

Stage	Carbon Dioxide Emissions (Tonnes CO ₂ per Annum)	
	Regulated	
Baseline (Existing structures)	74.8	36.9
After <i>Be Lean</i> Measures	53.5	36.9
After <i>Be Green</i> Measures	28.2	36.9
Stage	Regulated Carbon Dioxide Savings	
	Tonnes CO ₂ per Annum	Percentage
Savings from <i>Be Lean</i> Measures	21.3	28%
Savings from <i>Be Green</i> Measures	25.3	34%
Cumulative On-Site Savings	46.5	62%

Table iii: Site Wide Carbon Dioxide Emissions and Savings after each stage of the Energy Hierarchy

Stage	Carbon Dioxide Emissions (Tonnes CO ₂ per Annum)	
	Regulated	Unregulated
Baseline	91.9	57.5
After <i>Be Lean</i> Measures	67.4	57.5
After <i>Be Clean</i> Measures	67.4	57.5
After <i>Be Green</i> Measures	32.5	57.5
Stage	Regulated Carbon Dioxide Savings	
	Tonnes CO ₂ per Annum	Percentage
Savings from <i>Be Lean</i> Measures	24.5	27%
Savings from <i>Be Clean</i> Measures	0.0	0%
Savings from <i>Be Green</i> Measures	34.9	38%
Cumulative On-Site Savings	59.4	65%

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1. INTRODUCTION

- 1.1** This document has been prepared by Hodkinson Consultancy, a specialist energy and environmental consultancy for planning and development in support of the planning application for Edmansons Close located in the London Borough of Haringey.
- 1.2** The energy strategy for the site has been formulated to address a number of key objectives:
- > To provide comfortable, high-quality homes that people aspire to live in;
 - > To address energy policy;
 - > To adapt to climate change;
 - > To take account of specific site characteristics that link to the energy strategy, for instance acoustics and air quality;
 - > To provide a resilient supply of reasonably priced heat to residents;
 - > To take into consideration the heritage of the existing buildings and ensure any improvements are not to the detriment of the character of the building.
- 1.3** This statement first establishes a baseline assessment of the energy demands and associated CO₂ emissions. The report will then follow The London Plan Energy Hierarchy approach of **Be Lean, Be Clean** and **Be Green** to demonstrate CO₂ reductions at each step.

2. DEVELOPMENT OVERVIEW

Site Location

- 2.1 The proposed development site at Edmansons Close in the London Borough of Haringey is located at Edmansons Close, Bruce Grove, Tottenham, N17 6XD, as shown in Figure 1.



Figure 1: Site Location Plan (d+b studios, 2022)

- 2.2 The site occupies an area of c. 1ha and is located to the north of Tottenham. It consists of a series of terraced almshouses built around a central green, with several additional detached surrounding buildings.

Proposed Development

2.3 The proposed development is described as follows:

“Demolition of existing laundry building and 1970s infill building; alterations and extensions to 44 existing almshouses to create 8 x 1 bed, 12 x 2 bed and 6 x 3 bed units; alterations to existing Gatehouse to provide 1 x 2 bed unit; construction of 1 x new build 3 bed almshouse to replace 1970s infill building; construction of a new apartment building comprising 7 x studio units and 9 x 1 bed units; construction of 4 x new build 2 bed units within two new pavilions (2 units in each pavilion, 4 units in total); with landscaping; improvements to access; provision of five disabled car parking spaces; and ancillary development thereto.”

2.4 Figure 2, below, shows the proposed site layout.

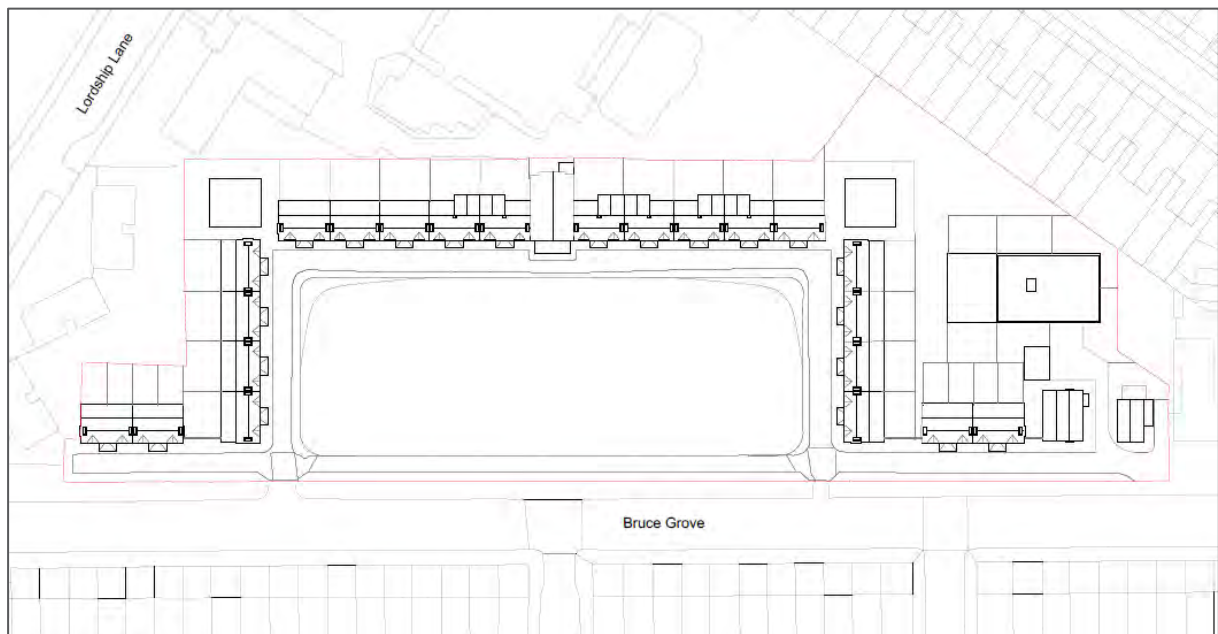


Figure 2: Proposed Block Plan, d+b studios, 2022

3. RELEVANT PLANNING POLICY

- 3.1 The following planning policies and requirements will inform the energy strategy for the proposed development.

National Policy: National Planning Policy Framework

- 3.2 The revised National Planning Policy Framework (NPPF) was published on the 20th December 2023 and sets out the Government's planning policies for England.
- 3.3 The NPPF provides a framework for achieving sustainable development, which has been summarised as "meeting the needs of the present without compromising the ability of future generations to meet their own needs" (Resolution 42/187 of the United Nations General Assembly). These address social progress, economic well-being and environmental protection. At the heart of the framework is a **presumption in favour of sustainable development**.
- 3.4 The document states that the planning system has three overarching objectives which are interdependent and need to be pursued in mutually supportive ways:
- a) **An economic objective** – to help build a strong, responsive and competitive economy, by ensuring that sufficient land of the right types is available in the right places and at the right time to support growth, innovation and improved productivity; and by identifying and coordinating the provision of infrastructure;
 - b) **A social objective** – to support strong, vibrant and healthy communities, by ensuring that a sufficient number and range of homes can be provided to meet the needs of present and future generations; and by fostering a well-designed, beautiful and safe places, with accessible services and open spaces that reflect current and future needs and support communities' health, social and cultural well-being; and
 - c) **An environmental objective** – to protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy.

Regional Policy: London Plan (2021)

- 3.5 The London Plan sets out an integrated economic, environmental, transport and social framework for the development of London. The following policies are considered relevant to this energy strategy:
- 3.6 **Policy SI2 Minimising Greenhouse Gas Emissions, states:**

‘Major development should be net zero-carbon. This means reducing greenhouse gas emissions in operation, and minimising both annual and peak energy demand in accordance with the following energy hierarchy:

- 1) Be lean: use less energy and manage demand during operation;
- 2) Be clean: exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly;
- 3) Be green: maximise opportunities for renewable energy by producing, storing and using renewable energy on-site;
- 4) Be seen: monitor, verify and report on energy performance through the Mayor’s post construction monitoring platform.

A minimum on-site reduction of at least 35 per cent beyond Building Regulations is required for major development. Residential development should achieve 10 per cent, and non-residential development should achieve 15 per cent through energy efficiency measures.’

Any residual on-site emissions (Regulated CO₂) are to be offset up to a standard of Zero Carbon.

3.7 Policy SI3 Energy Infrastructure, states:

‘Major development proposals within Heat Network Priority Areas should have a communal low-temperature heating system. The heat source for the communal heating system should be selected in accordance with the following heating hierarchy:

- a) Connect to local existing or planned heat networks;
- b) Use zero-emission or local secondary heat sources (in conjunction with heat pump, if required);
- c) Use low-emission combined heat and power (CHP) (only where there is a case for CHP to enable the delivery of an area-wide heat network);
- d) Use ultra-low NO_x gas boilers.’

3.8 Policy SI4 Managing Heat Risk seeks for energy strategies to demonstrate how they intend to reduce the risk of internal overheating, in line with the cooling hierarchy.

Local Policy: London Borough of Haringey

Strategic Policies

3.9 The London Borough of Haringey’s Local Plan was adopted in 2013. The following policies are considered relevant to this Statement:

3.10 Policy SP4- Working towards a low carbon Haringey indicates that the following measures will be promoted to reduce carbon emissions from new and existing buildings.

- > All new residential development will achieve a minimum 25% reduction in total (regulated) CO₂ emissions in line with Code for Sustainable Homes Level 4 energy standards, and should aim to achieve Level 6. All new residential development shall be zero carbon from 2016 onwards;
- > All developments should identify and implement, where viable, site-wide and area-wide decentralised energy facilities including the potential to link into a wider network;
- > Establish local networks of decentralised heat and energy facilities by requiring developers to prioritise connection to existing or planned networks where feasible;
- > Work with neighbouring boroughs and other partners to explore ways of implementing sub-regional decentralised energy networks;
- > All new developments are required, where viable, to achieve a reduction in predicted carbon dioxide emissions of 20% from on-site renewable energy regeneration, which can include connections to local sources of decentralised renewable energy.

3.11 Policy SP11- Design requires all new development to enhance and enrich Haringey's built environment and create places and buildings that are high quality, attractive, sustainable, safe and easy to use. The development should:

- > Be of the highest standard of design that respects its local character and historic significance;
- > Ensure impacts on health, climate change, natural resources and biodiversity are minimised by adopting and improving sustainable design and construction techniques;
- > Incorporate solutions to reduce crime and the fear of crime and apply the principles set out in 'Secured by Design' and Safer Places;
- > Promote high quality landscaping on and off site, seek the highest standards of access in all buildings and places, and be designed to be adaptable;
- > Applications for tall buildings should include an assessment supporting tall buildings in a Characterisation Study; comply with the Development Management Policies criteria for Tall and Large Buildings siting and design; and comply with relevant recommendations as set out in CABE / English Heritage "Guidance on Tall Buildings", 2007.

3.12 Policy SP12- Conservation indicates that the historic significance of Haringey's assets, their setting, and the wider environment should be conserved. Where archaeological excavation is required, findings should be published, disseminated, and used as the basis for archaeological interpretation on site. Where possible, development should help increase accessibility to the historic environment.

Development Management DPD

- 3.13** This document gives effect to Haringey's spatial strategy and the key objectives of the Strategic Policies Local Plan by supporting proposals that contribute to the delivery of sustainable development in accordance with the strategy. The following are the relevant policies:
- 3.14** **Policy DM9- Management of the Historic Environment** states that a development that conserves and enhances the significance of a heritage asset and its setting will be supported.
- 3.15** **Policy DM21- Sustainable Design, Layout and Construction** states that all new development will be expected to consider and implement sustainable design, layout and construction techniques. Proposal should apply the energy and cooling hierarchies to minimize energy use, maximise opportunities to enhance biodiversity on-site, use building materials with high environmental performance ratings; and seek opportunities for locally sourced labour. The Council will support appropriate measures to sustainably retrofit existing homes and non-residential buildings. Consideration will be given to the use of carbon offset payments.
- 3.16** **Policy DM22- Decentralised Energy** states that subject to other policy requirements, proposals that contribute to the provision and use of Decentralised Energy network infrastructure will be supported.

4. BASELINE EMISSIONS

- 4.1 This statement first establishes a baseline assessment of the energy demands and associated CO₂ emissions for the development. The report will then follow the GLA hierarchy approach of **Be Lean**, **Be Clean** and **Be Green**.
- 4.2 All calculations have been done using Part L 2021 software and the latest SAP methodology.

New Build

- 4.3 The estimated energy demand for dwellings has been calculated using Standard Assessment Procedure (SAP) methodology. SAP calculates the Regulated energy demands associated with hot water, space heating and fixed electrical items. The unregulated energy demands have been calculated using PHPP methodology.
- 4.4 Calculations have been completed on representative dwelling types. These differ in orientation and take into the account of ground floors, mid floors and top floors in apartments as well as houses. The selected dwellings therefore represent a fair aggregation of the proposed unit mix.

Refurbishment

- 4.5 SAP assessments are also completed for the refurbished dwellings. A baseline assessment is first undertaken. An improved specification is then applied and compared to the baseline to establish the improvement that is achieved by the proposed measures.
- 4.6 Appendix 3 of the GLA's Energy Assessment Guidance (2020) provides specification guidance that should be used to determine baseline emissions. This has been used to calculate the estimate energy performance in the main body of this report. However, this specification is not reflective of the existing condition of the buildings. The U-values in the GLA's baseline specification reflect performance that can be achieved from insulated external elements and double glazing. A building condition report was undertaken by Regency Grove Limited in February 24, which confirms that the building envelope is uninsulated.
- 4.7 As such, it is expected that the carbon emission improvements for the existing dwellings is greater than those that are presented within this report.
- 4.8 Table 1 summarises the assumed U-values and the source of the assumptions for the calculations presented in the main body of this report. Performance values have been taken from Appendix S of SAP 9.92 where they are not specified in the GLA's notional specification.

Table 1: Baseline specification for refurbished dwellings (GLA methodology)

Element	Baseline Performance	Source
External Walls	0.55 W/m ² K	GLA Energy Assessment Guidance (2020), Table 12 (No option for uninsulated wall)
Party Walls	0.0 W/m ² K	SAP 9.92, Table S8B (solid masonry)
Roofs	0.16 W/m ² K	GLA Energy Assessment Guidance (2020), Table 12
Floors	0.25 W/m ² K	GLA Energy Assessment Guidance (2020), Table 12
Glazing	1.60 W/m ² K , 0.63 g-value	GLA Energy Assessment Guidance (2020), Table 12
Doors	3.0 W/m ² K	SAP 9.92, Table S15A (Age band A)
Thermal Bridging	Default	GLA Energy Assessment Guidance (2020), Table 12
Heating	Mains gas boiler, 89.5% efficiency	GLA Energy Assessment Guidance (2020), Table 12 SAP 10.2 Notional Dwelling efficiency
Ventilation	Natural Ventilation (As per final building specification)	GLA Energy Assessment Guidance (2020), Table 12
Air Permeability	15 m ³ /h.m ² @ 50PA (Default)	GLA Energy Assessment Guidance (2020), Table 12

Baseline Emissions

- 4.9** Table 2, below, shows the baseline CO₂ emission rates for both the new build and refurbished parts of the development. TER Worksheets supporting these calculations can be found in Appendix A for the new build dwellings, and Appendix B for the refurbished dwellings.

Table 2: Carbon Dioxide Emissions Baseline

	Regulated [T CO ₂ /year]
New Build	17.1
Refurbishment	74.8
Total	91.9

5. BE LEAN – ENERGY EFFICIENCY

New Build

- 5.1 The new build portion of the development will target a 10% reduction in CO₂ emissions from the **Be Lean** stage alone, as required in London Plan policy.
- 5.2 This section sets out the potential measures to be implemented to allow these targets to be achieved, thereby locking in significant CO₂ reductions through a reduction in energy demands.

Insulation Standards

- 5.3 All new build dwellings will incorporate enhanced insulation in the building envelope (walls, roofs, floors and glazing) to achieve U-values such as the following:
- > External wall U-value of 0.18 W/m²K;
 - > Corridor wall U-value of 0.18 W/m²K (no active heating in the corridors);
 - > Party walls will be fully insulated and sealed (achieving an effective U-value of 0.0 W/m²K);
 - > Exposed floor U-value of 0.13 W/m²K;
 - > Roof U-value of 0.10 W/m²K;
 - > Glazing U-value of 0.90 W/m²K.

Air Tightness and Ventilation

- 5.4 Air tightness standards will conform to and exceed, Approved Document Part L requirements. By reducing air leakage loss and convective bypass of insulation, an improvement of design air permeability rate from 8m³/h.m² to 3m³/h.m² or less will further reduce space heating requirements.
- 5.5 A mechanical ventilation system with heat recovery (MVHR) system is proposed for all new build dwellings. These systems will remove stale air and odours from kitchens and wet rooms, whilst retaining the heat within the home, as shown in Figure 3, below. In this way substantial energy savings will be made.

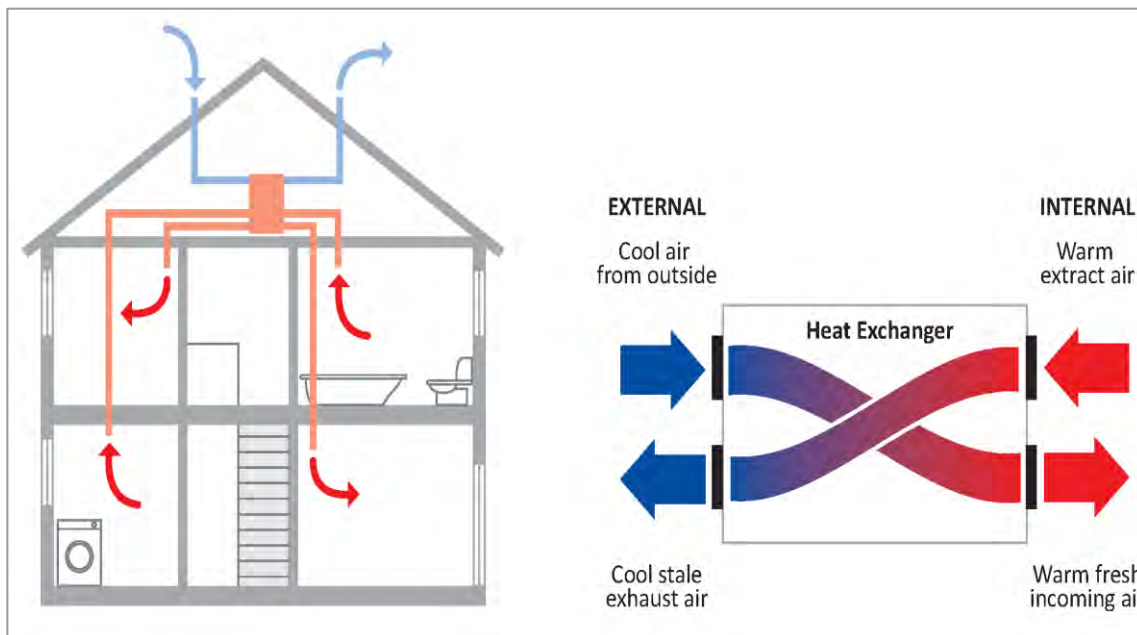


Figure 3: MVHR in operation

5.6 The selected MVHR units have heat recovery efficiencies of at least 90%, with the specific fan power (SFP) targets as follows:

- > < 0.56 for units with a kitchen and 1 wet room;
- > < 0.58 for units with a kitchen and 2 wet rooms.

5.7 Additionally, all homes will have openable windows and therefore the ability to naturally ventilate should the occupant desire. Convective ventilation and night purging of heat will therefore be facilitated.

5.8 Further detail of the location of the MVHR units will be shown in drawings at the detailed design stage, however, it is expected they will be located within utility cupboards.

Thermal Bridging

5.9 In well insulated buildings, as much as 30% of heat loss can occur through thermal bridges, which occur when highly conductive elements (e.g. metal studs) in the wall construction enable a low resistance escape route for heat. The Applicant is committed to delivering a development which prioritises the conservation of energy through lean design and has therefore placed particular importance on the development of construction details which minimise the effect of thermal bridges.

5.10 Figure 4 below illustrates the benefits of reducing thermal bridges.

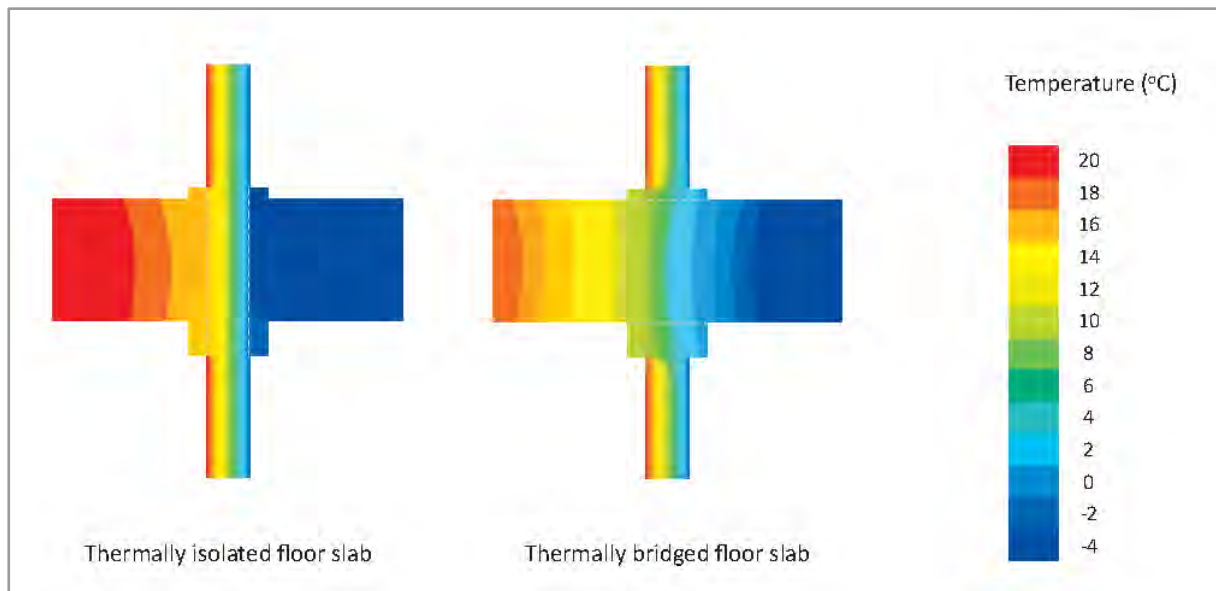


Figure 4: Thermal Bridging

- 5.11 Detailed modelling of all major junctions is likely to be undertaken at design stage. The results of initial assessments will be used to inform the design process and further modelling will take place to identify areas for further improvement.
- 5.12 The following psi values have been used in the initial modelling, based on calculated psi values achieved on similar schemes:

Table 3: Thermal Bridging Targets

Junction	Description	Target (W/mK)
E2	Lintels	0.15
E3	Sill	0.04
E4	Jamb	0.05
E20	Exposed floor (normal)	0.32
E7	Party floor between dwellings	0.20
E23	Balcony between dwellings, balcony support penetrates wall insulation	0.50
E15	Flat roof with parapet	0.30
E16	Corner (normal)	0.09
E18	Party wall corner between dwellings	0.12
P1	Party Wall to Ground Floor	0.20
P4	Party Wall to roof	0.10

- 5.13 Further details will be determined during the detailed design stage when bespoke calculations are expected to be undertaken on the targeted junctions.

Space Heating and Hot Water

- 5.14 The space heating requirement will be reduced by the fabric, air tightness and ventilation measures outlined above.
- 5.15 In line with GLA energy assessment guidance, a gas boiler has been assumed within the baseline assessment to provide the heating and hot water demand. The gas boiler assumed has an efficiency of 89.5%, in line with the notional dwelling in SAP 10.2.
- 5.16 As outlined at the **Be Green** stage, the final heating strategy for the new build development is individual air source heat pumps.

Lighting and Appliances

- 5.17 Energy efficient lighting will be installed in 100% of internal fittings in the homes.
- 5.18 It is very difficult to design and construct homes to reduce the unregulated electricity demands, because this is almost entirely dependent on the occupant of a home and can vary substantially. However, the Applicant is committed to ensuring that all efforts are made to enable the residents to minimise their unregulated electricity consumption.

Limiting the Risk of Summer Overheating

- 5.19 Minimising the risk of summer overheating is important so as to ensure that homes are adapted to climate change and remain comfortable to occupy in the future. Accordingly, dynamic thermal modelling has been undertaken on a selection of unit types to ensure that the development does not cause an unacceptable risk of summer overheating within the dwellings.
- 5.20 The following overheating measures are to be adopted for the development to mitigate overheating risk:
- > Solar control glazing to reduce uncomfortable solar heat gains whilst maximising energy efficiency. A g-value of 0.35 has been applied to all new build dwellings. These have been used in the dynamic overheating assessment.
 - > Louvered sliding screens on the south facing façade of the development to reduce solar gains, painted in the same heritage colours as the windows and doors.
 - > High performance MVHR systems to all dwellings to assist in background ventilation;

> Openable windows used as the primary means of ventilation for overheating.

5.21 Full details of the residential overheating modelling and applied strategy are presented in the accompanying Dynamic Overheating Report.

5.22 Table 4, below, summarises the proportion of glazed area for each of the new build areas of the proposed development. This has been provided by d+b studios.

Table 4: Glazed areas	
New Build Item	Proportion of glazing area to façade area (%)
Pavilions	15.3%
House Type 5	10.7%
Apartment Building	15.7%

Refurbishment

5.23 The dwellings to be refurbished are listed buildings and therefore there is a limit to changes that can be made to the fabric specification. No changes should be made that would significantly alter the character of the building. A summary of proposed changes is outlined below.

Fabric Performance

5.24 External walls: The existing walls of the dwellings are of solid masonry construction. External wall insulation is not considered acceptable due to the Grade II listed status of the buildings, as confirmed by the heritage officers. The existing walls will be repaired where required to improve draught proofing of the dwelling. It is proposed that an insulated plasterboard can be applied as internal wall insulation on the external walls of the dwelling to improve thermal performance. A 25mm high performance insulated plasterboard can reduce the U-value of the external walls to **0.55 W/m²K**. Any further insulation is not practical because it would have a significant impact on internal room areas, which are already small. The following technical considerations to this approach include:

- > Ensuring that the existing windows are not damaged during installation, and ensuring that the insulation is installed to minimise thermal bridging risk around the windows.
- > Consider detailing around the windows to ensure there is minimal visual impact from the wall insulation.

- > As the units will be fully refurbished, any existing services and/or sockets can be moved if required, to maximise the performance of the internal wall insulation.

- 5.25 Floor:** For the existing suspended timber floors within the dwellings, the most affective and appropriate way to insulate the suspended floors is to retrofit insulation beneath the floorboards, between the joists. This will involve lifting the existing floorboards, but assuming they are in good condition, these can be reinstated once the insulation has been installed. It is proposed to install a windtight, breathable membrane over the joists, ensuring it is suitably sealed. It is then proposed to install a natural, breathable mineral wool insulation between the joists, with an air tightness membrane laid over the top, before replacing the floorboards. It is critical to ensure that the depth of insulation installed does not compromise the cross ventilation in the space below the suspended floor. The floor insulation will allow the performance to be improved to at least **0.40 W/m²K**, but additional insulation will be added where space allows, giving a better performance.
- 5.26 Roofs:** It is proposed to insulate the roofs with mineral wool insulation to achieve a target U-value of **0.11 W/m²K**. The roof space is not intended to be used as a habitable space, and therefore this will have no visual impact. However, care will be taken whilst installing the insulation to cause no lasting damage to the existing structure of the dwelling.
- 5.27 Glazing:** It is proposed to retain the existing single glazed windows that are currently present to the front facades of the buildings, because these are an important feature of these listed buildings, and add secondary glazing behind so that the appearance of the façade does not change. The secondary glazing will improve the thermal performance to a similar standard of installing new double-glazed panes that retain the current characteristics. There are a range of manufacturers that provide secondary glazing with U-values in the range of **2.5 W/m²K to 2.9 W/m²K**. This is compared to upgrading to double glazing within the existing frame which can provide 2.4 W/m²K to 2.8 W/m²K. Secondary glazing can also offer better acoustic performance than double glazing, due to the larger gap between the panes of glass.
- 5.28** The new windows and doors to be installed to the rear elevations as part of the refurbishment will be double glazed units. A new glazing U-value of **1.4 W/m²K** is assumed.

Ventilation

- 5.29** A natural ventilation system is proposed with extract fans present within wet rooms. Adding in centralised ducting will significantly impact on ceiling structures and room heights and hence this is not proposed.
- 5.30** During the refurbishment, improvements will be made to the condition of the dwelling where possible, which can include improving the air tightness by draught proofing, repairing cracks and sealing edges. It is also important to retain sufficient air flow through the dwelling to ensure that there is adequate ventilation, good air quality and limited risk of condensation risk.

5.31 An air tightness test will be completed once the refurbishment of the dwellings is complete, with a target of 8m³/hr.m².

Space Heating and Hot Water

5.32 In line with GLA energy assessment guidance, a gas boiler has been assumed within the baseline assessment to provide the heating and hot water demand. The gas boiler assumed has an efficiency of 89.5%, in line with the notional dwelling in SAP 10.2.

5.33 As outlined at the **Be Green** stage, the final heating strategy for the refurbished dwellings is a mixture of individual air source heat pumps and electric boilers.

Lighting

5.34 Low energy light bulbs will be provided in all fittings.

CO₂ Emissions at *Be Lean* Stage

5.35 Table 5, below, shows the site wide estimated Regulated CO₂ emissions following the **Be Lean** measures outlined above. As shown, these result in a CO₂ emissions reduction of 19% over a Part L 2021 baseline for the new build development and 28% for the refurbished dwellings over the bespoke baseline. SAP DER Worksheets supporting this are in Appendix A for new builds and Appendix C for the refurbishment.

5.36 These figures have been calculated using the GLA’s Carbon Emission Reporting Spreadsheet, for both the new build and existing elements of the development.

Table 5: Regulated Carbon Dioxide Emissions at <i>Be Lean</i> Stage		
Stage	Carbon Dioxide Emissions (Tonnes CO ₂ per Annum)	
	New Build	Refurbishment
Baseline	17.1	74.8
After <i>Be Lean</i> Measures	13.9	53.5
Total Emissions Reduction	3.2	21.3
Percentage Reduction	19%	28%

5.37 Table 6 shows the estimated fabric energy efficiency improvement over a Part L 2021 baseline for the new build development. The energy strategy will be reviewed at the detailed design stage to ensure that all Part L 2021 metrics are achieved for all dwellings.

Table 6: Fabric Energy Efficiency – New Build

	Target Fabric Energy Efficiency (kWh/m²/year)	Design Fabric Energy Efficiency (kWh/m²/year)	Improvement (%)
Development Total	43.29	42.80	1%

5.38 Table 7, below, shows the estimated fabric energy efficiency improvement for the refurbished dwellings.

Table 7: Fabric Energy Efficiency - Refurbishment

	Baseline Fabric Energy Efficiency (kWh/m²/year)	Design Fabric Energy Efficiency (kWh/m²/year)	Improvement (%)
Development Total	96.05	92.34	4%

5.39 Table 8, below, summarises the estimated energy use intensity and space heating demand for both the new build and refurbished parts of the scheme, against the GLA's benchmarks.

Table 8: EUI and Space Heating Demand

Building Use	EUI (kWh/m²/year)	Space Heating Demand (kWh/m²/year)	Methodology Used	Explanatory Notes
New Build	55.8	22.0	SAP 10.2 for regulated, PHPP for unregulated	The unregulated energy estimates from PHPP are high, but realistic. It is challenging to reduce this within the assumptions. The refurbishment heating demands are high due to the limited improvements that can be made on the listed building.
Refurbishment	100.9	105.3	SAP 10.2 for regulated, PHPP for unregulated	

6. BE CLEAN: DECENTRALISED ENERGY

6.1 In line with Policy SI3 of the London Plan, the application of decentralised heating networks as a *Be Clean* measure has been evaluated. This is the next step in the Energy Hierarchy after *Be Lean*.

Policy Context

6.2 Policy SI3 of the London Plan outlines the following order of preference for the selection of a heat source:

- > Connect to local existing or planned heat networks;
- > Use zero-emission or local secondary heat sources (in conjunction with heat pump, if required);
- > Use low-emission combined heat and power (CHP) (only where there is a case for CHP to enable the delivery of an area-wide heat network);
- > Use ultra-low NOx gas boilers.

Area Wide Networks

6.3 Figure 5 below shows the location of the site (blue circle) on the London Heat Map.

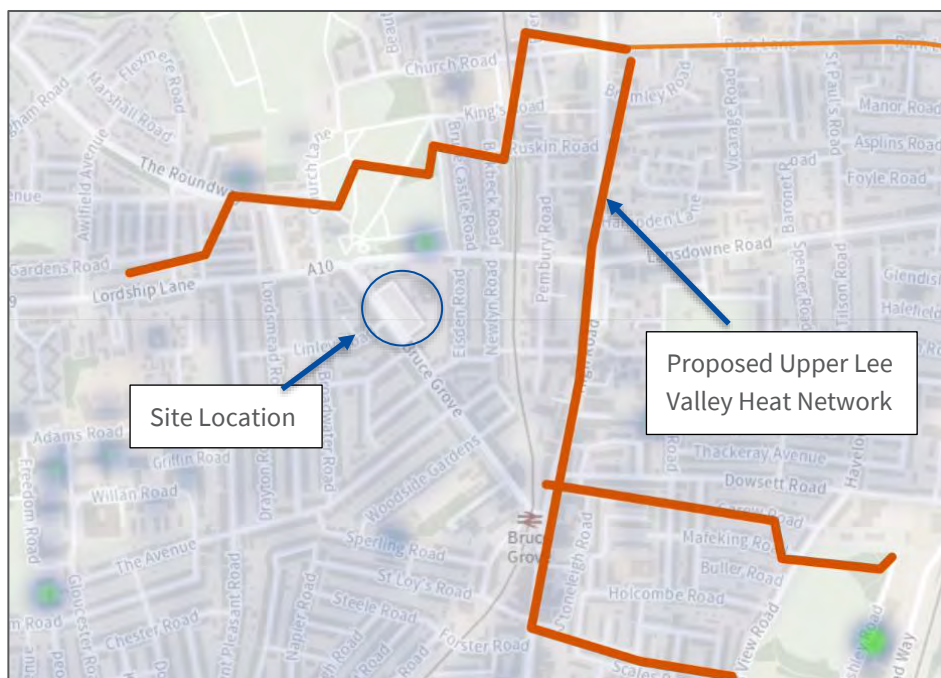


Figure 5: Site on London Heat Map (2022)

- 6.4** Existing networks are shown in red, with proposed networks in orange. There are no existing heat networks within proximity of the site, however, there is the proposed Upper Lee Valley Heat Network surrounding the development site.
- 6.5** Although plans are progressing to develop a decentralised heat network in the area, it is not yet near completion. There is also quite a significant distance from the development site to the proposed network route, and it would be costly to provide connection should the network become available in the future, especially to connect a small number of dwellings. The proposed development will therefore not be able to connect to an existing heat network.

Site Wide Heat Network

- 6.6** The feasibility of providing a site-wide heat network has been considered. Heat networks are generally feasible where there is a high concentration of demand from medium-high density development. This concentration can allow greater efficiency due to larger, more efficient plant installed, and provides economies of scale for the customers (fixed replacement and maintenance costs and management costs are spread across a larger number of dwellings).
- 6.7** The installation of communal heat networks also has high upfront costs and it is not recommended to install for low-density development. Additionally, low heat demands from a small development can result in additional heat losses and inefficiencies from the distribution system.
- 6.8** Due to the small scale of the development it is not proposed to install a site-wide heat network to supply heating and hot water demand.
- 6.9** A lifecycle cost assessment of individual heating systems compared to a heat network has been undertaken to support this, for both the new build dwellings and the refurbished dwellings. The results are summarised in Table 9 and Table 10, below. A more detailed breakdown of the costs is presented in Appendix D.
- 6.10** As shown, connecting the dwellings to a heat network would have significantly higher costs than individual heating systems within each dwelling, both for the Applicant (capital costs) and for residents (operational costs). For the refurbished dwellings, both individual ASHPs and electric boilers are considered, but both have lower costs compared to an ASHP led heat network scenario. Likewise for the new build dwellings, individual ASHPs have significantly lower costs compared to an ASHP led heat network.

Table 9: Heat Cost Summary – New Build

	Scenario 1a Individual ASHPs	Scenario 3a ASHP Heat Network
Capital Costs per dwelling (Capex)	£5,079	£6,856
Annual Operational Costs (£/year/per dwelling)	£995	£1,434
Total Operational Costs (30 years)	£29,835	£43,014
Total Lifecycle (Capex + Opex)	£34,914	£49,870

Table 10: Heat Cost Summary – Refurb

	Scenario 1b Individual ASHPs	Scenario 2 Individual Electric Boilers	Scenario 3b ASHP Heat Network
Capital Costs per dwelling (Capex)	£5,079	£2,402	£5,856
Annual Operational Costs (£/year/per dwelling)	£2,264	£2,558	£3,505
Total Operational Costs (30 years)	£67,910	£76,734	£105,162
Total Lifecycle (Capex + Opex)	£72,989	£79,136	£111,018

- 6.11** It is proposed for the heating and hot water demand in the new build dwellings to be supplied by an individual air source heat pump (ASHP) to each dwelling. For the refurbished dwellings, ASHPs are also proposed for the larger dwellings. However, for the small, one bed dwellings, there is limited space for the infrastructure required for an ASHP, therefore, in the one bed dwelling, individual electric boilers are proposed. Further details of this are included in the **Be Green** stage of the energy hierarchy.
- 6.12** Overall, this will deliver an all-electric scheme, with no need for gas, while also minimising the expected running costs as far as possible.

7. **BE GREEN: RENEWABLE ENERGY TECHNOLOGIES**

- 7.1** The final part of the Energy Hierarchy is **Be Green** which seeks for renewable energy technologies to be specified to provide, where feasible, a reduction in expected CO₂ emissions. This section provides a summary of the renewable energy sources that are proposed for the development.

Air Source Heat Pumps (Proposed)

- 7.2** Air Source Heat Pumps (ASHPs) generate heat via compression of a refrigerant which has extracted ambient heat from the external air. The compressive action raises the temperature of the refrigerant and allows it to provide heating.
- 7.3** It is proposed that the heating and hot water demand of the new build development is supplied by individual air source heat pumps to each dwelling. For the apartments, it is likely that the heat pump units will be located on the roof of the buildings, so that outdoor amenity space for each apartment is not compromised. Each apartment will be connected to one of the heat pump units. For the new build house, the external unit will be located outside the dwelling. Space will be reserved within each dwelling for hot water cylinders.
- 7.4** It is proposed that individual ASHPs will also provide the heating and hot water for the larger almshouses (refurbished dwellings). The heat pump units would be located in the garden of the dwelling, with an internal utility cupboard for the hot water cylinder. Figure 6 provides an indicative markup of where the ASHP unit and hot water cylinder could be located in house type 2.

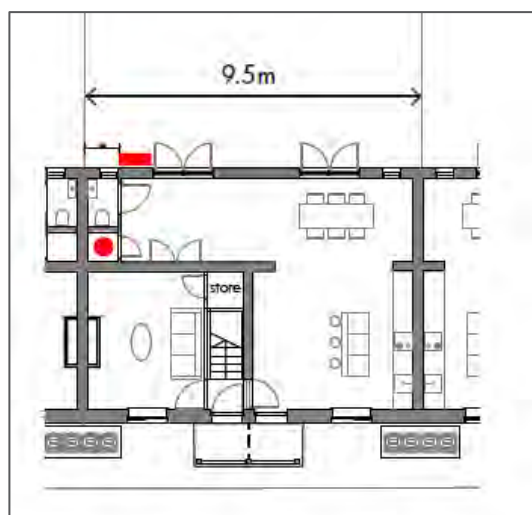


Figure 6: ASHP Location - House Type 2, d+b studios, 2024

- 7.5** For the smaller almshouses, there is very limited space available and very little storage space within the dwelling. The only location that a hot water cylinder could be located is within the cupboard under the stairs, but this would take away the storage space available. Therefore, ASHPs are not proposed for these units.
- 7.6** Instead, individual direct electric boilers are proposed for the small 1 bed almshouses. As these dwellings only have one shower and no bath, a compact electric boiler can be used that does not require a separate hot water cylinder. This would take up much less space and would mean that the hot water for the taps and the shower is heated on demand, rather than wastage caused by unused hot water in a cylinder. As shown in the heat cost analysis in Section 6 and Appendix D, although the boilers are less efficient than ASHPs, there is not a significant difference in expected running costs, as they are small dwellings and the expected heating and hot water demand is low.
- 7.7** The performance assuming electric boilers in these dwellings has been taken into account within the calculations for the **Be Green** stage of the development.
- 7.8** It is expected that the air source heat pump units will provide a seasonal coefficient of performance (SCOP) of at least 3.00. The final specification will be provided by a specialist at the design stage.

Photovoltaic (PV) Panels (Proposed)

- 7.9** PV panels generate electricity from solar radiation. The generating potential of PV panels is dependent on the availability of roof space and ensuring they are not overshadowed.
- 7.10** A large portion of the available roof space will be required for the proposed air source heat pump units. However, available roof space on the apartment building and the corner pavilions will be used to supply solar PV. A roof plan showing the proposed PV locations is in Appendix E. The proposal will provide 47 solar PV panels. Assuming an output of 350W per panel, it is estimated that this will provide 16 kWp for the proposed development. This will be reviewed by a specialist contractor at the detailed design stage.
- 7.11** Panels are to be positioned at an angle of 5-10 degrees towards a southerly direction.
- 7.12** Following discussions with the heritage team, and reviewing the layout of the almshouses, it is not proposed to install any PV onto the existing dwellings. The Heritage team have stated that it's not acceptable for any solar PV to be on the roofs that are visible from the road. This leaves roofs that are, for the most part, North facing. Solar PV works most efficiently on roofs that are orientated towards the South. There would be very little benefit from installing PV on North facing roofs, and therefore, they are not proposed as part of the refurbishment.

CO₂ Emissions at *Be Green* Stage

7.13 Table 11, below, shows the Regulated CO₂ reductions for the new build development following the application of the ***Be Green*** measures. SAP DER worksheets supporting this are in Appendix F for the new build development, and Appendix G for the refurbished dwellings.

Table 11: Regulated Carbon Dioxide Emissions at <i>Be Green</i> Stage		
Stage	Carbon Dioxide Emissions (Tonnes CO ₂ per Annum)	
	New Build	Refurbishment
After <i>Be Clean</i> Measures	13.9	53.5
After <i>Be Green</i> Measures	4.3	28.2
Total Emissions Reduction	9.6	25.3
Percentage Reduction	56%	34%

8. ZERO CARBON

- 8.1 The London Plan and the London Borough of Haringey planning policies require a minimum reduction in Regulated CO₂ emissions of 35% beyond the calculated baseline.
- 8.2 In addition to this, the new build development is also subject to an additional offsetting contribution to meet a total 100% reduction in Regulated CO₂ emissions in order to achieve a standard of Zero Carbon.
- 8.3 Table 12, below, shows the calculated carbon offsetting cost of the new build development, should the **Be Lean** and **Be Green** measures outlined in this report be adopted.

Table 12: Carbon Offset Payment		
Stage	Residual CO ₂ (Tonnes)	Offset Payment (£95/tonne/30yrs)
Residential (New Build)	4.3	£12,136

- 8.4 The £95/tonne/year price as set out in the London Plan has been used, for a period of 30 years.

9. SUMMARY

- 9.1** The energy strategy for the proposed development at Edmansons Close in the London Borough of Haringey has been formulated following the London Plan energy hierarchy: **Be Lean**, **Be Clean** and **Be Green**. The overriding objective is the formulation of a strategy which effectively balances a number of key elements, including CO₂ emissions, affordability of heat, and the provision of high-quality buildings. These elements need to work with the regulatory and planning requirements for the development.
- 9.2** The proposed development will apply appropriate treatment to 44 existing almshouses and convert them to provide 26 houses. These are listed buildings and there are sensitive heritage conditions to consider. In addition the development will include a new apartment building comprising of 16 flats, two corner pavilion buildings with an additional four apartments, and one new build house.
- 9.3** The proposed development will be built to Part L 2021 Building Regulations. Part O of building regulations will also influence the energy strategy.
- 9.4** For the new build development, a range of **Be Lean** energy efficiency measures are proposed. They allow the new build part of the development to achieve a **19%** reduction in site wide regulated CO₂ emissions, over a Part L 2021 baseline.
- 9.5** For the refurbished dwellings there are limitations to the improvements that can be made due to the listed status of the buildings. A baseline assessment has been undertaken based on the GLA's Energy Assessment Guidance notional specification for existing dwellings (Table 12). Improvements are then proposed where possible to estimate the CO₂ reduction achieved over the existing building. The proposed fabric improvements include draught proofing, adding internal wall insulation, plus floor and roof insulation, as well as upgrading the performance of the glazing. A **28%** reduction in CO₂ emissions is estimated over the baseline from fabric energy improvements.
- 9.6** In line with the London Plan, the feasibility of decentralised energy production has been considered at the **Be Clean** stage. There are no existing heat networks in close proximity to the development. Due to the small scale of the development it is not proposed to install a site wide heat network as it would result in high running costs to the residents and high lifecycle costs. An individual heating system for each dwelling is proposed.
- 9.7** A range of **Be Green** renewable energy technologies has been considered. It is proposed that the heating and hot water demand for the new build dwellings will be provided by individual air source heat pumps. The available roof space on the apartment building and corner pavilions will also be used to provide 16 kWp of solar PV. This delivers a further CO₂ reduction of **56%** for the new build dwellings.
- 9.8** Individual ASHPs are also proposed to provide heating and hot water to the larger refurbished almshouses. The small, 1 bed almshouses do not have sufficient space for a hot water cylinder

within the dwelling, therefore, individual electric combi boilers are proposed for these units. These measures result in a further **34%** reduction in CO₂ emissions for the refurbished dwellings at the **Be Green** stage.

- 9.9** Tables 13, 14 and 15, below, summarise the anticipated site wide CO₂ emissions for the Proposed Development. The combination of the **Be Lean** and **Be Green** measures as outlined above result in an overall **75%** reduction over the Part L 2021 baseline for the new build development, and **62%** reduction for the refurbished elements.
- 9.10** In line with the GLA guidance, the new build parts of the development will commit to offset the remaining CO₂ emissions through a payment to the London Borough of Haringey. The remaining CO₂ emissions to be offset are estimated as **4.3 Tonnes CO₂ per annum**, resulting in the estimated offset payment of **£12,136**.

Table 13: New Build Carbon Dioxide Emissions and Savings after each stage of the Energy Hierarchy

Stage	Carbon Dioxide Emissions (Tonnes CO ₂ per Annum)	
	Regulated	Unregulated
Part L 2021 Baseline	17.1	20.6
After <i>Be Lean</i> Measures	13.9	20.6
After <i>Be Clean</i> Measures	13.9	20.6
After <i>Be Green</i> Measures	4.3	20.6
Stage	Regulated Carbon Dioxide Savings	
	Tonnes CO ₂ per Annum	Percentage
Savings from <i>Be Lean</i> Measures	3.2	19%
Savings from <i>Be Clean</i> Measures	0.00	0%
Savings from <i>Be Green</i> Measures	9.6	56%
Cumulative On-Site Savings	12.8	75%

Table 14: Refurbishment Carbon Dioxide Emissions and Savings after each stage of the Energy Hierarchy

Stage	Carbon Dioxide Emissions (Tonnes CO ₂ per Annum)	
	Regulated	
Baseline (Existing structures)	74.8	36.9
After <i>Be Lean</i> Measures	53.5	36.9
After <i>Be Green</i> Measures	28.2	36.9
Stage	Regulated Carbon Dioxide Savings	
	Tonnes CO ₂ per Annum	Percentage
Savings from <i>Be Lean</i> Measures	21.3	28%
Savings from <i>Be Green</i> Measures	25.3	34%
Cumulative On-Site Savings	46.5	62%

Table 15: Site Wide Carbon Dioxide Emissions and Savings after each stage of the Energy Hierarchy

Stage	Carbon Dioxide Emissions (Tonnes CO ₂ per Annum)	
	Regulated	Unregulated
Baseline	91.9	57.5
After <i>Be Lean</i> Measures	67.4	57.5
After <i>Be Clean</i> Measures	67.4	57.5
After <i>Be Green</i> Measures	32.5	57.5
Stage	Regulated Carbon Dioxide Savings	
	Tonnes CO ₂ per Annum	Percentage
Savings from <i>Be Lean</i> Measures	24.5	27%
Savings from <i>Be Clean</i> Measures	0.0	0%
Savings from <i>Be Green</i> Measures	34.9	38%
Cumulative On-Site Savings	59.4	65%

APPENDICES

Appendix A: SAP TER/DER Worksheets – *New Build, Be Lean*

Appendix B: SAP TER/DER Worksheets – *Refurbishment, Baseline*

Appendix C: SAP TER/DER Worksheets – *Refurbishment, Be Lean*

Appendix D: Heat Cost Analysis

Appendix E: Indicative Roof Layout – solar PV

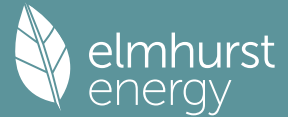
Appendix F: SAP TER/DER Worksheets – *New Build, Be Green*

Appendix G: SAP TER/DER Worksheets – *Refurbishment, Be Green*

Appendix A

SAP TER/DER Worksheets – *New Build, Be Lean*

Full SAP Calculation Printout



Property Reference	1B2P End GF - Apt_Be Lean				Issued on Date	30/08/2024	
Assessment Reference	1B2P End GF_Copy			Prop Type Ref			
Property	Apartment, 1B2P End GF, Tottenham, N17 6XD						
SAP Rating	84 B	DER	14.65	TER	15.83		
Environmental	90 B	% DER < TER				7.45	
CO ₂ Emissions (t/year)	0.64	DFEE	39.33	TFEE	39.04		
Compliance Check	See BREL	% DFEE < TFEE				-0.75	
% DPER < TPER	0.33	DPER	83.61	TPER	83.89		
Assessor Details	Miss Eleanor Ballinger				Assessor ID	M976-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.2000 (1b)	2.5000 (2b)	125.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.2000		125.5000 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	125.5000 (5)

2. Ventilation rate

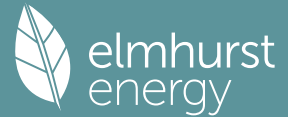
		m ³ per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)	
Number of open flues	0 * 20 =	0.0000 (6b)	
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)	
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)	
Number of flues attached to other heater	0 * 35 =	0.0000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

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	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) =												81.0000 (23c)
Effective ac	0.2576	0.2544	0.2512	0.2352	0.2321	0.2161	0.2161	0.2129	0.2225	0.2321	0.2384	0.2448 (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
Door to corridor			1.2000	1.0000	1.2000		(26)
Window (Uw = 0.90)			11.4800	0.8687	9.9730		(27)
Ground Floor			50.2000	0.1300	6.5260	75.0000	3765.0000 (28a)
External Wall	41.7500	11.4800	30.2700	0.1800	5.4486	60.0000	1816.2000 (29a)
Corridor Wall	4.1300	1.2000	2.9300	0.1800	0.5274	60.0000	175.8000 (29a)
Total net area of external elements Aum(A, m ²)			96.0800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	23.6750		(33)
Party Wall 1			30.1300	0.0000	0.0000	45.0000	1355.8500 (32)
Party Ceiling 1			50.2000			30.0000	1506.0000 (32b)
Internal Wall 1			46.7500			9.0000	420.7500 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	9039.6000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							180.0717 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	

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E2 Other lintels (including other steel lintels)	6.3000	0.1500	0.9450
E3 Sill	5.1000	0.0400	0.2040
E4 Jamb	18.1400	0.0500	0.9070
E5 Ground floor (normal)	16.7000	0.1600	2.6720
E5 Ground floor (normal)	1.6500	0.2700	0.4455
E7 Party floor between dwellings (in blocks of flats)	11.5500	0.1000	1.1550
E7 Party floor between dwellings (in blocks of flats)	1.6500	0.1200	0.1980
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.1500	0.2500	1.2875
E16 Corner (normal)	5.0000	0.0900	0.4500
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250
E18 Party wall between dwellings	7.5000	0.0600	0.4500
E25 Staggered party wall between dwellings	2.5000	0.1200	0.3000
P1 Party wall - Ground floor	12.0500	0.1000	1.2050
P2 Party wall - Intermediate floor within a dwelling	12.0500	0.0000	0.0000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			9.9940 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	33.6690 (37)

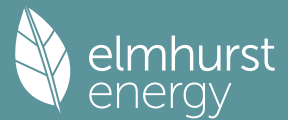
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	10.6670	10.5349	10.4029	9.7429	9.6109	8.9508	8.9508	8.8188	9.2148	9.6109	9.8749	10.1389 (38)
Average = Sum(39)m / 12 =	44.3359	44.2039	44.0719	43.4119	43.2798	42.6198	42.6198	42.4878	42.8838	43.2798	43.5439	43.8079 (39)
												43.3788
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8832	0.8806	0.8779	0.8648	0.8621	0.8490	0.8490	0.8464	0.8543	0.8621	0.8674	0.8727 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												1.6960 (42)
Hot water usage for mixer showers												
Hot water usage for baths	59.2376	58.3474	57.0502	54.5681	52.7365	50.6938	49.5328	50.8202	52.2314	54.4246	56.9600	59.0107 (42a)
Hot water usage for other uses	22.7669	22.4288	21.9526	21.0747	20.4173	19.6884	19.2947	19.7675	20.2823	21.0623	21.9583	22.6899 (42b)
Average daily hot water use (litres/day)	31.9986	30.8351	29.6715	28.5079	27.3443	26.1807	26.1807	27.3443	28.5079	29.6715	30.8351	31.9986 (42c)
												104.8133 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	114.0032	111.6112	108.6743	104.1507	100.4981	96.5629	95.0081	97.9319	101.0216	105.1584	109.7533	113.6992 (44)
Energy content (annual)	180.5531	158.9329	167.0283	142.5771	135.2897	118.7354	114.9041	121.2602	124.5697	142.6989	156.3637	178.0255 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	27.0830	23.8399	25.0542	21.3866	20.2935	17.8103	17.2356	18.1890	18.6855	21.4048	23.4546	26.7038 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	14.1899	12.8067	14.1574	13.6550	14.0813	13.5880	14.0186	14.0416	13.6118	14.0990	13.6881	14.1838 (61)
Total heat required for water heating calculated for each month	194.7430	171.7396	181.1857	156.2321	149.3710	132.3233	128.9227	135.3018	138.1815	156.7979	170.0517	192.2093 (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)
FV 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	194.7430	171.7396	181.1857	156.2321	149.3710	132.3233	128.9227	135.3018	138.1815	156.7979	170.0517	192.2093 (64)
12Total per year (kWh/year)												1907.0598 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
												0.0000 (64a)
Heat gains from water heating, kWh/month	63.5814	56.0469	59.0763	50.8206	48.5042	42.8765	41.7103	43.8294	44.8224	50.9721	55.4129	62.7394 (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	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	74.5246	82.5094	74.5246	77.0088	74.5246	77.0088	74.5246	74.5246	77.0088	74.5246	77.0088	74.5246 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	147.7534	149.2866	145.4229	137.1977	126.8147	117.0562	110.5370	109.0038	112.8674	121.0927	131.4756	141.2341 (68)
Pumps, fans	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800 (69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Water heating gains (Table 5)	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396 (71)
Total internal gains	85.4589	83.4031	79.4036	70.5842	65.1938	59.5507	56.0622	58.9105	62.2533	68.5109	76.9624	84.3272 (72)
	359.1767	366.6389	350.7910	336.2305	317.9730	302.0556	289.5636	290.8787	300.5693	315.5681	336.8867	351.5258 (73)

6. Solar gains						
[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	8.1600	11.2829	0.3500	0.8000	0.7700	17.8650 (75)
Southeast	2.8800	36.7938	0.3500	0.8000	0.7700	20.5617 (77)
Northwest	0.4400	11.2829	0.3500	0.8000	0.7700	0.9633 (81)

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Solar gains	39.3900	73.3498	116.9722	172.7781	218.9405	228.5362	215.6811	179.5328	136.0282	85.5461	48.3191	32.9727 (83)
Total gains	398.5667	439.9887	467.7632	509.0086	536.9134	530.5918	505.2447	470.4116	436.5975	401.1142	385.2057	384.4985 (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	56.6358	56.8049	56.9751	57.8413	58.0178	58.9163	58.9163	59.0993	58.5536	58.0178	57.6660	57.3185
alpha	4.7757	4.7870	4.7983	4.8561	4.8679	4.9278	4.9278	4.9400	4.9036	4.8679	4.8444	4.8212
util living area	0.9753	0.9593	0.9283	0.8420	0.6931	0.5045	0.3694	0.4123	0.6417	0.8736	0.9561	0.9786 (86)
MIT	19.9717	20.1526	20.4003	20.7160	20.9107	20.9850	20.9974	20.9956	20.9536	20.7070	20.3044	19.9455 (87)
Th 2	20.1818	20.1841	20.1863	20.1975	20.1998	20.2111	20.2111	20.2133	20.2066	20.1998	20.1953	20.1908 (88)
util rest of house	0.9702	0.9512	0.9140	0.8135	0.6467	0.4458	0.3040	0.3433	0.5792	0.8438	0.9460	0.9742 (89)
MIT 2	19.2536	19.4317	19.6721	19.9732	20.1392	20.2034	20.2102	20.2117	20.1801	19.9734	19.5911	19.2352 (90)
Living area fraction									FLA = Living area / (4) =			0.6096 (91)
MIT	19.6913	19.8711	20.1160	20.4260	20.6094	20.6798	20.6900	20.6895	20.6516	20.4206	20.0259	19.6682 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.5413	19.7211	19.9660	20.2760	20.4594	20.5298	20.5400	20.5395	20.5016	20.2706	19.8759	19.5182 (93)

8. Space heating requirement

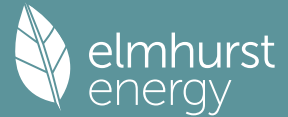
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9654	0.9457	0.9097	0.8165	0.6623	0.4698	0.3314	0.3721	0.6031	0.8467	0.9413	0.9697 (94)
Useful gains	384.7757	416.1169	425.5157	415.5875	355.5786	249.2612	167.4293	175.0231	263.3270	339.6330	362.5988	372.8416 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	675.7379	655.1526	593.4704	493.8511	379.1076	252.7272	167.9224	175.8791	274.5256	418.5405	556.3127	671.0559 (97)
Space heating kWh	216.4758	160.6320	124.9582	56.3498	17.5056	0.0000	0.0000	0.0000	0.0000	58.7071	139.4740	221.8714 (98a)
Space heating requirement - total per year (kWh/year)												995.9740
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	216.4758	160.6320	124.9582	56.3498	17.5056	0.0000	0.0000	0.0000	0.0000	58.7071	139.4740	221.8714 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												995.9740
Space heating per m2										(98c) / (4) =		19.8401 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												89.0000 (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	216.4758	160.6320	124.9582	56.3498	17.5056	0.0000	0.0000	0.0000	0.0000	58.7071	139.4740	221.8714 (98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000 (210)
Space heating fuel (main heating system)	243.2312	180.4854	140.4025	63.3144	19.6692	0.0000	0.0000	0.0000	0.0000	65.9631	156.7124	249.2938 (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	194.7430	171.7396	181.1857	156.2321	149.3710	132.3233	128.9227	135.3018	138.1815	156.7979	170.0517	192.2093 (64)
Efficiency of water heater (217)m	88.1867	88.1134	87.9860	87.7443	87.4753	87.3000	87.3000	87.3000	87.3000	87.7566	88.0579	88.2027 (217)
Fuel for water heating, kWh/month	220.8303	194.9075	205.9257	178.0539	170.7580	151.5731	147.6777	154.9849	158.2835	178.6736	193.1135	217.9177 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	15.1714	13.7032	15.1714	14.6820	15.1714	14.6820	15.1714	15.1714	14.6820	15.1714	14.6820	15.1714 (231)
Lighting	16.7457	13.4340	12.0958	8.8619	6.8452	5.5926	6.2444	8.1168	10.5429	13.8328	15.6241	17.2111 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												1119.0719 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												87.3000
Water heating fuel used												2172.6994 (219)
Space cooling fuel												0.0000 (221)

Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.6050)												
mechanical ventilation fans (SFP = 0.6050)												92.6316 (230a)

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central heating pump	41.0000 (230c)
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	178.6316 (231)
Electricity for lighting (calculated in Appendix L)	135.1474 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	3605.5502 (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	1119.0719	0.2100	235.0051 (261)
Total CO2 associated with community systems			0.0000 (262)
Water heating (other fuel)	2172.6994	0.2100	456.2669 (264)
Space and water heating			691.2720 (265)
Pumps, fans and electric keep-hot	178.6316	0.1387	24.7784 (267)
Energy for lighting	135.1474	0.1443	19.5059 (268)
Total CO2, kg/year			735.5563 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			14.6500 (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	1119.0719	1.1300	1264.5513 (275)
Total CO2 associated with community systems			0.0000 (276)
Water heating (other fuel)	2172.6994	1.1300	2455.1503 (278)
Space and water heating			3719.7015 (279)
Pumps, fans and electric keep-hot	178.6316	1.5128	270.2338 (281)
Energy for lighting	135.1474	1.5338	207.2936 (282)
Total Primary energy kWh/year			4197.2290 (286)
Dwelling Primary energy Rate (DPER)			83.6100 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	50.2000 (1b)	x 2.5000 (2b)	= 125.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 125.5000 (5)

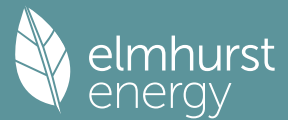
2. Ventilation rate

	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) = 0.1594 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4094 (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) = 0.3480 (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 infiltr rate	0.4436	0.4349	0.4262	0.3828	0.3741	0.3306	0.3306	0.3219	0.3480	0.3741	0.3915	0.4089 (22b)
Effective ac	0.5984	0.5946	0.5908	0.5733	0.5700	0.5546	0.5546	0.5518	0.5605	0.5700	0.5766	0.5836 (25)

3. Heat losses and heat loss parameter

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Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opaque door			1.2000	1.0000	1.2000			(26)					
TER Opening Type (Uw = 1.20)			11.3600	1.1450	13.0076			(27)					
Ground Floor			50.2000	0.1300	6.5260			(28a)					
External Wall	41.7500	11.3600	30.3900	0.1800	5.4702			(29a)					
Corridor Wall	4.1300	1.2000	2.9300	0.1800	0.5274			(29a)					
Total net area of external elements Aum(A, m2)			96.0800					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.7312			(33)					
Party Wall 1			30.1300	0.0000	0.0000			(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							190.0717	(35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value		Total						
E2 Other lintels (including other steel lintels)				6.3000	0.0500		0.3150						
E3 Sill				5.1000	0.0500		0.2550						
E4 Jamb				18.1400	0.0500		0.9070						
E5 Ground floor (normal)				16.7000	0.1600		2.6720						
E5 Ground floor (normal)				1.6500	0.1600		0.2640						
E7 Party floor between dwellings (in blocks of flats)				11.5500	0.0700		0.8085						
E7 Party floor between dwellings (in blocks of flats)				1.6500	0.0700		0.1155						
E23 Balcony within or between dwellings, balcony support penetrates wall insulation				5.1500	0.0200		0.1030						
E16 Corner (normal)				5.0000	0.0900		0.4500						
E17 Corner (inverted - internal area greater than external area)				2.5000	-0.0900		-0.2250						
E18 Party wall between dwellings				7.5000	0.0600		0.4500						
E25 Staggered party wall between dwellings				2.5000	0.0600		0.1500						
P1 Party wall - Ground floor				12.0500	0.0800		0.9640						
P2 Party wall - Intermediate floor within a dwelling				12.0500	0.0000		0.0000						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.2290	(36)					
Point Thermal Bridges							0.0000						
Total fabric heat loss						(33) + (36) + (36a) =	33.9602	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 24.7832	Feb 24.6249	Mar 24.4698	Apr 23.7412	May 23.6048	Jun 22.9702	Jul 22.9702	Aug 22.8527	Sep 23.2147	Oct 23.6048	Nov 23.8806	Dec 24.1689	(38)
Heat transfer coeff	58.7434	58.5852	58.4300	57.7014	57.5651	56.9304	56.9304	56.8129	57.1749	57.5651	57.8409	58.1292	(39)
Average = Sum(39)m / 12 =												57.7007	
HLP	Jan 1.1702	Feb 1.1670	Mar 1.1639	Apr 1.1494	May 1.1467	Jun 1.1341	Jul 1.1341	Aug 1.1317	Sep 1.1389	Oct 1.1467	Nov 1.1522	Dec 1.1580	(40)
HLP (average)												1.1494	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

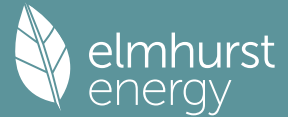
4. Water heating energy requirements (kWh/year)													

Assumed occupancy													1.6960 (42)
Hot water usage for mixer showers													
52.6557	51.8644	50.7113	48.5050	46.8769	45.0612	44.0291	45.1735	46.4279	48.3774	50.6311	52.4539	42a)	
Hot water usage for baths													
22.7669	22.4288	21.9526	21.0747	20.4173	19.6884	19.2947	19.7675	20.2823	21.0623	21.9583	22.6899	42b)	
Hot water usage for other uses													
31.9986	30.8351	29.6715	28.5079	27.3443	26.1807	26.1807	27.3443	28.5079	29.6715	30.8351	31.9986	42c)	
Average daily hot water use (litres/day)												98.7449	43)
Daily hot water use	Jan 107.4212	Feb 105.1282	Mar 102.3354	Apr 98.0876	May 94.6385	Jun 90.9303	Jul 89.5045	Aug 92.2853	Sep 95.2181	Oct 99.1112	Nov 103.4244	Dec 107.1425	44)
Energy conte	170.1289	149.7011	157.2856	134.2770	127.4016	111.8094	108.2479	114.2684	117.4134	134.4929	147.3470	167.7593	45)
Energy content (annual)										Total = Sum(45)m =		1640.1327	
Distribution loss (46)m = 0.15 x (45)m													
25.5193	22.4552	23.5928	20.1416	19.1102	16.7714	16.2372	17.1403	17.6120	20.1739	22.1021	25.1639	46)	
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	59)
Combi loss	50.9589	46.0274	50.9589	48.3720	48.2267	44.8423	45.6105	47.0276	46.9569	50.5060	49.3151	50.9589	61)
Total heat required for water heating calculated for each month													
221.0878	195.7285	208.2445	182.6490	175.6283	156.6517	153.8584	161.2960	164.3703	184.9989	196.6621	218.7182	62)	
WWHRS	-24.0720	-21.2895	-22.2931	-18.4596	-17.2036	-14.7213	-13.7989	-14.6737	-15.2312	-17.9559	-20.3419	-23.6262	63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	63d)
Output from w/h	197.0159	174.4391	185.9515	164.1894	158.4247	141.9304	140.0596	146.6223	149.1391	167.0430	176.3202	195.0920	64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		1996.2271	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	69.3076	61.2825	65.0372	56.7401	54.4177	48.3872	47.3951	49.7511	50.7792	57.3454	61.3217	68.5197	65)

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

Metabolic gains (Table 5), Watts													
(66)m	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	74.5105	82.4938	74.5105	76.9942	74.5105	76.9942	74.5105	74.5105	76.9942	74.5105	76.9942	74.5105	67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	147.7534	149.2866	145.4229	137.1977	126.8147	117.0562	110.5370	109.0038	112.8674	121.0927	131.4756	141.2341	68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	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)	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	71)
Water heating gains (Table 5)	93.1554	91.1942	87.4156	78.8057	73.1421	67.2044	63.7030	66.8698	70.5266	77.0771	85.1690	92.0963	72)
Total internal gains	366.8591	374.4144	358.7889	344.4374	325.9072	309.6947	297.1904	298.8239	308.8281	324.1202	345.0786	359.2808	73)

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6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W
Northeast					8.0700	11.2829	0.6300	0.7000			0.7700	27.8271 (75)
Southeast					2.8500	36.7938	0.6300	0.7000			0.7700	32.0473 (77)
Northwest					0.4400	11.2829	0.6300	0.7000			0.7700	1.5172 (81)
Solar gains	61.3916	114.3196	182.3068	269.2822	341.2276	356.1827	336.1476	279.8095	212.0062	133.3281	75.3080	51.3899 (83)
Total gains	428.2507	488.7340	541.0957	613.7196	667.1348	665.8775	633.3380	578.6334	520.8344	457.4483	420.3866	410.6707 (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	45.1190	45.2409	45.3610	45.9338	46.0426	46.5558	46.5558	46.6521	46.3568	46.0426	45.8231	45.5958
alpha	4.0079	4.0161	4.0241	4.0623	4.0695	4.1037	4.1037	4.1101	4.0905	4.0695	4.0549	4.0397
util living area	0.9793	0.9643	0.9335	0.8505	0.7062	0.5253	0.3902	0.4420	0.6795	0.8940	0.9642	0.9823 (86)
MIT	19.5270	19.7614	20.1015	20.5357	20.8306	20.9615	20.9910	20.9853	20.8928	20.4998	19.9502	19.4925 (87)
Th 2	19.9439	19.9465	19.9490	19.9607	19.9629	19.9731	19.9731	19.9750	19.9692	19.9629	19.9584	19.9538 (88)
util rest of house	0.9744	0.9560	0.9180	0.8178	0.6500	0.4490	0.3016	0.3479	0.6018	0.8625	0.9544	0.9780 (89)
MIT 2	18.2555	18.5513	18.9747	19.4998	19.8207	19.9496	19.9697	19.9689	19.8942	19.4743	18.8011	18.2188 (90)
Living area fraction	19.0306	19.2889	19.6616	20.1313	20.4363	20.5664	20.5923	20.5885	20.5029	20.0994	19.5016	18.9952 (92)
MIT	19.0306	19.2889	19.6616	20.1313	20.4363	20.5664	20.5923	20.5885	20.5029	20.0994	19.5016	18.9952 (92)
Temperature adjustment	19.0306	19.2889	19.6616	20.1313	20.4363	20.5664	20.5923	20.5885	20.5029	20.0994	19.5016	18.9952 (93)
adjusted MIT	19.0306	19.2889	19.6616	20.1313	20.4363	20.5664	20.5923	20.5885	20.5029	20.0994	19.5016	18.9952 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9690	0.9497	0.9131	0.8237	0.6766	0.4938	0.3554	0.4049	0.6437	0.8672	0.9492	0.9730 (94)
Useful gains	414.9541	464.1335	494.0813	505.5067	451.4161	328.8136	225.0965	234.2861	335.2450	396.7019	399.0172	399.5703 (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	865.3242	842.9758	769.0302	648.0603	502.9064	339.6705	227.2812	237.9588	366.0851	546.8324	717.3166	860.0336 (97)
Space heating kWh	335.0754	254.5820	204.5620	102.6386	38.3088	0.0000	0.0000	0.0000	0.0000	111.6970	229.1755	342.5847 (98a)
Space heating requirement - total per year (kWh/year)												1618.6240
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	335.0754	254.5820	204.5620	102.6386	38.3088	0.0000	0.0000	0.0000	0.0000	111.6970	229.1755	342.5847 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1618.6240
Space heating per m2										(98c) / (4) =		32.2435 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.4000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	335.0754	254.5820	204.5620	102.6386	38.3088	0.0000	0.0000	0.0000	0.0000	111.6970	229.1755	342.5847 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	362.6357	275.5217	221.3874	111.0808	41.4597	0.0000	0.0000	0.0000	0.0000	120.8842	248.0255	370.7627 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	197.0159	174.4391	185.9515	164.1894	158.4247	141.9304	140.0596	146.6223	149.1391	167.0430	176.3202	195.0920 (64)
Efficiency of water heater	85.5091	85.1903	84.5863	83.4036	81.8417	80.3000	80.3000	80.3000	80.3000	83.5384	84.9442	80.3000 (216)
Fuel for water heating, kWh/month	230.4033	204.7640	219.8363	196.8614	193.5746	176.7502	174.4204	182.5931	185.7274	199.9596	207.5718	85.5746 (217)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	227.9789 (219)
(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	15.4818	12.4201	11.1829	8.1931	6.3286	5.1705	5.7731	7.5041	9.7471	12.7888	14.4449	15.9121 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-17.2829	-25.2631	-37.6486	-43.9602	-48.8501	-46.1586	-45.6243	-42.3693	-36.8488	-29.6357	-19.3274	-14.8414 (233a)
(233a)m	-17.2829	-25.2631	-37.6486	-43.9602	-48.8501	-46.1586	-45.6243	-42.3693	-36.8488	-29.6357	-19.3274	-14.8414 (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)
(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)	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)
(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)	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)
(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)	-7.2180	-15.4164	-31.0650	-47.2705	-63.0850	-63.5674	-62.7891	-52.8732	-38.3940	-22.2155	-9.6942	-5.6884 (233b)
(233b)m	-7.2180	-15.4164	-31.0650	-47.2705	-63.0850	-63.5674	-62.7891	-52.8732	-38.3940	-22.2155	-9.6942	-5.6884 (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)
(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)

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Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year												
Space heating fuel - main system 1											1751.7576	(211)
Space heating fuel - main system 2											0.0000	(213)
Space heating fuel - secondary											0.0000	(215)
Efficiency of water heater											80.3000	
Water heating fuel used											2400.4410	(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)											124.9471	(232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation											-827.0869	(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											3536.0588	(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	1751.7576	0.2100	367.8691 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2400.4410	0.2100	504.0926 (264)
Space and water heating			871.9617 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	124.9471	0.1443	18.0337 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-407.8103	0.1338	-54.5662
PV Unit electricity exported	-419.2766	0.1255	-52.6305
Total			-107.1968 (269)
Total CO2, kg/year			794.7279 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.8300 (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	1751.7576	1.1300	1979.4861 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2400.4410	1.1300	2712.4983 (278)
Space and water heating			4691.9844 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	124.9471	1.5338	191.6480 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-407.8103	1.4945	-609.4598
PV Unit electricity exported	-419.2766	0.4608	-193.1834
Total			-802.6431 (283)
Total Primary energy kWh/year			4211.0901 (286)
Target Primary Energy Rate (TPER)			83.8900 (287)

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Property Reference	1B2P End MF - Apt_Be Lean			Issued on Date	30/08/2024
Assessment Reference	1B2P End MF_Copy	Prop Type Ref			
Property	Apartment, 1B2P End MF, Edmansons Close, Tottenham, N17 6XD				
SAP Rating	85 B	DER	12.83	TER	13.73
Environmental	91 B	% DER < TER			6.55
CO ₂ Emissions (t/year)	0.58	DFEE	30.50	TFEE	29.52
Compliance Check	See BREL	% DFEE < TFEE			-3.33
% DPER < TPER	-1.66	DPER	73.82	TPER	72.61
Assessor Details	Miss Eleanor Ballinger			Assessor ID	M976-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.2000 (1b)	2.5000 (2b)	125.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	125.5000 (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)

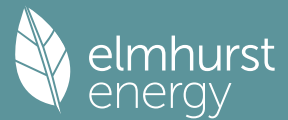
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275 (21)

	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) =												81.0000 (23c)
Effective ac	0.2576	0.2544	0.2512	0.2352	0.2321	0.2161	0.2161	0.2129	0.2225	0.2321	0.2384	0.2448 (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
Door to corridor			1.2000	1.0000	1.2000		(26)
Window (Uw = 0.90)			11.4800	0.8687	9.9730		(27)
External Wall	41.7500	11.4800	30.2700	0.1800	5.4486	60.0000	1816.2000 (29a)
Corridor Wall	4.1300	1.2000	2.9300	0.1800	0.5274	60.0000	175.8000 (29a)
Total net area of external elements Aum(A, m ²)			45.8800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	17.1490		(33)
Party Wall 1			30.1300	0.0000	0.0000	45.0000	1355.8500 (32)
Party Floor 1			50.2000			40.0000	2008.0000 (32d)
Party Ceiling 1			50.2000			30.0000	1506.0000 (32b)
Internal Wall 1			46.7500			9.0000	420.7500 (32c)
Heat capacity Cm = Sum(A x k)							7282.6000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							145.0717 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value		Total

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E2 Other lintels (including other steel lintels)	6.3000	0.1500	0.9450
E3 Sill	5.1000	0.0400	0.2040
E4 Jamb	18.1400	0.0500	0.9070
E7 Party floor between dwellings (in blocks of flats)	23.1000	0.1000	2.3100
E7 Party floor between dwellings (in blocks of flats)	3.3000	0.1400	0.4620
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	10.3000	0.2500	2.5750
E16 Corner (normal)	5.0000	0.0900	0.4500
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250
E18 Party wall between dwellings	7.5000	0.0600	0.4500
E25 Staggered party wall between dwellings	2.5000	0.1200	0.3000
P2 Party wall - Intermediate floor within a dwelling	24.1000	0.0000	0.0000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.3780 (36)
Point Thermal Bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	25.5270 (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	10.6670	10.5349	10.4029	9.7429	9.6109	8.9508	8.9508	8.8188	9.2148	9.6109	9.8749	10.1389 (38)
Average = Sum(39)m / 12 =	36.1939	36.0619	35.9299	35.2699	35.1378	34.4778	34.4778	34.3458	34.7418	35.1378	35.4019	35.6659 (39)
												35.2368
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7210	0.7184	0.7157	0.7026	0.7000	0.6868	0.6868	0.6842	0.6921	0.7000	0.7052	0.7105 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.6960 (42)
Hot water usage for mixer showers												
	59.2376	58.3474	57.0502	54.5681	52.7365	50.6938	49.5328	50.8202	52.2314	54.4246	56.9600	59.0107 (42a)
Hot water usage for baths	22.7669	22.4288	21.9526	21.0747	20.4173	19.6884	19.2947	19.7675	20.2823	21.0623	21.9583	22.6899 (42b)
Hot water usage for other uses	31.9986	30.8351	29.6715	28.5079	27.3443	26.1807	26.1807	27.3443	28.5079	29.6715	30.8351	31.9986 (42c)
Average daily hot water use (litres/day)												104.8133 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	114.0032	111.6112	108.6743	104.1507	100.4981	96.5629	95.0081	97.9319	101.0216	105.1584	109.7533	113.6992 (44)
Energy content (annual)	180.5531	158.9329	167.0283	142.5771	135.2897	118.7354	114.9041	121.2602	124.5697	142.6989	156.3637	178.0255 (45)
Distribution loss (46)m = 0.15 x (45)m	27.0830	23.8399	25.0542	21.3866	20.2935	17.8103	17.2356	18.1890	18.6855	21.4048	23.4546	26.7038 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	14.1899	12.8067	14.1574	13.6550	14.0813	13.5880	14.0186	14.0416	13.6118	14.0990	13.6881	14.1838 (61)
Total heat required for water heating calculated for each month	194.7430	171.7396	181.1857	156.2321	149.3710	132.3233	128.9227	135.3018	138.1815	156.7979	170.0517	192.2093 (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	194.7430	171.7396	181.1857	156.2321	149.3710	132.3233	128.9227	135.3018	138.1815	156.7979	170.0517	192.2093 (64)
12Total per year (kWh/year)												1907.0598 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
												0.0000 (64a)
Heat gains from water heating, kWh/month	63.5814	56.0469	59.0763	50.8206	48.5042	42.8765	41.7103	43.8294	44.8224	50.9721	55.4129	62.7394 (65)

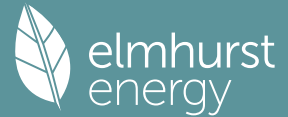
5. Internal gains (see Table 5 and 5a)

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	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995 (66)
	74.5246	82.5094	74.5246	77.0088	74.5246	77.0088	74.5246	74.5246	77.0088	74.5246	77.0088	74.5246 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	147.7534	149.2866	145.4229	137.1977	126.8147	117.0562	110.5370	109.0038	112.8674	121.0927	131.4756	141.2341 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396 (71)
Water heating gains (Table 5)	85.4589	83.4031	79.4036	70.5842	65.1938	59.5507	56.0622	58.9105	62.2533	68.5109	76.9624	84.3272 (72)
Total internal gains	359.1767	366.6389	350.7910	336.2305	317.9730	302.0556	289.5636	290.8787	300.5693	315.5681	336.8867	351.5258 (73)

6. Solar gains

[Jan]			Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W				
Northeast			8.1600	11.2829	0.3500	0.8000	0.7700	17.8650 (75)				
Southeast			2.8800	36.7938	0.3500	0.8000	0.7700	20.5617 (77)				
Northwest			0.4400	11.2829	0.3500	0.8000	0.7700	0.9633 (81)				
Solar gains	39.3900	73.3498	116.9722	172.7781	218.9405	228.5362	215.6811	179.5328	136.0282	85.5461	48.3191	32.9727 (83)
Total gains	398.5667	439.9887	467.7632	509.0086	536.9134	530.5918	505.2447	470.4116	436.5975	401.1142	385.2057	384.4985 (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	55.8918	56.0964	56.3025	57.3562	57.5717	58.6738	58.6738	58.8994	58.2280	57.5717	57.1423	56.7193	
alpha	4.7261	4.7398	4.7535	4.8237	4.8381	4.9116	4.9116	4.9266	4.8819	4.8381	4.8095	4.7813	
util living area	0.9476	0.9183	0.8675	0.7482	0.5858	0.4126	0.2997	0.3348	0.5354	0.7880	0.9119	0.9535 (86)	
MIT	20.1794	20.3606	20.5825	20.8328	20.9554	20.9936	20.9989	20.9982	20.9782	20.8202	20.4878	20.1556 (87)	
Th 2	20.3223	20.3246	20.3270	20.3385	20.3409	20.3525	20.3525	20.3548	20.3478	20.3409	20.3362	20.3316 (88)	
util rest of house	0.9398	0.9070	0.8501	0.7204	0.5493	0.3719	0.2558	0.2883	0.4888	0.7571	0.8980	0.9465 (89)	
MIT 2	19.5793	19.7554	19.9675	20.2047	20.3093	20.3489	20.3521	20.3541	20.3345	20.2003	19.8901	19.5640 (90)	
Living area fraction									fLA = Living area / (4) =				0.6096 (91)
MIT	19.9451	20.1243	20.3424	20.5876	20.7031	20.7419	20.7464	20.7467	20.7269	20.5781	20.2544	19.9246 (92)	
Temperature adjustment												-0.1500	
adjusted MIT	19.7951	19.9743	20.1924	20.4376	20.5531	20.5919	20.5964	20.5967	20.5769	20.4281	20.1044	19.7746 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9329	0.9005	0.8464	0.7247	0.5613	0.3870	0.2724	0.3058	0.5054	0.7614	0.8926	0.9398 (94)	
Useful gains	371.8297	396.2005	395.8937	368.8712	301.3452	205.3555	137.6166	143.8445	220.6412	305.4050	343.8342	361.3579 (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	560.8268	543.6069	491.9658	406.9299	311.0792	206.5871	137.7863	144.1393	225.0184	345.3397	460.3817	555.4813 (97)	
Space heating kWh	140.6138	99.0571	71.4777	27.4023	7.2421	0.0000	0.0000	0.0000	0.0000	29.7114	83.9142	144.4278 (98a)	
Space heating requirement - total per year (kWh/year)												603.8463	
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	140.6138	99.0571	71.4777	27.4023	7.2421	0.0000	0.0000	0.0000	0.0000	29.7114	83.9142	144.4278 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												603.8463	
Space heating per m2										(98c) / (4) =		12.0288 (99)	

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)	
Fraction of space heat from main system(s)												1.0000 (202)	
Efficiency of main space heating system 1 (in %)												89.0000 (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	140.6138	99.0571	71.4777	27.4023	7.2421	0.0000	0.0000	0.0000	0.0000	29.7114	83.9142	144.4278	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	157.9930	111.3001	80.3120	30.7890	8.1372	0.0000	0.0000	0.0000	0.0000	33.3837	94.2856	162.2784	(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	194.7430	171.7396	181.1857	156.2321	149.3710	132.3233	128.9227	135.3018	138.1815	156.7979	170.0517	192.2093	(64)
Efficiency of water heater (217)m	88.0048	87.9143	87.7743	87.5495	87.3772	87.3000	87.3000	87.3000	87.3000	87.5665	87.8545	88.0213	(216)
Fuel for water heating, kWh/month	221.2868	195.3490	206.4223	178.4500	170.9497	151.5731	147.6777	154.9849	158.2835	179.0617	193.5607	218.3668	(219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	15.3145	13.8324	15.3145	14.8205	15.3145	14.8205	15.3145	15.3145	14.8205	15.3145	14.8205	15.3145	(231)
Lighting	16.7457	13.4340	12.0958	8.8619	6.8452	5.5926	6.2444	8.1168	10.5429	13.8328	15.6241	17.2111	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												678.4789	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												87.3000	
Water heating fuel used												2175.9660	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.6160)													
mechanical ventilation fans (SFP = 0.6160)												94.3158	(230a)
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												180.3158	(231)

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Electricity for lighting (calculated in Appendix L)	135.1474	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3169.9081	(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	678.4789	0.2100	142.4806	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2175.9660	0.2100	456.9529	(264)
Space and water heating			599.4334	(265)
Pumps, fans and electric keep-hot	180.3158	0.1387	25.0120	(267)
Energy for lighting	135.1474	0.1443	19.5059	(268)
Total CO2, kg/year			643.9514	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.8300	(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	678.4789	1.1300	766.6812	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2175.9660	1.1300	2458.8416	(278)
Space and water heating			3225.5228	(279)
Pumps, fans and electric keep-hot	180.3158	1.5128	272.7817	(281)
Energy for lighting	135.1474	1.5338	207.2936	(282)
Total Primary energy kWh/year			3705.5981	(286)
Dwelling Primary energy Rate (DPER)			73.8200	(287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	50.2000	(1b) x 2.5000	(2b) = 125.5000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.2000			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 125.5000	(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)

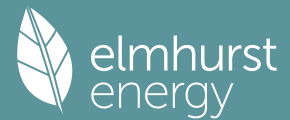
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1594	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			5.0000	(17)
Infiltration rate			0.4094	(18)
Number of sides sheltered			2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.3480	(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	0.4436	0.4349	0.4262	0.3828	0.3741	0.3306	0.3306	0.3219	0.3480	0.3741	0.3915	0.4089	(22b)
Effective ac	0.5984	0.5946	0.5908	0.5733	0.5700	0.5546	0.5546	0.5518	0.5605	0.5700	0.5766	0.5836	(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
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TER Opaque door			1.2000	1.0000	1.2000	(26)
TER Opening Type (Uw = 1.20)			11.3600	1.1450	13.0076	(27)
External Wall	41.7500	11.3600	30.3900	0.1800	5.4702	(29a)
Corridor Wall	4.1300	1.2000	2.9300	0.1800	0.5274	(29a)
Total net area of external elements Aum(A, m2)			45.8800			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		20.2052	(33)
Party Wall 1			30.1300	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 155.0717 (35)

List of Thermal Bridges						
K1 Element			Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)			6.3000	0.0500	0.3150	
E3 Sill			5.1000	0.0500	0.2550	
E4 Jamb			18.1400	0.0500	0.9070	
E7 Party floor between dwellings (in blocks of flats)			23.1000	0.0700	1.6170	
E7 Party floor between dwellings (in blocks of flats)			3.3000	0.0700	0.2310	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation			10.3000	0.0200	0.2060	
E16 Corner (normal)			5.0000	0.0900	0.4500	
E17 Corner (inverted - internal area greater than external area)			2.5000	-0.0900	-0.2250	
E18 Party wall between dwellings			7.5000	0.0600	0.4500	
E25 Staggered party wall between dwellings			2.5000	0.0600	0.1500	
P2 Party wall - Intermediate floor within a dwelling			24.1000	0.0000	0.0000	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 4.3560 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 24.5612 (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	24.7832	24.6249	24.4698	23.7412	23.6048	22.9702	22.9702	22.8527	23.2147	23.6048	23.8806	24.1689	(38)
Average = Sum(39)m / 12 =	49.3444	49.1862	49.0310	48.3024	48.1661	47.5314	47.5314	47.4139	47.7759	48.1661	48.4419	48.7302	(39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.9830	0.9798	0.9767	0.9622	0.9595	0.9468	0.9468	0.9445	0.9517	0.9595	0.9650	0.9707	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.6960 (42)
Hot water usage for mixer showers													
Hot water usage for baths	52.6557	51.8644	50.7113	48.5050	46.8769	45.0612	44.0291	45.1735	46.4279	48.3774	50.6311	52.4539	(42a)
Hot water usage for other uses	22.7669	22.4288	21.9526	21.0747	20.4173	19.6884	19.2947	19.7675	20.2823	21.0623	21.9583	22.6899	(42b)
Average daily hot water use (litres/day)	31.9986	30.8351	29.6715	28.5079	27.3443	26.1807	26.1807	27.3443	28.5079	29.6715	30.8351	31.9986	(42c)
Daily hot water use	107.4212	105.1282	102.3354	98.0876	94.6385	90.9303	89.5045	92.2853	95.2181	99.1112	103.4244	107.1425	(44)
Energy content (annual)	170.1289	149.7011	157.2856	134.2770	127.4016	111.8094	108.2479	114.2684	117.4134	134.4929	147.3470	167.7593	(45)
Distribution loss (46)m = 0.15 x (45)m	25.5193	22.4552	23.5928	20.1416	19.1102	16.7714	16.2372	17.1403	17.6120	20.1739	22.1021	25.1639	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	50.9589	46.0274	50.9589	48.3720	48.2267	44.8423	45.6105	47.0276	46.9569	50.5060	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	221.0878	195.7285	208.2445	182.6490	175.6283	156.6517	153.8584	161.2960	164.3703	184.9989	196.6621	218.7182	(62)
WWHRS	-24.0720	-21.2895	-22.2931	-18.4596	-17.2036	-14.7213	-13.7989	-14.6737	-15.2312	-17.9559	-20.3419	-23.6262	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	197.0159	174.4391	185.9515	164.1894	158.4247	141.9304	140.0596	146.6223	149.1391	167.0430	176.3202	195.0920	(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)
Heat gains from water heating, kWh/month	69.3076	61.2825	65.0372	56.7401	54.4177	48.3872	47.3951	49.7511	50.7792	57.3454	61.3217	68.5197	(65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a) =													0.0000 (64a)

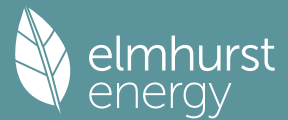
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	74.5105	82.4938	74.5105	76.9942	74.5105	76.9942	74.5105	74.5105	76.9942	74.5105	76.9942	74.5105	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	147.7534	149.2866	145.4229	137.1977	126.8147	117.0562	110.5370	109.0038	112.8674	121.0927	131.4756	141.2341	(68)
Pumps, fans	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	(69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Water heating gains (Table 5)	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	(71)
Total internal gains	93.1554	91.1942	87.4156	78.8057	73.1421	67.2044	63.7030	66.8698	70.5266	77.0771	85.1690	92.0963	(72)
	366.8591	374.4144	358.7889	344.4374	325.9072	309.6947	297.1904	298.8239	308.8281	324.1202	345.0786	359.2808	(73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
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				m2	Table 6a W/m2	Specific data or Table 6b		Specific data or Table 6c		factor Table 6d		W
				8.0700	11.2829	0.6300		0.7000		0.7700		27.8271 (75)
Northeast				2.8500	36.7938	0.6300		0.7000		0.7700		32.0473 (77)
Southeast				0.4400	11.2829	0.6300		0.7000		0.7700		1.5172 (81)
Northwest												
Solar gains	61.3916	114.3196	182.3068	269.2822	341.2276	356.1827	336.1476	279.8095	212.0062	133.3281	75.3080	51.3899 (83)
Total gains	428.2507	488.7340	541.0957	613.7196	667.1348	665.8775	633.3380	578.6334	520.8344	457.4483	420.3866	410.6707 (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	43.8223	43.9634	44.1024	44.7677	44.8944	45.4939	45.4939	45.6066	45.2611	44.8944	44.6389	44.3747
alpha	3.9215	3.9309	3.9402	3.9845	3.9930	4.0329	4.0329	4.0404	4.0174	3.9930	3.9759	3.9583
util living area	0.9616	0.9367	0.8899	0.7794	0.6194	0.4461	0.3277	0.3723	0.5918	0.8343	0.9361	0.9664 (86)
MIT	19.6849	19.9333	20.2670	20.6595	20.8884	20.9770	20.9948	20.9914	20.9311	20.6170	20.1030	19.6500 (87)
Th 2	20.0976	20.1002	20.1028	20.1150	20.1172	20.1279	20.1279	20.1298	20.1238	20.1172	20.1126	20.1078 (88)
util rest of house	0.9546	0.9258	0.8715	0.7467	0.5721	0.3889	0.2638	0.3039	0.5285	0.8006	0.9232	0.9603 (89)
MIT 2	18.5801	18.8908	19.3016	19.7714	20.0194	20.1123	20.1255	20.1256	20.0721	19.7374	19.1162	18.5437 (90)
Living area fraction	fLA = Living area / (4) = 0.6096 (91)											
MIT	19.2535	19.5263	19.8900	20.3128	20.5491	20.6393	20.6554	20.6534	20.5957	20.2736	19.7177	19.2180 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.2535	19.5263	19.8900	20.3128	20.5491	20.6393	20.6554	20.6534	20.5957	20.2736	19.7177	19.2180 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9466	0.9176	0.8666	0.7544	0.5957	0.4227	0.3026	0.3453	0.5633	0.8070	0.9165	0.9527 (94)
Useful gains	405.4006	448.4657	468.9225	462.9724	397.4270	281.4919	191.6491	199.8027	293.4097	369.1625	385.3026	391.2581 (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	737.8735	719.4108	656.5267	551.2638	426.2277	287.0589	192.7582	201.6695	310.3373	465.9392	611.2262	731.8321 (97)
Space heating kWh	247.3598	182.0751	139.5775	63.5698	21.4277	0.0000	0.0000	0.0000	0.0000	72.0019	162.6650	253.3870 (98a)
Space heating requirement - total per year (kWh/year)	1142.0639											
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	247.3598	182.0751	139.5775	63.5698	21.4277	0.0000	0.0000	0.0000	0.0000	72.0019	162.6650	253.3870 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	1142.0639											
Space heating per m2	(98c) / (4) = 22.7503 (99)											
9a. Energy requirements - Individual heating systems, including micro-CHP												
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.4000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	247.3598	182.0751	139.5775	63.5698	21.4277	0.0000	0.0000	0.0000	0.0000	72.0019	162.6650	253.3870 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	267.7054	197.0510	151.0579	68.7985	23.1902	0.0000	0.0000	0.0000	0.0000	77.9241	176.0444	274.2283 (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	197.0159	174.4391	185.9515	164.1894	158.4247	141.9304	140.0596	146.6223	149.1391	167.0430	176.3202	195.0920 (64)
Water heating requirement	84.8702	84.4734	83.7749	82.5283	81.2363	80.3000	80.3000	80.3000	80.3000	82.7100	84.2090	80.3000 (216)
Efficiency of water heater	84.8702	84.4734	83.7749	82.5283	81.2363	80.3000	80.3000	80.3000	80.3000	82.7100	84.2090	84.9426 (217)
Fuel for water heating, kWh/month	232.1380	206.5018	221.9657	198.9492	195.0171	176.7502	174.4204	182.5931	185.7274	201.9622	209.3840	229.6750 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
(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	15.4818	12.4201	11.1829	8.1931	6.3286	5.1705	5.7731	7.5041	9.7471	12.7888	14.4449	15.9121 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-17.2829	-25.2631	-37.6486	-43.9602	-48.8501	-46.1586	-45.6243	-42.3693	-36.8488	-29.6357	-19.3274	-14.8414 (233a)
(233a)m	-17.2829	-25.2631	-37.6486	-43.9602	-48.8501	-46.1586	-45.6243	-42.3693	-36.8488	-29.6357	-19.3274	-14.8414 (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)
(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)	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)
(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)	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)
(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)	-7.2180	-15.4164	-31.0650	-47.2705	-63.0850	-63.5674	-62.7891	-52.8732	-38.3940	-22.2155	-9.6942	-5.6884 (233b)
(233b)m	-7.2180	-15.4164	-31.0650	-47.2705	-63.0850	-63.5674	-62.7891	-52.8732	-38.3940	-22.2155	-9.6942	-5.6884 (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)
(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)	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)
(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)	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)
(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	1235.9998 (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	80.3000
Water heating fuel used	2415.0842 (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)	124.9471 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-827.0869 (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	3034.9442 (238)

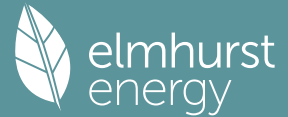
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1235.9998	0.2100	259.5600 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2415.0842	0.2100	507.1677 (264)
Space and water heating			766.7277 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	124.9471	0.1443	18.0337 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-407.8103	0.1338	-54.5662
PV Unit electricity exported	-419.2766	0.1255	-52.6305
Total			-107.1968 (269)
Total CO2, kg/year			689.4939 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.7300 (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	1235.9998	1.1300	1396.6798 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2415.0842	1.1300	2729.0452 (278)
Space and water heating			4125.7250 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	124.9471	1.5338	191.6480 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-407.8103	1.4945	-609.4598
PV Unit electricity exported	-419.2766	0.4608	-193.1834
Total			-802.6431 (283)
Total Primary energy kWh/year			3644.8307 (286)
Target Primary Energy Rate (TPER)			72.6100 (287)

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Property Reference	1B2P End TF - Apt_Be Lean				Issued on Date	30/08/2024
Assessment Reference	1B2P End TF_Copy		Prop Type Ref			
Property	Apartment, 1B2P End TF, Edmansons Close, Tottenham, N17 6XD					
SAP Rating	84 B	DER	14.76	TER	17.26	
Environmental	90 B	% DER < TER				14.48
CO ₂ Emissions (t/year)	0.65	DFEE	39.96	TFEE	45.43	
Compliance Check	See BREL	% DFEE < TFEE				12.05
% DPER < TPER	8.04	DPER	84.20	TPER	91.56	
Assessor Details	Miss Eleanor Ballinger				Assessor ID	M976-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.2000 (1b)	2.5000 (2b)	125.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.2000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	125.5000 (5)

2. Ventilation rate

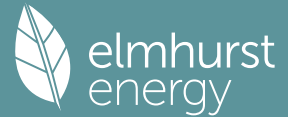
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) =												81.0000 (23c)
Effective ac	0.2576	0.2544	0.2512	0.2352	0.2321	0.2161	0.2161	0.2129	0.2225	0.2321	0.2384	0.2448 (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
Door to corridor			1.2000	1.0000	1.2000		(26)
Window (Uw = 0.90)			11.4800	0.8687	9.9730		(27)
External Wall	41.7500	11.4800	30.2700	0.1800	5.4486	60.0000	1816.2000 (29a)
Corridor Wall	4.1300	1.2000	2.9300	0.1800	0.5274	60.0000	175.8000 (29a)
External Roof 1	50.2000		50.2000	0.1000	5.0200	80.0000	4016.0000 (30)
Total net area of external elements Aum(A, m ²)			96.0800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	22.1690		(33)
Party Wall 1			30.1300	0.0000	0.0000	45.0000	1355.8500 (32)
Party Floor 1			50.2000			2008.0000	(32d)
Internal Wall 1			46.7500			9.0000	420.7500 (32c)
Heat capacity Cm = Sum(A x k)							9792.6000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							195.0717 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	

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E2 Other lintels (including other steel lintels)	6.3000	0.1500	0.9450
E3 Sill	5.1000	0.0400	0.2040
E4 Jamb	18.1400	0.0500	0.9070
E7 Party floor between dwellings (in blocks of flats)	11.5500	0.1000	1.1550
E7 Party floor between dwellings (in blocks of flats)	1.6500	0.1400	0.2310
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.1500	0.2500	1.2875
E14 Flat roof	1.6500	0.0800	0.1320
E15 Flat roof with parapet	16.7000	0.3000	5.0100
E16 Corner (normal)	5.0000	0.0900	0.4500
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250
E18 Party wall between dwellings	7.5000	0.0600	0.4500
E25 Staggered party wall between dwellings	2.5000	0.1200	0.3000
P2 Party wall - Intermediate floor within a dwelling	12.0500	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	12.0500	0.1000	1.2050
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			12.0515 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	34.2205 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 10.6670	Feb 10.5349	Mar 10.4029	Apr 9.7429	May 9.6109	Jun 8.9508	Jul 8.9508	Aug 8.8188	Sep 9.2148	Oct 9.6109	Nov 9.8749	Dec 10.1389 (38)
Heat transfer coeff	44.8874	44.7554	44.6234	43.9634	43.8313	43.1713	43.1713	43.0393	43.4353	43.8313	44.0954	44.3594 (39)
Average = Sum(39)m / 12 =												43.9303
HLP	Jan 0.8942	Feb 0.8915	Mar 0.8889	Apr 0.8758	May 0.8731	Jun 0.8600	Jul 0.8600	Aug 0.8574	Sep 0.8652	Oct 0.8731	Nov 0.8784	Dec 0.8837 (40)
HLP (average)												0.8751
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.6960 (42)
Hot water usage for mixer showers	59.2376	58.3474	57.0502	54.5681	52.7365	50.6938	49.5328	50.8202	52.2314	54.4246	56.9600	59.0107 (42a)
Hot water usage for baths	22.7669	22.4288	21.9526	21.0747	20.4173	19.6884	19.2947	19.7675	20.2823	21.0623	21.9583	22.6899 (42b)
Hot water usage for other uses	31.9986	30.8351	29.6715	28.5079	27.3443	26.1807	26.1807	27.3443	28.5079	29.6715	30.8351	31.9986 (42c)
Average daily hot water use (litres/day)												104.8133 (43)
Daily hot water use	Jan 114.0032	Feb 111.6112	Mar 108.6743	Apr 104.1507	May 100.4981	Jun 96.5629	Jul 95.0081	Aug 97.9319	Sep 101.0216	Oct 105.1584	Nov 109.7533	Dec 113.6992 (44)
Energy conte	180.5531	158.9329	167.0283	142.5771	135.2897	118.7354	114.9041	121.2602	124.5697	142.6989	156.3637	178.0255 (45)
Energy content (annual)										Total = Sum(45)m =		1740.9388
Distribution loss (46)m = 0.15 x (45)m	27.0830	23.8399	25.0542	21.3866	20.2935	17.8103	17.2356	18.1890	18.6855	21.4048	23.4546	26.7038 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	14.1899	12.8067	14.1574	13.6550	14.0813	13.5880	14.0186	14.0416	13.6118	14.0990	13.6881	14.1838 (61)
Total heat required for water heating calculated for each month	194.7430	171.7396	181.1857	156.2321	149.3710	132.3233	128.9227	135.3018	138.1815	156.7979	170.0517	192.2093 (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)
FV 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	194.7430	171.7396	181.1857	156.2321	149.3710	132.3233	128.9227	135.3018	138.1815	156.7979	170.0517	192.2093 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		1907.0598 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
												0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												
Heat gains from water heating, kWh/month	63.5814	56.0469	59.0763	50.8206	48.5042	42.8765	41.7103	43.8294	44.8224	50.9721	55.4129	62.7394 (65)

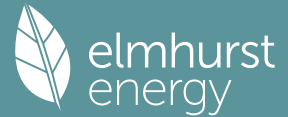
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	Jan 84.7995	Feb 84.7995	Mar 84.7995	Apr 84.7995	May 84.7995	Jun 84.7995	Jul 84.7995	Aug 84.7995	Sep 84.7995	Oct 84.7995	Nov 84.7995	Dec 84.7995 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	74.5246	82.5094	74.5246	77.0088	74.5246	77.0088	74.5246	74.5246	77.0088	74.5246	77.0088	74.5246 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	147.7534	149.2866	145.4229	137.1977	126.8147	117.0562	110.5370	109.0038	112.8674	121.0927	131.4756	141.2341 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800 (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)	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396 (71)
Water heating gains (Table 5)	85.4589	83.4031	79.4036	70.5842	65.1938	59.5507	56.0622	58.9105	62.2533	68.5109	76.9624	84.3272 (72)
Total internal gains	359.1767	366.6389	350.7910	336.2305	317.9730	302.0556	289.5636	290.8787	300.5693	315.5681	336.8867	351.5258 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	8.1600	11.2829	0.3500	0.8000	0.7700	17.8650 (75)
Southeast	2.8800	36.7938	0.3500	0.8000	0.7700	20.5617 (77)
Northwest	0.4400	11.2829	0.3500	0.8000	0.7700	0.9633 (81)

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Solar gains	39.3900	73.3498	116.9722	172.7781	218.9405	228.5362	215.6811	179.5328	136.0282	85.5461	48.3191	32.9727 (83)
Total gains	398.5667	439.9887	467.7632	509.0086	536.9134	530.5918	505.2447	470.4116	436.5975	401.1142	385.2057	384.4985 (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	60.5997	60.7785	60.9583	61.8735	62.0599	63.0087	63.0087	63.2020	62.6257	62.0599	61.6883	61.3211
alpha	5.0400	5.0519	5.0639	5.1249	5.1373	5.2006	5.2006	5.2135	5.1750	5.1373	5.1126	5.0881
util living area	0.9802	0.9661	0.9377	0.8546	0.7048	0.5122	0.3745	0.4182	0.6524	0.8856	0.9633	0.9830 (86)
MIT	20.0169	20.1902	20.4285	20.7333	20.9196	20.9875	20.9980	20.9965	20.9590	20.7230	20.3352	19.9917 (87)
Th 2	20.1725	20.1747	20.1769	20.1881	20.1904	20.2016	20.2016	20.2039	20.1971	20.1904	20.1859	20.1814 (88)
util rest of house	0.9757	0.9587	0.9242	0.8259	0.6570	0.4516	0.3073	0.3471	0.5878	0.8560	0.9540	0.9791 (89)
MIT 2	19.2862	19.4572	19.6888	19.9795	20.1369	20.1955	20.2010	20.2027	20.1745	19.9785	19.6099	19.2687 (90)
Living area fraction	19.7316	19.9040	20.1397	20.4390	20.6140	20.6783	20.6868	20.6866	20.6527	20.4323	20.0520	19.7094 (92)
Temperature adjustment	19.5816	19.7540	19.9897	20.2890	20.4640	20.5283	20.5368	20.5366	20.5027	20.2823	19.9020	-0.1500
adjusted MIT												19.5594 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9718	0.9542	0.9207	0.8298	0.6737	0.4767	0.3356	0.3770	0.6131	0.8597	0.9502	0.9755 (94)
Useful gains	387.3220	419.8373	430.6484	422.3594	361.6931	252.9097	169.5661	177.3351	267.6767	344.8470	366.0097	375.0928 (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	685.9527	664.7973	601.9557	500.6990	384.1377	255.9311	169.9569	178.0351	278.1034	424.3899	564.5084	681.3332 (97)
Space heating kWh	222.1812	164.6131	127.4526	56.4045	16.6988	0.0000	0.0000	0.0000	0.0000	59.1799	142.9190	227.8429 (98a)
Space heating requirement - total per year (kWh/year)												1017.2920
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	222.1812	164.6131	127.4526	56.4045	16.6988	0.0000	0.0000	0.0000	0.0000	59.1799	142.9190	227.8429 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1017.2920
Space heating per m2										(98c) / (4) =		20.2648 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												89.0000 (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	222.1812	164.6131	127.4526	56.4045	16.6988	0.0000	0.0000	0.0000	0.0000	59.1799	142.9190	227.8429 (98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000 (210)
Space heating fuel (main heating system)	249.6418	184.9586	143.2052	63.3758	18.7626	0.0000	0.0000	0.0000	0.0000	66.4943	160.5832	256.0032 (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	194.7430	171.7396	181.1857	156.2321	149.3710	132.3233	128.9227	135.3018	138.1815	156.7979	170.0517	192.2093 (64)
Efficiency of water heater	88.1978	88.1238	87.9941	87.7446	87.4680	87.3000	87.3000	87.3000	87.3000	87.7593	88.0682	87.3000 (216)
Fuel for water heating, kWh/month	220.8027	194.8845	205.9067	178.0533	170.7722	151.5731	147.6777	154.9849	158.2835	178.6681	193.0910	217.8899 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	15.3145	13.8324	15.3145	14.8205	15.3145	14.8205	15.3145	15.3145	14.8205	15.3145	14.8205	15.3145 (231)
Lighting	16.7457	13.4340	12.0958	8.8619	6.8452	5.5926	6.2444	8.1168	10.5429	13.8328	15.6241	17.2111 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												1143.0247 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												87.3000
Water heating fuel used												2172.5877 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.6160)												
mechanical ventilation fans (SFP = 0.6160)												94.3158 (230a)

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central heating pump	41.0000 (230c)
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	180.3158 (231)
Electricity for lighting (calculated in Appendix L)	135.1474 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	3631.0756 (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	1143.0247	0.2100	240.0352 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2172.5877	0.2100	456.2434 (264)
Space and water heating			696.2786 (265)
Pumps, fans and electric keep-hot	180.3158	0.1387	25.0120 (267)
Energy for lighting	135.1474	0.1443	19.5059 (268)
Total CO2, kg/year			740.7966 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			14.7600 (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	1143.0247	1.1300	1291.6180 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2172.5877	1.1300	2455.0241 (278)
Space and water heating			3746.6420 (279)
Pumps, fans and electric keep-hot	180.3158	1.5128	272.7817 (281)
Energy for lighting	135.1474	1.5338	207.2936 (282)
Total Primary energy kWh/year			4226.7173 (286)
Dwelling Primary energy Rate (DPER)			84.2000 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	50.2000 (1b)	x 2.5000 (2b)	= 125.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 125.5000 (5)

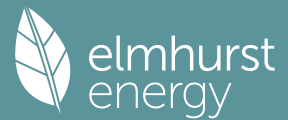
2. Ventilation rate

	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) = 0.1594 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4094 (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) = 0.3480 (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	0.4436	0.4349	0.4262	0.3828	0.3741	0.3306	0.3306	0.3219	0.3480	0.3741	0.3915	0.4089 (22b)
Effective ac	0.5984	0.5946	0.5908	0.5733	0.5700	0.5546	0.5546	0.5518	0.5605	0.5700	0.5766	0.5836 (25)

3. Heat losses and heat loss parameter

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Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opaque door			1.2000	1.0000	1.2000			(26)					
TER Opening Type (Uw = 1.20)			11.3600	1.1450	13.0076			(27)					
External Wall	41.7500	11.3600	30.3900	0.1800	5.4702			(29a)					
Corridor Wall	4.1300	1.2000	2.9300	0.1800	0.5274			(29a)					
External Roof 1	50.2000		50.2000	0.1100	5.5220			(30)					
Total net area of external elements Aum(A, m2)			96.0800					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.7272			(33)					
Party Wall 1			30.1300	0.0000	0.0000			(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							195.0717	(35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value		Total						
E2 Other lintels (including other steel lintels)				6.3000	0.0500		0.3150						
E3 Sill				5.1000	0.0500		0.2550						
E4 Jamb				18.1400	0.0500		0.9070						
E7 Party floor between dwellings (in blocks of flats)				11.5500	0.0700		0.8085						
E7 Party floor between dwellings (in blocks of flats)				1.6500	0.0700		0.1155						
E23 Balcony within or between dwellings, balcony support penetrates wall insulation				5.1500	0.0200		0.1030						
E14 Flat roof				1.6500	0.0800		0.1320						
E15 Flat roof with parapet				16.7000	0.5600		9.3520						
E16 Corner (normal)				5.0000	0.0900		0.4500						
E17 Corner (inverted - internal area greater than external area)				2.5000	-0.0900		-0.2250						
E18 Party wall between dwellings				7.5000	0.0600		0.4500						
E25 Staggered party wall between dwellings				2.5000	0.0600		0.1500						
P2 Party wall - Intermediate floor within a dwelling				12.0500	0.0000		0.0000						
P4 Party wall - Roof (insulation at ceiling level)				12.0500	0.1200		1.4460						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.2590	(36)					
Point Thermal Bridges						(36a) =	0.0000						
Total fabric heat loss						(33) + (36) + (36a) =	39.9862	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 24.7832	Feb 24.6249	Mar 24.4698	Apr 23.7412	May 23.6048	Jun 22.9702	Jul 22.9702	Aug 22.8527	Sep 23.2147	Oct 23.6048	Nov 23.8806	Dec 24.1689	(38)
Heat transfer coeff	64.7694	64.6112	64.4560	63.7274	63.5911	62.9564	62.9564	62.8389	63.2009	63.5911	63.8669	64.1552	(39)
Average = Sum(39)m / 12 =												63.7267	
HLP	Jan 1.2902	Feb 1.2871	Mar 1.2840	Apr 1.2695	May 1.2668	Jun 1.2541	Jul 1.2541	Aug 1.2518	Sep 1.2590	Oct 1.2668	Nov 1.2722	Dec 1.2780	(40)
HLP (average)												1.2695	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

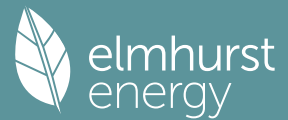
4. Water heating energy requirements (kWh/year)													

Assumed occupancy													1.6960 (42)
Hot water usage for mixer showers													
52.6557	51.8644	50.7113	48.5050	46.8769	45.0612	44.0291	45.1735	46.4279	48.3774	50.6311	52.4539	52.4539	(42a)
Hot water usage for baths													
22.7669	22.4288	21.9526	21.0747	20.4173	19.6884	19.2947	19.7675	20.2823	21.0623	21.9583	22.6899	22.6899	(42b)
Hot water usage for other uses													
31.9986	30.8351	29.6715	28.5079	27.3443	26.1807	26.1807	27.3443	28.5079	29.6715	30.8351	31.9986	31.9986	(42c)
Average daily hot water use (litres/day)													98.7449 (43)
Daily hot water use	Jan 107.4212	Feb 105.1282	Mar 102.3354	Apr 98.0876	May 94.6385	Jun 90.9303	Jul 89.5045	Aug 92.2853	Sep 95.2181	Oct 99.1112	Nov 103.4244	Dec 107.1425	(44)
Energy conte	170.1289	149.7011	157.2856	134.2770	127.4016	111.8094	108.2479	114.2684	117.4134	134.4929	147.3470	167.7593	(45)
Energy content (annual)										Total = Sum(45)m =	1640.1327		
Distribution loss (46)m = 0.15 x (45)m													
25.5193	22.4552	23.5928	20.1416	19.1102	16.7714	16.2372	17.1403	17.6120	20.1739	22.1021	25.1639	25.1639	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	48.3720	48.2267	44.8423	45.6105	47.0276	46.9569	50.5060	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
221.0878	195.7285	208.2445	182.6490	175.6283	156.6517	153.8584	161.2960	164.3703	184.9989	196.6621	218.7182	218.7182	(62)
WWHRS	-24.0720	-21.2895	-22.2931	-18.4596	-17.2036	-14.7213	-13.7989	-14.6737	-15.2312	-17.9559	-20.3419	-23.6262	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	197.0159	174.4391	185.9515	164.1894	158.4247	141.9304	140.0596	146.6223	149.1391	167.0430	176.3202	195.0920	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =	1996.2271	1996	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
												0.0000	(64a)
Heat gains from water heating, kWh/month	69.3076	61.2825	65.0372	56.7401	54.4177	48.3872	47.3951	49.7511	50.7792	57.3454	61.3217	68.5197	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	Jan 84.7995	Feb 84.7995	Mar 84.7995	Apr 84.7995	May 84.7995	Jun 84.7995	Jul 84.7995	Aug 84.7995	Sep 84.7995	Oct 84.7995	Nov 84.7995	Dec 84.7995	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	74.5105	82.4938	74.5105	76.9942	74.5105	76.9942	74.5105	74.5105	76.9942	74.5105	76.9942	74.5105	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	147.7534	149.2866	145.4229	137.1977	126.8147	117.0562	110.5370	109.0038	112.8674	121.0927	131.4756	141.2341	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	(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)	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	(71)
Water heating gains (Table 5)	93.1554	91.1942	87.4156	78.8057	73.1421	67.2044	63.7030	66.8698	70.5266	77.0771	85.1690	92.0963	(72)
Total internal gains	366.8591	374.4144	358.7889	344.4374	325.9072	309.6947	297.1904	298.8239	308.8281	324.1202	345.0786	359.2808	(73)

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6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W		
Northeast					8.0700	11.2829	0.6300	0.7000	0.7700	27.8271 (75)		
Southeast					2.8500	36.7938	0.6300	0.7000	0.7700	32.0473 (77)		
Northwest					0.4400	11.2829	0.6300	0.7000	0.7700	1.5172 (81)		
Solar gains	61.3916	114.3196	182.3068	269.2822	341.2276	356.1827	336.1476	279.8095	212.0062	133.3281	75.3080	51.3899 (83)
Total gains	428.2507	488.7340	541.0957	613.7196	667.1348	665.8775	633.3380	578.6334	520.8344	457.4483	420.3866	410.6707 (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	41.9977	42.1006	42.2019	42.6844	42.7759	43.2071	43.2071	43.2879	43.0400	42.7759	42.5912	42.3998
alpha	3.7998	3.8067	3.8135	3.8456	3.8517	3.8805	3.8805	3.8859	3.8693	3.8517	3.8394	3.8267
util living area	0.9819	0.9693	0.9436	0.8732	0.7436	0.5679	0.4273	0.4821	0.7189	0.9105	0.9693	0.9844 (86)
MIT	19.3427	19.5789	19.9356	20.4078	20.7598	20.9374	20.9838	20.9745	20.8444	20.3831	19.7915	19.3072 (87)
Th 2	19.8485	19.8510	19.8534	19.8648	19.8670	19.8770	19.8770	19.8788	19.8731	19.8670	19.8626	19.8581 (88)
util rest of house	0.9773	0.9616	0.9292	0.8417	0.6850	0.4815	0.3229	0.3724	0.6362	0.8808	0.9603	0.9805 (89)
MIT 2	17.9554	18.2544	18.7005	19.2762	19.6654	19.8394	19.8711	19.8687	19.7647	19.2644	18.5341	17.9169 (90)
Living area fraction	18.8010	19.0618	19.4533	19.9660	20.3325	20.5087	20.5494	20.5427	20.4228	19.9463	19.3005	18.7644 (92)
MIT	18.8010	19.0618	19.4533	19.9660	20.3325	20.5087	20.5494	20.5427	20.4228	19.9463	19.3005	18.7644 (92)
Temperature adjustment	18.8010	19.0618	19.4533	19.9660	20.3325	20.5087	20.5494	20.5427	20.4228	19.9463	19.3005	18.7644 (93)
adjusted MIT	18.8010	19.0618	19.4533	19.9660	20.3325	20.5087	20.5494	20.5427	20.4228	19.9463	19.3005	18.7644 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9718	0.9550	0.9232	0.8448	0.7104	0.5313	0.3862	0.4386	0.6789	0.8832	0.9546	0.9754 (94)
Useful gains	416.1880	466.7338	499.5192	518.4921	473.9318	353.7841	244.5846	253.7659	353.5708	404.0025	401.3154	400.5753 (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	939.2229	915.0076	834.9209	705.2059	548.9496	371.9889	248.6385	260.3253	399.6081	594.3429	779.2106	934.3794 (97)
Space heating kWh	389.1380	301.2400	249.5388	134.4339	55.8132	0.0000	0.0000	0.0000	0.0000	141.6132	272.0846	397.1503 (98a)
Space heating requirement - total per year (kWh/year)												1941.0120
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	389.1380	301.2400	249.5388	134.4339	55.8132	0.0000	0.0000	0.0000	0.0000	141.6132	272.0846	397.1503 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1941.0120
Space heating per m2										(98c) / (4) =		38.6656 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.4000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	389.1380	301.2400	249.5388	134.4339	55.8132	0.0000	0.0000	0.0000	0.0000	141.6132	272.0846	397.1503 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	421.1450	326.0174	270.0637	145.4913	60.4039	0.0000	0.0000	0.0000	0.0000	153.2611	294.4638	429.8163 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	197.0159	174.4391	185.9515	164.1894	158.4247	141.9304	140.0596	146.6223	149.1391	167.0430	176.3202	195.0920 (64)
Efficiency of water heater	85.8110	85.5404	85.0124	83.9562	82.3761	80.3000	80.3000	80.3000	80.3000	84.0296	85.3075	80.3000 (216)
Fuel for water heating, kWh/month	229.5927	203.9259	218.7346	195.5655	192.3189	176.7502	174.4204	182.5931	185.7274	198.7907	206.6879	85.8705 (217)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	227.1932 (219)
(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	15.4818	12.4201	11.1829	8.1931	6.3286	5.1705	5.7731	7.5041	9.7471	12.7888	14.4449	15.9121 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-17.2829	-25.2631	-37.6486	-43.9602	-48.8501	-46.1586	-45.6243	-42.3693	-36.8488	-29.6357	-19.3274	-14.8414 (233a)
(233a)m	-17.2829	-25.2631	-37.6486	-43.9602	-48.8501	-46.1586	-45.6243	-42.3693	-36.8488	-29.6357	-19.3274	-14.8414 (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)
(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)	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)
(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)	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)
(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)	-7.2180	-15.4164	-31.0650	-47.2705	-63.0850	-63.5674	-62.7891	-52.8732	-38.3940	-22.2155	-9.6942	-5.6884 (233b)
(233b)m	-7.2180	-15.4164	-31.0650	-47.2705	-63.0850	-63.5674	-62.7891	-52.8732	-38.3940	-22.2155	-9.6942	-5.6884 (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)
(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)

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Electricity generated by hydro-electric generators (Appendix M) (negative quantity)										
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)										
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year										
Space heating fuel - main system 1										2100.6624 (211)
Space heating fuel - main system 2										0.0000 (213)
Space heating fuel - secondary										0.0000 (215)
Efficiency of water heater										80.3000
Water heating fuel used										2392.3006 (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)										124.9471 (232)
Energy saving/generation technologies (Appendices M ,N and Q)										
PV generation										-827.0869 (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										3876.8231 (238)

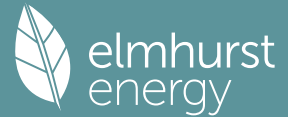
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2100.6624	0.2100	441.1391 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2392.3006	0.2100	502.3831 (264)
Space and water heating			943.5222 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	124.9471	0.1443	18.0337 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-407.8103	0.1338	-54.5662
PV Unit electricity exported	-419.2766	0.1255	-52.6305
Total			-107.1968 (269)
Total CO2, kg/year			866.2884 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			17.2600 (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	2100.6624	1.1300	2373.7485 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2392.3006	1.1300	2703.2996 (278)
Space and water heating			5077.0481 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	124.9471	1.5338	191.6480 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-407.8103	1.4945	-609.4598
PV Unit electricity exported	-419.2766	0.4608	-193.1834
Total			-802.6431 (283)
Total Primary energy kWh/year			4596.1538 (286)
Target Primary Energy Rate (TPER)			91.5600 (287)

Full SAP Calculation Printout



Property Reference	2B3P GF - Corner_Be Lean				Issued on Date	30/08/2024	
Assessment Reference	2B3P - GF - Corner_Copy			Prop Type Ref			
Property	Corner Pavillion, 2B3P GF, Edmansons Close, Tottenham, N17 6XD						
SAP Rating	83 B	DER	16.36	TER	15.02		
Environmental	88 B	% DER < TER				-8.92	
CO ₂ Emissions (t/year)	0.86	DFEE	49.55	TFEE	45.26		
Compliance Check	See BREL	% DFEE < TFEE				-9.49	
% DPER < TPER	-17.42	DPER	92.72	TPER	78.96		
Assessor Details	Miss Eleanor Ballinger				Assessor ID	M976-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	60.8500 (1b)	2.5000 (2b)	152.1250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.8500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	152.1250 (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)

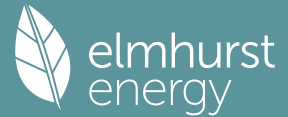
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	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) =												81.0000 (23c)
Effective ac	0.2576	0.2544	0.2512	0.2352	0.2321	0.2161	0.2161	0.2129	0.2225	0.2321	0.2384	0.2448 (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
Door to corridor			1.2000	1.0000	1.2000		(26)
Window (Uw = 0.90)			19.5800	0.8687	17.0097		(27)
Ground Floor			60.8500	0.1300	7.9105	75.0000	4563.7500 (28a)
External Wall	69.7500	19.5800	50.1700	0.1800	9.0306	60.0000	3010.2000 (29a)
Corridor Wall	19.3800	1.2000	18.1800	0.1800	3.2724	60.0000	1090.7999 (29a)
Total net area of external elements Aum(A, m ²)			149.9800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	38.4232		(33)
Party Ceilings 1			60.8500			30.0000	1825.5000 (32b)
Internal Wall 1			100.0000			900.0000	900.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	11390.2499 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							187.1857 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				9.3600	0.1500	1.4040	

elmhurst
energy

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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	45.8495	45.9560	46.0631	46.6060	46.7161	47.2746	47.2746	47.3879	47.0496	46.7161	46.4964	46.2787	
alpha	4.0566	4.0637	4.0709	4.1071	4.1144	4.1516	4.1516	4.1592	4.1366	4.1144	4.0998	4.0852	
util living area	0.9821	0.9681	0.9404	0.8654	0.7298	0.5491	0.4090	0.4603	0.6972	0.9037	0.9686	0.9848 (86)	
MIT	19.5157	19.7499	20.0828	20.5111	20.8143	20.9568	20.9899	20.9838	20.8860	20.4845	19.9339	19.4779 (87)	
Th 2	19.9731	19.9752	19.9774	19.9881	19.9902	20.0009	20.0009	20.0031	19.9966	19.9902	19.9859	19.9817 (88)	
util rest of house	0.9778	0.9607	0.9265	0.8353	0.6757	0.4727	0.3191	0.3656	0.6216	0.8749	0.9600	0.9811 (89)	
MIT 2	18.6406	18.8718	19.1963	19.6051	19.8664	19.9798	19.9979	19.9977	19.9331	19.5929	19.0635	18.6098 (90)	
Living area fraction									fLA = Living area / (4) =				0.4026 (91)
MIT	18.9929	19.2254	19.5533	19.9699	20.2481	20.3732	20.3973	20.3947	20.3168	19.9519	19.4139	18.9593 (92)	
Temperature adjustment												-0.1500	
adjusted MIT	18.8429	19.0754	19.4033	19.8199	20.0981	20.2232	20.2473	20.2447	20.1668	19.8019	19.2639	18.8093 (93)	

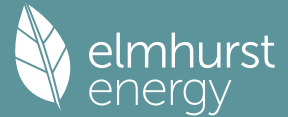
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9716	0.9525	0.9171	0.8296	0.6819	0.4903	0.3417	0.3891	0.6353	0.8685	0.9522	0.9756 (94)
Useful gains	474.5774	533.4619	566.3168	575.9694	510.2511	365.0558	242.1803	253.4426	376.0649	453.4523	456.5099	456.0481 (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	1003.5727	975.9375	886.2924	741.3238	568.7780	376.3440	244.1029	256.7031	407.9744	623.2192	827.7233	998.8030 (97)
Space heating kWh	393.5725	297.3436	238.0619	119.0552	43.5441	0.0000	0.0000	0.0000	0.0000	126.3066	267.2737	403.8097 (98a)
Space heating requirement - total per year (kWh/year)												1888.9672
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	393.5725	297.3436	238.0619	119.0552	43.5441	0.0000	0.0000	0.0000	0.0000	126.3066	267.2737	403.8097 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1888.9672
Space heating per m2										(98c) / (4) =		31.0430 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													89.0000 (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	393.5725	297.3436	238.0619	119.0552	43.5441	0.0000	0.0000	0.0000	0.0000	126.3066	267.2737	403.8097 (98)	
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000 (210)	
Space heating fuel (main heating system)	442.2163	334.0940	267.4852	133.7699	48.9259	0.0000	0.0000	0.0000	0.0000	141.9175	300.3075	453.7187 (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	212.5901	187.4492	197.6951	170.3247	162.7431	144.0689	140.2938	147.2937	150.4948	170.9033	185.5078	209.8067 (64)	
Efficiency of water heater	88.3963	88.3349	88.2206	87.9915	87.6534	87.3000	87.3000	87.3000	87.3000	88.0145	88.2956	87.3000 (216)	
Fuel for water heating, kWh/month	240.4967	212.2029	224.0917	193.5696	185.6666	165.0274	160.7031	168.7214	172.3881	194.1764	210.0987	237.3074 (219)	
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)	
Pumps and Fa	17.3607	15.6806	17.3607	16.8007	17.3607	16.8007	17.3607	17.3607	16.8007	17.3607	16.8007	17.3607 (231)	
Lighting	21.1974	17.0054	15.3115	11.2178	8.6650	7.0794	7.9045	10.2745	13.3456	17.5102	19.7777	21.7866 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)	
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)	
Annual totals kWh/year													
Space heating fuel - main system 1													2122.4350 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													87.3000
Water heating fuel used													2364.4500 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.6380)													
mechanical ventilation fans (SFP = 0.6380)													118.4080 (230a)
central heating pump													41.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													204.4080 (231)
Electricity for lighting (calculated in Appendix L)													171.0755 (232)

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

PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	4862.3685 (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	2122.4350	0.2100	445.7114 (261)
Total CO2 associated with community systems			0.0000 (273)
Water heating (other fuel)	2364.4500	0.2100	496.5345 (264)
Space and water heating			942.2459 (265)
Pumps, fans and electric keep-hot	204.4080	0.1387	28.3539 (267)
Energy for lighting	171.0755	0.1443	24.6915 (268)
Total CO2, kg/year			995.2912 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			16.3600 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2122.4350	1.1300	2398.3516 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2364.4500	1.1300	2671.8285 (278)
Space and water heating			5070.1801 (279)
Pumps, fans and electric keep-hot	204.4080	1.5128	309.2284 (281)
Energy for lighting	171.0755	1.5338	262.4013 (282)
Total Primary energy kWh/year			5641.8098 (286)
Dwelling Primary energy Rate (DPER)			92.7200 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	60.8500 (1b)	x 2.5000 (2b)	= 152.1250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.8500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 152.1250 (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)

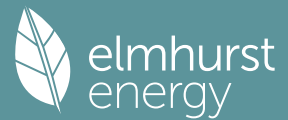
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1315 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3815	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3243 (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	0.4134	0.4053	0.3972	0.3567	0.3486	0.3080	0.3080	0.2999	0.3243	0.3486	0.3648	0.3810 (22b)
Effective ac	0.5855	0.5821	0.5789	0.5636	0.5608	0.5474	0.5474	0.5450	0.5526	0.5608	0.5665	0.5726 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opaque door			1.2000	1.0000	1.2000		(26)

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TER Opening Type (Uw = 1.20)			14.0300	1.1450	16.0649	(27)
Ground Floor			60.8500	0.1300	7.9105	(28a)
External Wall	69.7500	14.0300	55.7200	0.1800	10.0296	(29a)
Corridor Wall	19.3800	1.2000	18.1800	0.1800	3.2724	(29a)
Total net area of external elements Aum(A, m2)			149.9800			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	38.4774		(33)

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

197.1857 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	9.3600	0.0500	0.4680
E3 Sill	8.1600	0.0500	0.4080
E4 Jamb	35.6000	0.0500	1.7800
E5 Ground floor (normal)	27.9000	0.1600	4.4640
E5 Ground floor (normal)	7.7500	0.1600	1.2400
E7 Party floor between dwellings (in blocks of flats)	22.4000	0.0700	1.5680
E7 Party floor between dwellings (in blocks of flats)	7.7500	0.0700	0.5425
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	11.0000	0.0200	0.2200
E16 Corner (normal)	15.0000	0.0900	1.3500
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			11.8155 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 50.2929 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.3907	29.2241	29.0608	28.2939	28.1504	27.4824	27.4824	27.3586	27.7397	28.1504	28.4407	28.7441	(38)
Heat transfer coeff	79.6836	79.5170	79.3537	78.5867	78.4432	77.7752	77.7752	77.6515	78.0325	78.4432	78.7335	79.0370	(39)
Average = Sum(39)m / 12 =												78.5861	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3095	1.3068	1.3041	1.2915	1.2891	1.2781	1.2781	1.2761	1.2824	1.2891	1.2939	1.2989	(40)
HLP (average)												1.2915	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.0056 (42)
Hot water usage for mixer showers	57.8463	56.9770	55.7102	53.2865	51.4978	49.5031	48.3693	49.6265	51.0046	53.1463	55.6221	57.6246	(42a)
Hot water usage for baths	24.9990	24.6277	24.1049	23.1409	22.4191	21.6187	21.1864	21.7055	22.2708	23.1273	24.1111	24.9145	(42b)
Hot water usage for other uses	35.1690	33.8901	32.6112	31.3324	30.0535	28.7746	28.7746	30.0535	31.3324	32.6112	33.8901	35.1690	(42c)
Average daily hot water use (litres/day)												108.4821	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	118.0143	115.4948	112.4263	107.7597	103.9704	99.8964	98.3303	101.3855	104.6078	108.8848	113.6233	117.7081	(44)
Energy content (annual)	186.9057	164.4630	172.7951	147.5177	139.9641	122.8343	118.9220	125.5365	128.9919	147.7556	161.8772	184.3024	(45)
Distribution loss (46)m = 0.15 x (45)m	28.0359	24.6695	25.9193	22.1277	20.9946	18.4251	17.8383	18.8305	19.3488	22.1633	24.2816	27.6454	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.2640	50.1081	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	237.8646	210.4904	223.7540	196.8328	190.9230	172.0983	169.0300	176.4954	178.3069	198.7145	211.1923	235.2613	(62)
WWHRS	-26.4449	-23.3881	-24.4907	-20.2792	-18.8995	-16.1724	-15.1591	-16.1202	-16.7326	-19.7259	-22.3471	-25.9552	(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	211.4197	187.1024	199.2633	176.5535	172.0235	155.9259	153.8710	160.3752	161.5743	178.9886	188.8452	209.3062	(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)

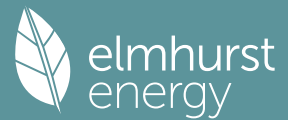
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	100.2781	100.2781	100.2781	100.2781	100.2781	100.2781	100.2781	100.2781	100.2781	100.2781	100.2781	100.2781	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	88.3105	97.7723	88.3105	91.2542	88.3105	91.2542	88.3105	88.3105	91.2542	88.3105	91.2542	88.3105	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	175.0855	176.9023	172.3239	162.5771	150.2735	138.7098	130.9846	129.1678	133.7461	143.4929	155.7966	167.3602	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.0278	33.0278	33.0278	33.0278	33.0278	33.0278	33.0278	33.0278	33.0278	33.0278	33.0278	33.0278	(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)	-80.2225	-80.2225	-80.2225	-80.2225	-80.2225	-80.2225	-80.2225	-80.2225	-80.2225	-80.2225	-80.2225	-80.2225	(71)
Water heating gains (Table 5)	100.6531	98.4982	94.3469	85.2478	79.6745	73.8311	69.9846	73.2266	76.6924	83.1566	91.8791	99.4896	(72)
Total internal gains	420.1325	429.2563	411.0648	395.1625	374.3419	356.8786	342.3632	343.7883	354.7762	371.0434	395.0133	411.2438	(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			5.9400		11.2829		0.6300		0.7000		0.7700		20.4824 (75)
Southeast			0.8600		36.7938		0.6300		0.7000		0.7700		9.6704 (77)
Southwest			3.8600		36.7938		0.6300		0.7000		0.7700		43.4044 (79)
Northwest			3.3700		11.2829		0.6300		0.7000		0.7700		11.6205 (81)

Solar gains	85.1777	155.7524	241.4309	346.6192	431.5750	447.5147	423.5198	357.2249	277.3982	179.7764	103.9652	71.6378 (83)
Total gains	505.3102	585.0087	652.4956	741.7817	805.9169	804.3932	765.8829	701.0132	632.1744	550.8198	498.9784	482.8816 (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	41.8278	41.9154	42.0016	42.4116	42.4891	42.8541	42.8541	42.9223	42.7128	42.4891	42.3325	42.1699	
alpha	3.7885	3.7944	3.8001	3.8274	3.8326	3.8569	3.8569	3.8615	3.8475	3.8326	3.8222	3.8113	
util living area	0.9840	0.9715	0.9463	0.8783	0.7519	0.5778	0.4355	0.4903	0.7257	0.9152	0.9723	0.9864 (86)	
MIT	19.2967	19.5444	19.9092	20.3858	20.7463	20.9321	20.9822	20.9723	20.8363	20.3603	19.7509	19.2560 (87)	
Th 2	19.8334	19.8355	19.8376	19.8475	19.8494	19.8580	19.8580	19.8596	19.8547	19.8494	19.8456	19.8417 (88)	
util rest of house	0.9799	0.9642	0.9323	0.8472	0.6930	0.4893	0.3277	0.3773	0.6421	0.8862	0.9640	0.9829 (89)	
MIT 2	17.8860	18.1995	18.6561	19.2370	19.6367	19.8174	19.8517	19.8487	19.7410	19.2241	18.4709	17.8399 (90)	
Living area fraction									FLA = Living area / (4) =				0.4026 (91)
MIT	18.4540	18.7410	19.1607	19.6996	20.0835	20.2662	20.3069	20.3011	20.1820	19.6815	18.9863	18.4101 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.4540	18.7410	19.1607	19.6996	20.0835	20.2662	20.3069	20.3011	20.1820	19.6815	18.9863	18.4101 (93)	

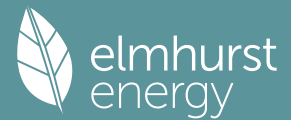
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9731	0.9553	0.9222	0.8426	0.7059	0.5222	0.3710	0.4223	0.6680	0.8811	0.9557	0.9768 (94)
Useful gains	491.7006	558.8313	601.7421	625.0054	568.9145	420.0152	284.1151	296.0720	422.3132	485.3024	476.8600	471.6582 (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	1127.8417	1100.5933	1004.6704	848.7029	657.6252	440.6918	288.3028	302.9255	474.5947	712.3843	935.8475	1123.1214 (97)
Space heating kWh	473.2890	364.0640	299.7787	161.0622	66.0008	0.0000	0.0000	0.0000	0.0000	168.9489	330.4710	484.6886 (98a)
Space heating requirement - total per year (kWh/year)												2348.3032
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	473.2890	364.0640	299.7787	161.0622	66.0008	0.0000	0.0000	0.0000	0.0000	168.9489	330.4710	484.6886 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2348.3032
Space heating per m2										(98c) / (4) =		38.5917 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.4000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	473.2890	364.0640	299.7787	161.0622	66.0008	0.0000	0.0000	0.0000	0.0000	168.9489	330.4710	484.6886 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	512.2175	394.0087	324.4358	174.3097	71.4295	0.0000	0.0000	0.0000	0.0000	182.8452	357.6526	524.5547 (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	211.4197	187.1024	199.2633	176.5535	172.0235	155.9259	153.8710	160.3752	161.5743	178.9886	188.8452	209.3062 (64)
Efficiency of water heater (217)m	86.0543	85.7813	85.2542	84.1851	82.5133	80.3000	80.3000	80.3000	80.3000	84.2579	85.5675	86.1183 (216)
Fuel for water heating, kWh/month	245.6819	218.1155	233.7284	209.7206	208.4796	194.1791	191.6201	199.7200	201.2133	212.4295	220.6973	243.0448 (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	18.3492	14.7204	13.2541	9.7105	7.5007	6.1281	6.8424	8.8940	11.5524	15.1574	17.1202	18.8592 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-28.7586	-40.6992	-58.7409	-66.3529	-71.8440	-67.2009	-66.3979	-62.5478	-55.7820	-46.6998	-31.6817	-24.8477 (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)	-15.7896	-33.2654	-66.1961	-99.5251	-131.6793	-132.3059	-130.7223	-110.6247	-81.0266	-47.5774	-21.0861	-12.4802 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												2541.4537 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)

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Efficiency of water heater	80.3000	
Water heating fuel used	2578.6303	(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)	148.0884	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1503.8318	(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	3850.3405	(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	2541.4537	0.2100	533.7053 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2578.6303	0.2100	541.5124 (264)
Space and water heating			1075.2176 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	148.0884	0.1443	21.3737 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-621.5532	0.1345	-83.5890
PV Unit electricity exported	-882.2786	0.1259	-111.0532
Total			-194.6422 (269)
Total CO2, kg/year			913.8784 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.0200 (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	2541.4537	1.1300	2871.8427 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2578.6303	1.1300	2913.8522 (278)
Space and water heating			5785.6949 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	148.0884	1.5338	227.1429 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-621.5532	1.4970	-930.4805
PV Unit electricity exported	-882.2786	0.4620	-407.6411
Total			-1338.1216 (283)
Total Primary energy kWh/year			4804.8170 (286)
Target Primary Energy Rate (TPER)			78.9600 (287)

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Property Reference	2B3P TF - Corner_Be Lean				Issued on Date	30/08/2024
Assessment Reference	2B3P - TF - Corner_Copy	Prop Type Ref				
Property	Corner Pavillion, 2B3P TF, Edmansons Close, Tottenham, N17 6XD					
SAP Rating	83 B	DER	15.65	TER	16.23	
Environmental	88 B	% DER < TER				3.57
CO ₂ Emissions (t/year)	0.82	DFEE	46.64	TFEE	50.83	
Compliance Check	See BREL	% DFEE < TFEE				8.26
% DPER < TPER	-3.99	DPER	88.92	TPER	85.51	
Assessor Details	Miss Eleanor Ballinger				Assessor ID	M976-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	60.8500 (1b)	2.5000 (2b)	152.1250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.8500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	152.1250 (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)

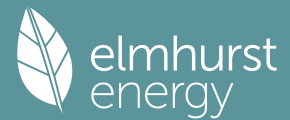
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	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) =												81.0000 (23c)
Effective ac	0.2576	0.2544	0.2512	0.2352	0.2321	0.2161	0.2161	0.2129	0.2225	0.2321	0.2384	0.2448 (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
Door to corridor			1.2000	1.0000	1.2000		(26)
Window (Uw = 0.90)			19.5800	0.8687	17.0097		(27)
External Wall	69.7500	19.5800	50.1700	0.1800	9.0306	60.0000	3010.2000 (29a)
Corridor Wall		1.2000	18.1800	0.1800	3.2724	60.0000	1090.7999 (29a)
Main Roof	60.8500		60.8500	0.1000	6.0850	80.0000	4868.0000 (30)
Total net area of external elements Aum(A, m ²)			149.9800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.5977		(33)
Party Floor 1			60.8500			40.0000	2434.0000 (32d)
Internal Wall 1			100.0000			900.0000	(32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	12302.9999 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							202.1857 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				9.3600	0.1500	1.4040	

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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	50.3662	50.4853	50.6049	51.2116	51.3347	51.9592	51.9592	52.0859	51.7076	51.3347	51.0891	50.8459
alpha	4.3577	4.3657	4.3737	4.4141	4.4223	4.4639	4.4639	4.4724	4.4472	4.4223	4.4059	4.3897
util living area	0.9821	0.9649	0.9325	0.8513	0.7125	0.5312	0.3909	0.4340	0.6607	0.8873	0.9664	0.9852 (86)
MIT	19.6897	19.9362	20.2483	20.6189	20.8638	20.9714	20.9941	20.9908	20.9265	20.6009	20.0860	19.6479 (87)
Th 2	19.9885	19.9907	19.9928	20.0035	20.0057	20.0165	20.0165	20.0186	20.0122	20.0057	20.0014	19.9971 (88)
util rest of house	0.9776	0.9565	0.9165	0.8184	0.6569	0.4563	0.3054	0.3444	0.5841	0.8541	0.9568	0.9815 (89)
MIT 2	18.8169	19.0592	19.3612	19.7113	19.9176	20.0031	20.0148	20.0158	19.9733	19.7063	19.2173	18.7824 (90)
Living area fraction									fLA = Living area / (4) =			0.4026 (91)
MIT	19.1683	19.4123	19.7184	20.0767	20.2986	20.3930	20.4091	20.4083	20.3571	20.0665	19.5671	19.1309 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.0183	19.2623	19.5684	19.9267	20.1486	20.2430	20.2591	20.2583	20.2071	19.9165	19.4171	18.9809 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9720	0.9490	0.9085	0.8156	0.6653	0.4740	0.3267	0.3666	0.6001	0.8507	0.9498	0.9765 (94)
Useful gains	501.3466	571.8278	604.2095	599.6899	517.6013	363.5054	239.5482	251.2930	382.4709	481.6837	485.7474	479.7797 (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	998.6814	972.2281	882.5459	735.8447	562.4467	371.1560	240.6696	253.1566	403.6371	620.2251	823.9255	993.4674 (97)
Space heating kWh	370.0171	269.0690	207.0823	98.0314	33.3650	0.0000	0.0000	0.0000	0.0000	103.0748	243.4882	382.1837 (98a)
Space heating requirement - total per year (kWh/year)												1706.3115
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	370.0171	269.0690	207.0823	98.0314	33.3650	0.0000	0.0000	0.0000	0.0000	103.0748	243.4882	382.1837 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1706.3115
Space heating per m2										(98c) / (4) =		28.0413 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													89.0000 (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	370.0171	269.0690	207.0823	98.0314	33.3650	0.0000	0.0000	0.0000	0.0000	103.0748	243.4882	382.1837 (98)	
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000 (210)	
Space heating fuel (main heating system)	415.7495	302.3247	232.6767	110.1477	37.4887	0.0000	0.0000	0.0000	0.0000	115.8144	273.5823	429.4198 (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	212.5901	187.4492	197.6951	170.3247	162.7431	144.0689	140.2938	147.2937	150.4948	170.9033	185.5078	209.8067 (64)	
Efficiency of water heater	88.3721	88.2940	88.1615	87.9134	87.5846	87.3000	87.3000	87.3000	87.3000	87.9319	88.2568	88.3900 (216)	
Fuel for water heating, kWh/month	240.5626	212.3011	224.2419	193.7414	185.8124	165.0274	160.7031	168.7214	172.3881	194.3588	210.1909	237.3648 (219)	
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)	
Pumps and Fa	17.3607	15.6806	17.3607	16.8007	17.3607	16.8007	17.3607	17.3607	16.8007	17.3607	16.8007	17.3607 (231)	
Lighting	21.1974	17.0054	15.3115	11.2178	8.6650	7.0794	7.9045	10.2745	13.3456	17.5102	19.7777	21.7866 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)	
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)	
Annual totals kWh/year													
Space heating fuel - main system 1													1917.2039 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													87.3000
Water heating fuel used													2365.4139 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.6380)													
mechanical ventilation fans (SFP = 0.6380)													118.4080 (230a)
central heating pump													41.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													204.4080 (231)
Electricity for lighting (calculated in Appendix L)													171.0755 (232)

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

PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	4658.1013 (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	1917.2039	0.2100	402.6128 (261)
Total CO2 associated with community systems			0.0000 (273)
Water heating (other fuel)	2365.4139	0.2100	496.7369 (264)
Space and water heating			899.3497 (265)
Pumps, fans and electric keep-hot	204.4080	0.1387	28.3539 (267)
Energy for lighting	171.0755	0.1443	24.6915 (268)
Total CO2, kg/year			952.3951 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			15.6500 (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	1917.2039	1.1300	2166.4404 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2365.4139	1.1300	2672.9177 (278)
Space and water heating			4839.3581 (279)
Pumps, fans and electric keep-hot	204.4080	1.5128	309.2284 (281)
Energy for lighting	171.0755	1.5338	262.4013 (282)
Total Primary energy kWh/year			5410.9879 (286)
Dwelling Primary energy Rate (DPER)			88.9200 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	60.8500 (1b)	x 2.5000 (2b)	= 152.1250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.8500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 152.1250 (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) =	0.1315 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3815	(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) =	0.3243 (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	0.4134	0.4053	0.3972	0.3567	0.3486	0.3080	0.3080	0.2999	0.3243	0.3486	0.3648	0.3810 (22b)
Effective ac	0.5855	0.5821	0.5789	0.5636	0.5608	0.5474	0.5474	0.5450	0.5526	0.5608	0.5665	0.5726 (25)

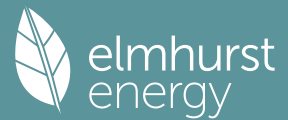
3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opaque door			1.2000	1.0000	1.2000		(26)

elmhurst
energy

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	1.9800	11.2829	0.6300	0.7000	0.7700	6.8275 (75)
Southeast	0.8600	36.7938	0.6300	0.7000	0.7700	9.6704 (77)
Southwest	7.8200	36.7938	0.6300	0.7000	0.7700	87.9333 (79)
Northwest	3.3700	11.2829	0.6300	0.7000	0.7700	11.6205 (81)

Solar gains	116.0517	203.8066	295.1333	392.9658	465.0556	472.6458	451.1227	395.6660	328.7497	229.6382	140.1191	98.5940 (83)
Total gains	536.1842	633.0630	706.1981	788.1283	839.3975	829.5243	793.4859	739.4543	683.5259	600.6817	535.1324	509.8378 (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	38.4435	38.5157	38.5867	38.9238	38.9875	39.2869	39.2869	39.3429	39.1711	38.9875	38.8588	38.7252
alpha	3.5629	3.5677	3.5724	3.5949	3.5992	3.6191	3.6191	3.6229	3.6114	3.5992	3.5906	3.5817
util living area	0.9829	0.9687	0.9432	0.8818	0.7710	0.6092	0.4639	0.5120	0.7309	0.9109	0.9704	0.9856 (86)
MIT	19.1369	19.4128	19.7960	20.2825	20.6717	20.8994	20.9713	20.9589	20.7997	20.2880	19.6276	19.0889 (87)
Th 2	19.7169	19.7190	19.7210	19.7306	19.7324	19.7407	19.7407	19.7423	19.7375	19.7324	19.7288	19.7250 (88)
util rest of house	0.9782	0.9604	0.9277	0.8492	0.7093	0.5109	0.3395	0.3845	0.6408	0.8789	0.9610	0.9816 (89)
MIT 2	17.6047	17.9531	18.4318	19.0249	19.4598	19.6820	19.7312	19.7271	19.6024	19.0490	18.2351	17.5492 (90)
Living area fraction	18.2216	18.5409	18.9810	19.5312	19.9478	20.1722	20.2305	20.2231	20.0845	19.5479	18.7957	0.4026 (91)
MIT	18.2216	18.5409	18.9810	19.5312	19.9478	20.1722	20.2305	20.2231	20.0845	19.5479	18.7957	18.1691 (92)
Temperature adjustment												0.0000
adjusted MIT	18.2216	18.5409	18.9810	19.5312	19.9478	20.1722	20.2305	20.2231	20.0845	19.5479	18.7957	18.1691 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9706	0.9502	0.9164	0.8432	0.7208	0.5464	0.3893	0.4351	0.6680	0.8732	0.9517	0.9747 (94)
Useful gains	520.4043	601.5244	647.1302	664.5689	605.0328	453.2618	308.9364	321.7696	456.5893	524.5004	509.2678	496.9578 (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	1237.5859	1210.3533	1105.4045	933.4209	722.9671	484.7136	315.8097	332.0897	522.1186	784.3374	1028.5985	1232.7767 (97)
Space heating kWh	533.5831	409.1331	340.9560	193.5734	87.7431	0.0000	0.0000	0.0000	0.0000	193.3187	373.9181	547.4493 (98a)
Space heating requirement - total per year (kWh/year)												2679.6747
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	533.5831	409.1331	340.9560	193.5734	87.7431	0.0000	0.0000	0.0000	0.0000	193.3187	373.9181	547.4493 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2679.6747
Space heating per m2										(98c) / (4) =		44.0374 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.4000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	533.5831	409.1331	340.9560	193.5734	87.7431	0.0000	0.0000	0.0000	0.0000	193.3187	373.9181	547.4493 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	577.4709	442.7847	369.0000	209.4951	94.9601	0.0000	0.0000	0.0000	0.0000	209.2193	404.6732	592.4775 (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	211.4197	187.1024	199.2633	176.5535	172.0235	155.9259	153.8710	160.3752	161.5743	178.9886	188.8452	209.3062 (64)
Efficiency of water heater (217)m	86.2778	86.0094	85.5216	84.5791	83.0125	80.3000	80.3000	80.3000	80.3000	84.5468	85.8159	86.3424 (217)
Fuel for water heating, kWh/month	245.0454	217.5371	232.9978	208.7436	207.2260	194.1791	191.6201	199.7200	201.2133	211.7035	220.0586	242.4141 (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	18.3492	14.7204	13.2541	9.7105	7.5007	6.1281	6.8424	8.8940	11.5524	15.1574	17.1202	18.8592 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-28.7586	-40.6992	-58.7409	-66.3529	-71.8440	-67.2009	-66.3979	-62.5478	-55.7820	-46.6998	-31.6817	-24.8477 (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)	-15.7896	-33.2654	-66.1961	-99.5251	-131.6793	-132.3059	-130.7223	-110.6247	-81.0266	-47.5774	-21.0861	-12.4802 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												2900.0809 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)

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Efficiency of water heater	80.3000	
Water heating fuel used	2572.4588	(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)	148.0884	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1503.8318	(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	4202.7962	(238)

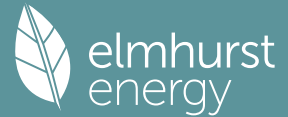
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2900.0809	0.2100	609.0170 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2572.4588	0.2100	540.2163 (264)
Space and water heating			1149.2333 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	148.0884	0.1443	21.3737 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-621.5532	0.1345	-83.5890
PV Unit electricity exported	-882.2786	0.1259	-111.0532
Total			-194.6422 (269)
Total CO2, kg/year			987.8941 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.2300 (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	2900.0809	1.1300	3277.0914 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2572.4588	1.1300	2906.8784 (278)
Space and water heating			6183.9698 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	148.0884	1.5338	227.1429 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-621.5532	1.4970	-930.4805
PV Unit electricity exported	-882.2786	0.4620	-407.6411
Total			-1338.1216 (283)
Total Primary energy kWh/year			5203.0919 (286)
Target Primary Energy Rate (TPER)			85.5100 (287)

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Property Reference	House Type 5 - NEW_Be Lean				Issued on Date	30/08/2024
Assessment Reference	House Type 5 Det Baseline	Prop Type Ref				
Property	House Type 5, Edmansons Close, Tottenham, N17 6XD					
SAP Rating	85 B	DER	12.93	TER	11.51	
Environmental	88 B	% DER < TER				-12.34
CO ₂ Emissions (t/year)	1.15	DFEE	44.54	TFEE	44.88	
Compliance Check	See BREL	% DFEE < TFEE				0.75
% DPER < TPER	-22.14	DPER	73.69	TPER	60.33	
Assessor Details	Miss Eleanor Ballinger				Assessor ID	M976-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	62.0500 (1b)	x 2.4000 (2b)	= 148.9200 (1b) - (3b)
First floor	42.7500 (1c)	x 2.6000 (2c)	= 111.1500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	104.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 260.0700 (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)											
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	0.1769	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) =	81.0000 (23c)											
Effective ac	0.2719	0.2684	0.2650	0.2476	0.2442	0.2268	0.2268	0.2233	0.2337	0.2442	0.2511	0.2580 (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
Front door			1.8900	1.0000	1.8900		(26)
Window (Uw = 0.90)			25.0400	0.8687	21.7529		(27)
Ground Floor			62.0500	0.1300	8.0665	75.0000	4653.7500 (28a)
External Wall	148.9600	26.9300	122.0300	0.1800	21.9654	60.0000	7321.8004 (29a)
1st Floor	42.7500		42.7500	0.1000	4.2750	9.0000	384.7500 (30)
Ground floor	19.3000		19.3000	0.1000	1.9300	9.0000	173.7000 (30)
Total net area of external elements Aum(A, m ²)			273.0600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	59.8798		(33)
Party Ceilings 1			60.8500			90.0000	5476.5000 (32b)
Internal Wall 1			100.0000			9.0000	900.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	18910.5004 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							180.4437 (35)
List of Thermal Bridges							

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K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	31.9500	0.1600	5.1120
E6 Intermediate floor within a dwelling	18.5000	0.0700	1.2950
E10 Eaves (insulation at ceiling level)	18.6000	0.0600	1.1160
E10 Eaves (insulation at ceiling level)	9.3000	0.0600	0.5580
E24 Eaves (insulation at ceiling level - inverted)	9.3000	0.0800	0.7440
E12 Gable (insulation at ceiling level)	9.2000	0.2400	2.2080
E12 Gable (insulation at ceiling level)	4.2000	0.2400	1.0080
E16 Corner (normal)	20.0000	0.0900	1.8000
E1 Steel lintel with perforated steel base plate	12.3200	0.1500	1.8480
E3 Sill	11.4200	0.0400	0.4568
E4 Jamb	43.2000	0.0500	2.1600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 18.3058 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 78.1856 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)
 (38)m Jan 23.3358 Feb 23.0381 Mar 22.7404 Apr 21.2519 May 20.9542 Jun 19.4658 Jul 19.4658 Aug 19.1681 Sep 20.0611 Oct 20.9542 Nov 21.5496 Dec 22.1450 (38)
 Heat transfer coeff 101.5214 101.2237 100.9260 99.4375 99.1398 97.6513 97.6513 97.3536 98.2467 99.1398 99.7352 100.3306 (39)
 Average = Sum(39)m / 12 = 99.3631

HLP Jan 0.9687 Feb 0.9659 Mar 0.9630 Apr 0.9488 May 0.9460 Jun 0.9318 Jul 0.9318 Aug 0.9289 Sep 0.9375 Oct 0.9460 Nov 0.9517 Dec 0.9574 (40)
 HLP (average) 0.9481
 Days in mont 31 28 31 30 31 30 31 31 30 31 30 31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.7797 (42)
 Hot water usage for mixer showers 79.6803 78.4828 76.7379 73.3994 70.9356 68.1880 66.6263 68.3580 70.2562 73.2063 76.6166 79.3750 (42a)
 Hot water usage for baths 30.5811 30.1269 29.4874 28.3081 27.4251 26.4460 25.9171 26.5522 27.2437 28.2914 29.4949 30.4777 (42b)
 Hot water usage for other uses 43.0973 41.5301 39.9630 38.3958 36.8286 35.2614 35.2614 36.8286 38.3958 39.9630 41.5301 43.0973 (42c)
 Average daily hot water use (litres/day) 140.9954 (43)
 Daily hot water use Jan 153.3587 Feb 150.1399 Mar 146.1882 Apr 140.1033 May 135.1893 Jun 129.8954 Jul 127.8048 Aug 131.7388 Sep 135.8957 Oct 141.4607 Nov 147.6417 Dec 152.9500 (44)
 Energy conte 242.8827 213.7972 224.6859 191.7944 181.9908 159.7216 154.5689 163.1202 167.5730 191.9608 210.3426 239.4827 (45)
 Energy content (annual) Total = Sum(45)m = 2341.9207
 Distribution loss (46)m = 0.15 x (45)m 36.4324 32.0696 33.7029 28.7692 27.2986 23.9582 23.1853 24.4680 25.1360 28.7941 31.5514 35.9224 (46)
 Water storage loss:
 Total storage loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (56)
 If cylinder contains dedicated solar storage 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (57)
 Primary loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (59)
 Combi loss 14.3395 12.9384 14.2958 13.7731 14.1933 13.6961 14.1275 14.1480 13.7150 14.2173 13.8176 14.3313 (61)
 Total heat required for water heating calculated for each month 257.2221 226.7356 238.9817 205.5675 196.1841 173.4177 168.6964 177.2682 181.2880 206.1781 224.1602 253.8141 (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)
 FGHS 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 257.2221 226.7356 238.9817 205.5675 196.1841 173.4177 168.6964 177.2682 181.2880 206.1781 224.1602 253.8141 (64)
 Total per year (kWh/year) = Sum(64)m = 2509.5137 (64)
 12Total per year (kWh/year) = 2510 (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 84.3434 74.3222 78.2820 67.2149 64.0603 56.5315 54.9260 57.7745 59.1468 67.3813 73.3933 83.2108 (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 138.9870 138.9870 138.9870 138.9870 138.9870 138.9870 138.9870 138.9870 138.9870 138.9870 138.9870 138.9870 (66)
 Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 133.0882 147.3477 133.0882 137.5245 133.0882 137.5245 133.0882 133.0882 137.5245 133.0882 137.5245 133.0882 (67)
 Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 263.8623 266.6004 259.7005 245.0116 226.4694 209.0425 197.4001 194.6621 201.5619 216.2509 234.7930 252.2200 (68)
 Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 36.8987 36.8987 36.8987 36.8987 36.8987 36.8987 36.8987 36.8987 36.8987 36.8987 36.8987 36.8987 (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) -111.1896 -111.1896 -111.1896 -111.1896 -111.1896 -111.1896 -111.1896 -111.1896 -111.1896 -111.1896 -111.1896 -111.1896 (71)
 Water heating gains (Table 5) 113.3647 110.5985 105.2178 93.3540 86.1025 78.5159 73.8253 77.6539 82.1483 90.5662 101.9352 111.8425 (72)
 Total internal gains 578.0113 592.2426 565.7026 543.5862 513.3563 489.7790 469.0098 470.1003 485.9308 507.6014 541.9488 564.8468 (73)

6. Solar gains

[Jan] Area m2 Solar flux Table 6a W/m2 g Specific data or Table 6b FF Specific data or Table 6c Access factor Table 6d Gains W
 Southeast 10.9600 36.7938 0.3500 0.8000 0.7700 78.2486 (77)
 Southwest 2.7600 36.7938 0.3500 0.8000 0.7700 19.7050 (79)
 Northwest 11.3200 11.2829 0.3500 0.8000 0.7700 24.7834 (81)
 Solar gains 122.7370 217.2985 319.1830 432.1335 517.4782 528.4508 503.3594 437.4388 357.9439 246.0567 148.5097 104.0672 (83)
 Total gains 700.7483 809.5410 884.8856 975.7197 1030.8345 1018.2298 972.3692 907.5390 843.8747 753.6581 690.4585 668.9140 (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	51.7419	51.8941	52.0472	52.8263	52.9849	53.7926	53.7926	53.9571	53.4666	52.9849	52.6686	52.3561
alpha	4.4495	4.4596	4.4698	4.5218	4.5323	4.5862	4.5862	4.5971	4.5644	4.5323	4.5112	4.4904
util living area	0.9884	0.9773	0.9554	0.8931	0.7708	0.5867	0.4360	0.4835	0.7208	0.9211	0.9779	0.9904 (86)
MIT	19.6269	19.8510	20.1527	20.5435	20.8245	20.9620	20.9921	20.9876	20.9039	20.5361	20.0222	19.5953 (87)
Th 2	20.1095	20.1119	20.1143	20.1262	20.1286	20.1406	20.1406	20.1430	20.1358	20.1286	20.1238	20.1190 (88)
util rest of house	0.9857	0.9722	0.9453	0.8693	0.7243	0.5172	0.3536	0.3979	0.6541	0.8982	0.9721	0.9882 (89)
MIT 2	18.8577	19.0804	19.3772	19.7573	20.0061	20.1207	20.1379	20.1384	20.0792	19.7599	19.2607	18.8337 (90)
Living area fraction	fLA = Living area / (4) =											0.3884 (91)
MIT	19.1564	19.3797	19.6783	20.0627	20.3240	20.4474	20.4696	20.4682	20.3995	20.0614	19.5564	19.1295 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.0064	19.2297	19.5283	19.9127	20.1740	20.2974	20.3196	20.3182	20.2495	19.9114	19.4064	18.9795 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9814	0.9658	0.9371	0.8627	0.7269	0.5303	0.3710	0.4157	0.6635	0.8914	0.9659	0.9844 (94)
Useful gains	687.6923	781.8466	829.2305	841.7961	749.3486	540.0180	360.7278	377.3035	559.9385	671.8422	666.9299	658.4920 (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	1493.0158	1450.5059	1314.8977	1095.0715	840.1061	556.3601	363.2255	381.4487	604.1674	923.1294	1227.3840	1482.8333 (97)
Space heating kWh	599.1607	449.3390	361.3364	182.3583	67.5236	0.0000	0.0000	0.0000	0.0000	186.9577	403.5270	613.3099 (98a)
Space heating requirement - total per year (kWh/year)												2863.5125
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	599.1607	449.3390	361.3364	182.3583	67.5236	0.0000	0.0000	0.0000	0.0000	186.9577	403.5270	613.3099 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2863.5125
Space heating per m2											(98c) / (4) =	27.3236 (99)
9a. Energy requirements - Individual heating systems, including micro-CHP												
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												89.0000 (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	599.1607	449.3390	361.3364	182.3583	67.5236	0.0000	0.0000	0.0000	0.0000	186.9577	403.5270	613.3099 (98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000 (210)
Space heating fuel (main heating system)	673.2143	504.8753	405.9959	204.8969	75.8692	0.0000	0.0000	0.0000	0.0000	210.0648	453.4011	689.1123 (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	257.2221	226.7356	238.9817	205.5675	196.1841	173.4177	168.6964	177.2682	181.2880	206.1781	224.1602	253.8141 (64)
Efficiency of water heater	88.4825	88.4225	88.3154	88.0910	87.7291	87.3000	87.3000	87.3000	87.3000	88.1003	88.3853	87.3000 (216)
(217)m	88.4825	88.4225	88.3154	88.0910	87.7291	87.3000	87.3000	87.3000	87.3000	88.1003	88.3853	88.4956 (217)
Fuel for water heating, kWh/month	290.7040	256.4229	270.6003	233.3581	223.6250	198.6457	193.2376	203.0564	207.6610	234.0266	253.6170	286.8099 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
(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	24.4966	22.1260	24.4966	23.7064	24.4966	23.7064	24.4966	24.4966	23.7064	24.4966	23.7064	24.4966 (231)
Lighting	34.5831	27.7439	24.9803	18.3016	14.1367	11.5498	12.8960	16.7627	21.7731	28.5674	32.2668	35.5443 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	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)
(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)	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)
(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)	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)
(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)	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)
(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)	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)
(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)	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)
(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)	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)
(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												3217.4298 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												87.3000
Water heating fuel used												2851.7643 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.6380)												
mechanical ventilation fans (SFP = 0.6380)												202.4281 (230a)
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)

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Total electricity for the above, kWh/year	288.4281	(231)
Electricity for lighting (calculated in Appendix L)	279.1058	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	6636.7280	(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	3217.4298	0.2100	675.6603 (261)
Total CO2 associated with community systems			0.0000 (273)
Water heating (other fuel)	2851.7643	0.2100	598.8705 (264)
Space and water heating			1274.5308 (265)
Pumps, fans and electric keep-hot	288.4281	0.1387	40.0085 (267)
Energy for lighting	279.1058	0.1443	40.2836 (268)
Total CO2, kg/year			1354.8229 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.9300 (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	3217.4298	1.1300	3635.6957 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2851.7643	1.1300	3222.4937 (278)
Space and water heating			6858.1894 (279)
Pumps, fans and electric keep-hot	288.4281	1.5128	436.3340 (281)
Energy for lighting	279.1058	1.5338	428.1017 (282)
Total Primary energy kWh/year			7722.6251 (286)
Dwelling Primary energy Rate (DPER)			73.6900 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	62.0500 (1b)	x 2.4000 (2b)	= 148.9200 (1b) - (3b)
First floor	42.7500 (1c)	x 2.6000 (2c)	= 111.1500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	104.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	260.0700 (5)

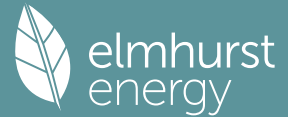
2. Ventilation rate

	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) = 0.1538 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4038 (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) = 0.3735 (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	0.4762	0.4669	0.4576	0.4109	0.4015	0.3548	0.3548	0.3455	0.3735	0.4015	0.4202	0.4389 (22b)
Effective ac	0.6134	0.6090	0.6047	0.5844	0.5806	0.5630	0.5630	0.5597	0.5698	0.5806	0.5883	0.5963 (25)

3. Heat losses and heat loss parameter

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Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.20)			24.3200	1.1450	27.8473		(27)
Ground floor			62.0500	0.1300	8.0665		(28a)
External Wall	148.9600	26.2100	122.7500	0.1800	22.0950		(29a)
1st Floor	42.7500		42.7500	0.1100	4.7025		(30)
Ground floor	19.3000		19.3000	0.1100	2.1230		(30)
Total net area of external elements Aum(A, m2)			273.0600				(31)
Fabric heat loss, W/K = Sum (A x U)					66.7243		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 165.3473 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	31.9500	0.1600	5.1120
E6 Intermediate floor within a dwelling	18.5000	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	18.6000	0.0600	1.1160
E10 Eaves (insulation at ceiling level)	9.3000	0.0600	0.5580
E24 Eaves (insulation at ceiling level - inverted)	9.3000	0.2400	2.2320
E12 Gable (insulation at ceiling level)	9.2000	0.0600	0.5520
E12 Gable (insulation at ceiling level)	4.2000	0.0600	0.2520
E16 Corner (normal)	20.0000	0.0900	1.8000
E1 Steel lintel with perforated steel base plate	12.3200	0.0500	0.6160
E3 Sill	11.4200	0.0500	0.5710
E4 Jamb	43.2000	0.0500	2.1600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 14.9690 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 81.6933 (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	52.6440	52.2660	51.8956	50.1557	49.8301	48.3147	48.3147	48.0341	48.8984	49.8301	50.4887	51.1772
Average = Sum(39)m / 12 =	134.3373	133.9594	133.5889	131.8490	131.5235	130.0080	130.0080	129.7274	130.5918	131.5235	132.1820	132.8705

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2818	1.2782	1.2747	1.2581	1.2550	1.2405	1.2405	1.2379	1.2461	1.2550	1.2613	1.2678
HLP (average)												1.2581
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

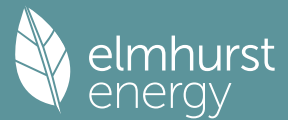
Assumed occupancy												2.7797
Hot water usage for mixer showers												(42)
70.8269	69.7625	68.2115	65.2439	63.0539	60.6116	59.2234	60.7626	62.4500	65.0723	68.1036	70.5555	(42a)
Hot water usage for baths												
30.5811	30.1269	29.4874	28.3081	27.4251	26.4460	25.9171	26.5522	27.2437	28.2914	29.4949	30.4777	(42b)
Hot water usage for other uses												
43.0973	41.5301	39.9630	38.3958	36.8286	35.2614	35.2614	36.8286	38.3958	39.9630	41.5301	43.0973	(42c)
Average daily hot water use (litres/day)												132.8329
												(43)
Daily hot water use												
144.5053	141.4196	137.6618	131.9478	127.3076	122.3190	120.4019	124.1435	128.0895	133.3266	139.1287	144.1306	(44)
Energy conte	228.8611	201.3796	211.5811	180.6299	171.3805	150.4055	145.6157	153.7156	157.9472	180.9230	198.2143	225.6736
Energy content (annual)												(45)
Distribution loss (46)m = 0.15 x (45)m												
34.3292	30.2069	31.7372	27.0945	25.7071	22.5608	21.8424	23.0573	23.6921	27.1384	29.7322	33.8510	(46)
Water storage loss:												
Total storage loss												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	(61)
Total heat required for water heating calculated for each month												
279.8200	247.4070	262.5400	229.9450	222.3394	199.7205	196.5746	204.6745	207.2622	231.8819	247.5294	276.6325	(62)
WWHRS	-32.3791	-28.6363	-29.9863	-24.8299	-23.1405	-19.8015	-18.5608	-19.7375	-20.4874	-24.1524	-27.3617	-31.7795
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63a)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
FGHRS	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												
247.4409	218.7706	232.5536	205.1151	199.1988	179.9190	178.0138	184.9369	186.7748	207.7295	220.1677	244.8530	(64)
12Total per year (kWh/year)												2505.4739
Electric shower(s)												(64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000
Heat gains from water heating, kWh/month												
88.8360	78.4656	83.0904	72.3882	69.7237	62.3386	61.1569	63.8501	64.8462	72.8966	78.2350	87.7762	(65)

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

Metabolic gains (Table 5), Watts												
(66)m	138.9870	138.9870	138.9870	138.9870	138.9870	138.9870	138.9870	138.9870	138.9870	138.9870	138.9870	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
133.0882	147.3477	133.0882	137.5245	133.0882	137.5245	133.0882	133.0882	137.5245	133.0882	137.5245	133.0882	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
263.8623	266.6004	259.7005	245.0116	226.4694	209.0425	197.4001	194.6621	201.5619	216.2509	234.7930	252.2200	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
36.8987	36.8987	36.8987	36.8987	36.8987	36.8987	36.8987	36.8987	36.8987	36.8987	36.8987	36.8987	(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	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-111.1896	-111.1896	-111.1896	-111.1896	-111.1896	-111.1896	-111.1896	-111.1896	-111.1896	-111.1896	-111.1896	-111.1896	(71)
Water heating gains (Table 5)												
119.4033	116.7642	111.6807	100.5392	93.7147	86.5814	82.2002	85.8201	90.0642	97.9793	108.6598	117.9788	(72)
Total internal gains												
584.0499	598.4084	572.1655	550.7714	520.9685	497.8444	477.3847	478.2665	493.8467	515.0145	548.6734	570.9831	(73)

6. Solar gains

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[Jan]	Area m2				Solar flux Table 6a W/m2	Specific data or Table 6b	g Specific data or Table 6c	FF Specific data or Table 6c	Access factor Table 6d	Gains W		
South-east	10.6400				36.7938	0.6300	0.7000	0.7700	0.7700	119.6433 (77)		
South-west	2.6800				36.7938	0.6300	0.7000	0.7700	0.7700	30.1357 (79)		
North-west	11.0000				11.2829	0.6300	0.7000	0.7700	0.7700	37.9303 (81)		
Solar gains	187.7094	332.3375	488.1837	660.9757	791.5465	808.3430	769.9568	669.1022	547.4800	376.3267	227.1270	159.1555 (83)
Total gains	771.7593	930.7458	1060.3492	1211.7470	1312.5149	1306.1874	1247.3415	1147.3687	1041.3266	891.3412	775.8003	730.1386 (84)
7. Mean internal temperature (heating season)												
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	35.8310	35.9321	36.0318	36.5073	36.5976	37.0242	37.0242	37.1043	36.8587	36.5976	36.4153	36.2266
alpha	3.3887	3.3955	3.4021	3.4338	3.4398	3.4683	3.4683	3.4736	3.4572	3.4398	3.4277	3.4151
util living area	0.9822	0.9664	0.9373	0.8673	0.7467	0.5812	0.4415	0.4929	0.7166	0.9061	0.9692	0.9851 (86)
MIT	18.9911	19.2982	19.7223	20.2595	20.6691	20.9004	20.9708	20.9573	20.7887	20.2375	19.5248	18.9469 (87)
Th 2	19.8551	19.8579	19.8607	19.8738	19.8763	19.8877	19.8877	19.8898	19.8833	19.8763	19.8713	19.8661 (88)
util rest of house	0.9782	0.9590	0.9232	0.8377	0.6923	0.4978	0.3371	0.3850	0.6390	0.8783	0.9611	0.9817 (89)
MIT 2	17.5388	17.9279	18.4597	19.1201	19.5851	19.8224	19.8756	19.8705	19.7261	19.1126	18.2276	17.4896 (90)
Living area fraction	18.1028	18.4600	18.9500	19.5626	20.0060	20.2410	20.3009	20.2926	fLA = Living area / (4) =	19.5495	18.7314	0.3884 (91)
MIT	18.1028	18.4600	18.9500	19.5626	20.0060	20.2410	20.3009	20.2926	20.1388	19.5495	18.7314	18.0556 (92)
Temperature adjustment	18.1028	18.4600	18.9500	19.5626	20.0060	20.2410	20.3009	20.2926	20.1388	19.5495	18.7314	0.0000
adjusted MIT	18.1028	18.4600	18.9500	19.5626	20.0060	20.2410	20.3009	20.2926	20.1388	19.5495	18.7314	18.0556 (93)
8. Space heating requirement												
Utilisation	0.9694	0.9468	0.9091	0.8282	0.6991	0.5255	0.3769	0.4255	0.6583	0.8684	0.9501	0.9739 (94)
Useful gains	748.1505	881.2622	963.9572	1003.5744	917.6161	686.3723	470.1351	488.2078	685.5571	774.0820	737.0707	711.0961 (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	1854.2319	1816.4923	1663.1863	1405.8467	1092.4403	733.3801	481.1502	504.9743	788.6149	1177.0653	1537.4560	1840.9966 (97)
Space heating kWh	822.9246	628.4747	520.2264	289.6361	130.0692	0.0000	0.0000	0.0000	0.0000	299.8196	576.2774	840.6459 (98a)
Space heating requirement - total per year (kWh/year)												4108.0739
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	822.9246	628.4747	520.2264	289.6361	130.0692	0.0000	0.0000	0.0000	0.0000	299.8196	576.2774	840.6459 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4108.0739
Space heating per m2										(98c) / (4) =		39.1992 (99)
9a. Energy requirements - Individual heating systems, including micro-CHP												
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.4000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	822.9246	628.4747	520.2264	289.6361	130.0692	0.0000	0.0000	0.0000	0.0000	299.8196	576.2774	840.6459 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	890.6110	680.1674	563.0156	313.4590	140.7675	0.0000	0.0000	0.0000	0.0000	324.4801	623.6768	909.7900 (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	247.4409	218.7706	232.5536	205.1151	199.1988	179.9190	178.0138	184.9369	186.7748	207.7295	220.1677	244.8530 (64)
Water heating requirement	86.7522	86.5077	86.0529	85.1206	83.4905	80.3000	80.3000	80.3000	80.3000	85.1669	86.3437	86.8030 (216)
Efficiency of water heater (217)m	285.2274	252.8916	270.2450	240.9701	238.5886	224.0585	221.6859	230.3075	232.5963	243.9088	254.9898	282.0789 (219)
Fuel for water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Space cooling fuel requirement	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)
(221)m	27.6531	22.1843	19.9745	14.6342	11.3039	9.2354	10.3118	13.4036	17.4100	22.8429	25.8010	28.4217 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-54.0981	-74.3340	-104.1644	-114.0645	-120.4538	-111.4807	-110.0210	-105.0315	-95.9550	-83.4508	-58.7486	-46.9945 (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)	-36.7553	-76.5123	-150.6372	-224.2340	-294.6200	-295.4017	-291.9940	-248.1435	-183.0581	-108.8221	-48.8682	-29.1334 (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	4445.9675 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	80.3000
Water heating fuel used	2977.5485 (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)	223.1764 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-3066.9767 (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	4665.7157 (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	4445.9675	0.2100	933.6532 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2977.5485	0.2100	625.2852 (264)
Space and water heating			1558.9384 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	223.1764	0.1443	32.2113 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1078.7968	0.1352	-145.8002
PV Unit electricity exported	-1988.1799	0.1262	-250.8219
Total			-396.6221 (269)
Total CO2, kg/year			1206.4568 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.5100 (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	4445.9675	1.1300	5023.9432 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2977.5485	1.1300	3364.6298 (278)
Space and water heating			8388.5731 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	223.1764	1.5338	342.3154 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1078.7968	1.4995	-1617.6834
PV Unit electricity exported	-1988.1799	0.4631	-920.7116
Total			-2538.3950 (283)
Total Primary energy kWh/year			6322.5942 (286)
Target Primary Energy Rate (TPER)			60.3300 (287)

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Property Reference	Studio Mid GF - Apt_Be Lean				Issued on Date	30/08/2024	
Assessment Reference	Studio Mid GF_Copy			Prop Type Ref			
Property	Apartment, Studio Mid GF, Edmansons Close, Tottenham, N17 6XD						
SAP Rating	82 B	DER	20.03	TER	20.53		
Environmental	88 B	% DER < TER				2.44	
CO ₂ Emissions (t/year)	0.66	DFEE	57.04	TFEE	50.71		
Compliance Check	See BREL	% DFEE < TFEE				-12.48	
% DPER < TPER	-3.28	DPER	113.08	TPER	109.49		
Assessor Details	Miss Eleanor Ballinger				Assessor ID	M976-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	37.6000	2.5000	94.0000
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	37.6000		
Dwelling volume			

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	3	(19)

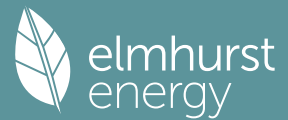
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	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	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366 (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) =												81.0000 (23c)
Effective ac	0.2432	0.2403	0.2374	0.2229	0.2200	0.2054	0.2054	0.2025	0.2112	0.2200	0.2258	0.2316 (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
Door to corridor			1.2000	1.0000	1.2000		(26)
Window (Uw = 0.90)			11.0400	0.8687	9.5907		(27)
Heat Loss Floor 1			37.6000	0.1300	4.8880	75.0000	2820.0000 (28a)
External Wall	37.6000	11.0400	26.5600	0.1800	4.7808	60.0000	1593.6000 (29a)
Corridor Wall	27.2700	1.2000	26.0700	0.1800	4.6926	60.0000	1564.2000 (29a)
Total net area of external elements Aum(A, m ²)			102.4700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	25.1521		(33)
Party Wall 1			15.6600	0.0000	0.0000	45.0000	704.7000 (32)
Party Ceiling 1			37.6000			30.0000	1128.0000 (32b)
Internal Wall 1			21.8000			9.0000	196.2000 (32c)
Heat capacity Cm = Sum(A x k)							8006.7000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							212.9442 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	

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E5 Ground floor (normal)	12.8000	0.1600	2.0480	
E5 Ground floor (normal)	10.1000	0.3200	3.2320	
E7 Party floor between dwellings (in blocks of flats)	7.6500	0.1000	0.7650	
E7 Party floor between dwellings (in blocks of flats)	10.1000	0.1400	1.4140	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.1500	0.2500	1.2875	
E16 Corner (normal)	5.0000	0.0900	0.4500	
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250	
E18 Party wall between dwellings	2.5000	0.0600	0.1500	
E25 Staggered party wall between dwellings	7.5000	0.1200	0.9000	
P1 Party wall - Ground floor	5.8000	0.1000	0.5800	
P2 Party wall - Intermediate floor within a dwelling	5.8000	0.0000	0.0000	
E1 Steel lintel with perforated steel base plate	5.8000	0.1500	0.8700	
E3 Sill	4.6000	0.0400	0.1840	
E4 Jamb	16.4000	0.0500	0.8200	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				12.4755 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	37.6276 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)				
(38)m	Jan 7.5446	Feb 7.4545	Mar 7.3643	Apr 6.9136
Heat transfer coeff	45.1723	45.0821	44.9920	44.5412
Average = Sum(39)m / 12 =	44.4511	44.0003	44.0003	43.9102
	44.1806	44.4511	44.6314	44.8117 (39)
	44.5187			
HLP	Jan 1.2014	Feb 1.1990	Mar 1.1966	Apr 1.1846
HLP (average)	May 1.1822	Jun 1.1702	Jul 1.1702	Aug 1.1678
Days in mont	Sep 1.1750	Oct 1.1822	Nov 1.1870	Dec 1.1918 (40)
				1.1840
	31	28	31	30
				31

4. Water heating energy requirements (kWh/year)				

Assumed occupancy				1.3441 (42)
Hot water usage for mixer showers				
52.6002	51.8097	50.6578	48.4539	46.8275
45.0137	43.9827	45.1259	46.3790	48.3265
50.5777	52.3986 (42a)			
Hot water usage for baths				
20.2297	19.9293	19.5062	18.7261	18.1420
17.4943	17.1444	17.5646	18.0220	18.7151
19.5112	20.1613 (42b)			
Hot water usage for other uses				
28.3950	27.3625	26.3300	25.2974	24.2649
23.2323	23.2323	24.2649	25.2974	26.3300
27.3625	28.3950 (42c)			
Average daily hot water use (litres/day)				93.0654 (43)
Daily hot water use	Jan 101.2250	Feb 99.1015	Mar 96.4940	Apr 92.4774
Energy conte	160.3156	141.1192	148.3076	126.5970
120.1265	105.4277	102.0255	107.6688	110.6071
89.6984	93.3715	97.4514	100.9550 (44)	
126.7042	138.8374	158.0712 (45)		
Energy content (annual)				Total = Sum(45)m = 1545.8079
Distribution loss (46)m = 0.15 x (45)m				
24.0473	21.1679	22.2461	18.9895	18.0190
15.8142	15.3038	16.1503	16.5911	19.0056
20.8256	23.7107 (46)			
Water storage loss:				
Total storage loss	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage				
0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	14.1413	12.7609	14.1000	13.5938
14.0138	13.5297	13.9631	13.9813	13.5509
14.0405	13.6375	14.1359 (61)		
Total heat required for water heating calculated for each month				
174.4569	153.8801	162.4077	140.1907	134.1404
118.9574	115.9886	121.6501	124.1580	140.7447
152.4749	172.2071 (62)			
WWHRS	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
FV diverter	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 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	174.4569	153.8801	162.4077	140.1907
134.1404	118.9574	115.9886	121.6501	124.1580
140.7447	152.4749	172.2071 (64)		
1711.2567 (64)				
1711 (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 (64a)
0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower (s) (kWh/year) = Sum(64a)m =				
Heat gains from water heating, kWh/month	56.8403	50.1124	52.8373	45.4919
43.4455	38.4371	37.4143	39.2952	40.1646
45.6393	49.5728	56.0926 (65)		

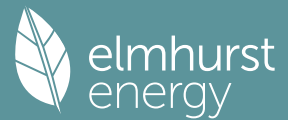
5. Internal gains (see Table 5 and 5a)				

Metabolic gains (Table 5), Watts				
(66)m	Jan 67.2056	Feb 67.2056	Mar 67.2056	Apr 67.2056
67.2056	67.2056	67.2056	67.2056	67.2056
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5				
58.2808	64.5252	58.2808	60.2235	58.2808
60.2235	58.2808	60.2235	58.2808	60.2235
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5				
115.5483	116.7473	113.7258	107.2933	99.1735
91.5420	86.4437	85.2447	88.2662	94.6987
102.8185	110.4500 (68)			
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5				
29.7206	29.7206	29.7206	29.7206	29.7206
29.7206	29.7206	29.7206	29.7206	29.7206 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000
3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)				
-53.7645	-53.7645	-53.7645	-53.7645	-53.7645
-53.7645	-53.7645	-53.7645	-53.7645	-53.7645 (71)
Water heating gains (Table 5)				
76.3982	74.5720	71.0179	63.1832	58.3945
53.3849	50.2880	52.8161	55.7842	61.3431
68.8511	75.3933 (72)			
Total internal gains	296.3890	302.0061	289.1862	276.8618
262.0106	248.3122	238.1742	239.5033	247.4356
260.4843	278.0548	290.2858 (73)		

6. Solar gains				

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c
Access factor Table 6d				Gains W
Southwest	2.8800	36.7938	0.3500	0.8000
Northwest	8.1600	11.2829	0.3500	0.8000
0.7700				20.5617 (79)
0.7700				17.8650 (81)
Solar gains	38.4267	71.3889	113.4394	166.9762
211.1416	220.2218	207.9031	173.3321	131.7234
83.1498	47.1070	32.1860 (83)		

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Total gains 334.8157 373.3951 402.6255 443.8380 473.1521 468.5339 446.0773 412.8355 379.1590 343.6341 325.1618 322.4718 (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	49.2356	49.3340	49.4329	49.9332	50.0344	50.5470	50.5470	50.6508	50.3407	50.0344	49.8323	49.6318
alpha	4.2824	4.2889	4.2955	4.3289	4.3356	4.3698	4.3698	4.3767	4.3560	4.3356	4.3222	4.3088
util living area	0.9826	0.9711	0.9478	0.8819	0.7540	0.5733	0.4275	0.4781	0.7156	0.9107	0.9699	0.9850 (86)
MIT	19.6407	19.8387	20.1339	20.5269	20.8183	20.9582	20.9907	20.9852	20.8923	20.5209	20.0225	19.6066 (87)
Th 2	19.9189	19.9208	19.9227	19.9323	19.9343	19.9439	19.9439	19.9458	19.9400	19.9343	19.9304	19.9266 (88)
util rest of house	0.9780	0.9635	0.9339	0.8512	0.6964	0.4892	0.3281	0.3738	0.6339	0.8804	0.9606	0.9810 (89)
MIT 2	18.7107	18.9061	19.1937	19.5681	19.8171	19.9249	19.9414	19.9414	19.8833	19.5737	19.0962	18.6831 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.5244	19.7221	20.0163	20.4071	20.6932	20.8291	20.8595	20.8547	20.7662	20.4025	19.9067	19.4912 (92)
Temperature adjustment												
adjusted MIT	19.3744	19.5721	19.8663	20.2571	20.5432	20.6791	20.7095	20.7047	20.6162	20.2525	19.7567	19.3412 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9751	0.9606	0.9330	0.8613	0.7306	0.5486	0.4007	0.4496	0.6879	0.8905	0.9588	0.9783 (94)
Useful gains	326.4792	358.6817	375.6578	382.2927	345.6827	257.0577	178.7260	185.6131	260.8123	305.9930	311.7731	315.4752 (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	680.9461	661.4516	601.3785	505.8576	393.0887	267.4807	180.8214	189.0195	287.8887	429.0647	564.8849	678.5006 (97)
Space heating kWh	263.7234	203.4614	167.9362	88.9667	35.2701	0.0000	0.0000	0.0000	0.0000	91.5653	182.2405	270.0909 (98a)
Space heating requirement - total per year (kWh/year)	1303.2544											
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	263.7234	203.4614	167.9362	88.9667	35.2701	0.0000	0.0000	0.0000	0.0000	91.5653	182.2405	270.0909 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	1303.2544											
Space heating per m2	(98c) / (4) = 34.6610 (99)											

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												89.0000 (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	263.7234	203.4614	167.9362	88.9667	35.2701	0.0000	0.0000	0.0000	0.0000	91.5653	182.2405	270.0909 (98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000 (210)
Space heating fuel (main heating system)	296.3184	228.6083	188.6923	99.9626	39.6293	0.0000	0.0000	0.0000	0.0000	102.8824	204.7646	303.4730 (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	174.4569	153.8801	162.4077	140.1907	134.1404	118.9574	115.9886	121.6501	124.1580	140.7447	152.4749	172.2071 (64)
Efficiency of water heater (217)m	88.3153	88.2599	88.1560	87.9522	87.6486	87.3000	87.3000	87.3000	87.3000	87.9622	88.2175	87.3000 (216)
Fuel for water heating, kWh/month	197.5387	174.3489	184.2275	159.3942	153.0434	136.2628	132.8621	139.3472	142.2200	160.0058	172.8399	194.9581 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	13.3039	12.0164	13.3039	12.8748	13.3039	12.8748	13.3039	13.3039	12.8748	13.3039	12.8748	13.3039 (231)
Lighting	12.9335	10.3758	9.3422	6.8445	5.2869	4.3194	4.8229	6.2690	8.1428	10.6838	12.0673	13.2930 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1	1464.3308 (211)											
Space heating fuel - main system 2	0.0000 (213)											
Space heating fuel - secondary	0.0000 (215)											
Efficiency of water heater	87.3000											
Water heating fuel used	1947.0486 (219)											
Space cooling fuel	0.0000 (221)											
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.6160)												
mechanical ventilation fans (SFP = 0.6160)	70.6429 (230a)											
central heating pump	41.0000 (230c)											

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main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	156.6429 (231)
Electricity for lighting (calculated in Appendix L)	104.3811 (232)

Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	3672.4034 (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	1464.3308	0.2100	307.5095 (261)
Total CO2 associated with community systems			0.0000 (273)
Water heating (other fuel)	1947.0486	0.2100	408.8802 (264)
Space and water heating			716.3897 (265)
Pumps, fans and electric keep-hot	156.6429	0.1387	21.7283 (267)
Energy for lighting	104.3811	0.1443	15.0654 (268)
Total CO2, kg/year			753.1834 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			20.0300 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1464.3308	1.1300	1654.6938 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1947.0486	1.1300	2200.1649 (278)
Space and water heating			3854.8587 (279)
Pumps, fans and electric keep-hot	156.6429	1.5128	236.9693 (281)
Energy for lighting	104.3811	1.5338	160.1032 (282)
Total Primary energy kWh/year			4251.9313 (286)
Dwelling Primary energy Rate (DPER)			113.0800 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	37.6000 (1b)	x 2.5000 (2b)	= 94.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	37.6000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 94.0000 (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) = 0.2128 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4628 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3586 (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	0.4573	0.4483	0.4393	0.3945	0.3855	0.3407	0.3407	0.3317	0.3586	0.3855	0.4035	0.4214 (22b)
Effective ac	0.6045	0.6005	0.5965	0.5778	0.5743	0.5580	0.5580	0.5550	0.5643	0.5743	0.5814	0.5888 (25)

3. Heat losses and heat loss parameter

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Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opaque door			1.2000	1.0000	1.2000			(26)					
TER Opening Type (Uw = 1.20)			8.2000	1.1450	9.3893			(27)					
Heat Loss Floor 1			37.6000	0.1300	4.8880			(28a)					
External Wall	37.6000	8.2000	29.4000	0.1800	5.2920			(29a)					
Corridor Wall	27.2700	1.2000	26.0700	0.1800	4.6926			(29a)					
Total net area of external elements Aum(A, m2)			102.4700					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.4619			(33)					
Party Wall 1			15.6600	0.0000	0.0000			(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							222.9442	(35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value		Total						
E5 Ground floor (normal)				12.8000	0.1600		2.0480						
E5 Ground floor (normal)				10.1000	0.1600		1.6160						
E7 Party floor between dwellings (in blocks of flats)				7.6500	0.0700		0.5355						
E7 Party floor between dwellings (in blocks of flats)				10.1000	0.0700		0.7070						
E23 Balcony within or between dwellings, balcony support penetrates wall insulation				5.1500	0.0200		0.1030						
E16 Corner (normal)				5.0000	0.0900		0.4500						
E17 Corner (inverted - internal area greater than external area)				2.5000	-0.0900		-0.2250						
E18 Party wall between dwellings				2.5000	0.0600		0.1500						
E25 Staggered party wall between dwellings				7.5000	0.0600		0.4500						
P1 Party wall - Ground floor				5.8000	0.0800		0.4640						
P2 Party wall - Intermediate floor within a dwelling				5.8000	0.0000		0.0000						
E1 Steel lintel with perforated steel base plate				5.8000	0.0500		0.2900						
E3 Sill				4.6000	0.0500		0.2300						
E4 Jamb				16.4000	0.0500		0.8200						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.6385	(36)					
Point Thermal bridges							0.0000	(36a) =					
Total fabric heat loss						(33) + (36) + (36a) =	33.1004	(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	18.7531	18.6272	18.5037	17.9239	17.8154	17.3105	17.3105	17.2170	17.5050	17.8154	18.0349	18.2643	(38)
Average = Sum(39)m / 12 =	51.8535	51.7276	51.6041	51.0243	50.9159	50.4109	50.4109	50.3174	50.6054	50.9159	51.1353	51.3647	(39)
												51.0238	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.3791	1.3757	1.3725	1.3570	1.3541	1.3407	1.3407	1.3382	1.3459	1.3541	1.3600	1.3661	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	
												1.3570	
												31	

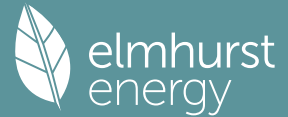
4. Water heating energy requirements (kWh/year)													

Assumed occupancy													1.3441 (42)
Hot water usage for mixer showers													
	46.7557	46.0531	45.0292	43.0701	41.6244	40.0122	39.0958	40.1119	41.2258	42.9569	44.9580	46.5766	(42a)
Hot water usage for baths													
	20.2297	19.9293	19.5062	18.7261	18.1420	17.4943	17.1444	17.5646	18.0220	18.7151	19.5112	20.1613	(42b)
Hot water usage for other uses													
	28.3950	27.3625	26.3300	25.2974	24.2649	23.2323	23.2323	24.2649	25.2974	26.3300	27.3625	28.3950	(42c)
Average daily hot water use (litres/day)													87.6770 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	95.3805	93.3449	90.8653	87.0937	84.0313	80.7388	79.4725	81.9413	84.5452	88.0019	91.8317	95.1330	(44)
Energy conte	151.0594	132.9218	139.6566	119.2269	113.1222	99.2777	96.1151	101.4605	104.2527	119.4177	130.8311	148.9552	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
	22.6589	19.9383	20.9485	17.8840	16.9683	14.8917	14.4173	15.2191	15.6379	17.9127	19.6247	22.3433	(46)
Water storage loss:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	48.6049	42.9642	46.3040	42.9503	42.8214	39.8164	40.4983	41.7564	41.6935	44.8448	45.2869	48.4787	(61)
Total heat required for water heating calculated for each month													
	199.6642	175.8860	185.9606	162.1772	155.9436	139.0941	136.6134	143.2169	145.9462	164.2625	176.1179	197.4339	(62)
WWHRS	-21.3748	-18.9040	-19.7952	-16.3912	-15.2760	-13.0718	-12.2527	-13.0295	-13.5246	-15.9440	-18.0626	-20.9789	(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	178.2895	156.9820	166.1654	145.7860	140.6676	126.0223	124.3607	130.1873	132.4216	148.3185	158.0553	176.4550	(64)
												1783.7113	(64)
12Total per year (kWh/year)												1784	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
												0.0000	(64a)
Heat gains from water heating, kWh/month													
	62.3785	54.9376	58.0118	50.3805	48.3185	42.9639	42.0829	44.1747	45.0874	50.9176	54.8230	61.6473	(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	67.2056	67.2056	67.2056	67.2056	67.2056	67.2056	67.2056	67.2056	67.2056	67.2056	67.2056	67.2056	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	58.3191	64.5676	58.3191	60.2631	58.3191	60.2631	58.3191	58.3191	60.2631	58.3191	60.2631	58.3191	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	115.5483	116.7473	113.7258	107.2933	99.1735	91.5420	86.4437	85.2447	88.2662	94.6987	102.8185	110.4500	(68)
Pumps, fans	29.7206	29.7206	29.7206	29.7206	29.7206	29.7206	29.7206	29.7206	29.7206	29.7206	29.7206	29.7206	(69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
	-53.7645	-53.7645	-53.7645	-53.7645	-53.7645	-53.7645	-53.7645	-53.7645	-53.7645	-53.7645	-53.7645	-53.7645	(71)
Water heating gains (Table 5)													
	83.8420	81.7523	77.9729	69.9729	64.9442	59.6721	56.5630	59.3746	62.6214	68.4376	76.1431	82.8593	(72)
Total internal gains	303.8710	309.2288	296.1794	283.6910	268.5985	254.6389	244.4875	246.1001	254.3123	267.6170	285.3863	297.7900	(73)

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6. Solar gains

[Jan]	Area m2				Solar flux Table 6a W/m2	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W
Southwest	2.1400				36.7938		0.6300		0.7000	0.7700	24.0636 (79)
Northwest	6.0600				11.2829		0.6300		0.7000	0.7700	20.8962 (81)
Solar gains	44.9598	83.5240	132.7174	195.3451	247.0086	257.6291	243.2188	202.7788	154.1062	97.2827	37.6583 (83)
Total gains	348.8308	392.7528	428.8968	479.0361	515.6070	512.2680	487.7063	448.8788	408.4185	364.8997	335.4483 (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	44.9059	45.0152	45.1229	45.6356	45.7329	46.1910	46.1910	46.2768	46.0134	45.7329	45.5366	45.3332
alpha	3.9937	4.0010	4.0082	4.0424	4.0489	4.0794	4.0794	4.0851	4.0676	4.0489	4.0358	4.0222
util living area	0.9840	0.9733	0.9511	0.8887	0.7664	0.5907	0.4446	0.4984	0.7353	0.9188	0.9726	0.9862 (86)
MIT	19.4415	19.6557	19.9840	20.4260	20.7653	20.9398	20.9851	20.9767	20.8534	20.4180	19.8640	19.4095 (87)
Th 2	20.3105	20.3121	20.3138	20.3215	20.3229	20.3296	20.3296	20.3309	20.3271	20.3229	20.3200	20.3170 (88)
util rest of house	0.9816	0.9692	0.9436	0.8716	0.7329	0.5387	0.3806	0.4318	0.6876	0.9027	0.9678	0.9841 (89)
MIT 2	18.8560	19.0693	19.3938	19.8267	20.1396	20.2910	20.3225	20.3190	20.2242	19.8266	19.2832	18.8292 (90)
Living area fraction									fLA = Living area /	(4) =	0.8750	0.8750 (91)
MIT	19.3683	19.5824	19.9102	20.3511	20.6871	20.8587	20.9023	20.8945	20.7747	20.3441	19.7914	19.3370 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3683	19.5824	19.9102	20.3511	20.6871	20.8587	20.9023	20.8945	20.7747	20.3441	19.7914	19.3370 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9775	0.9642	0.9385	0.8724	0.7514	0.5801	0.4355	0.4881	0.7201	0.9032	0.9634	0.9804 (94)
Useful gains	340.9808	378.6790	402.5272	417.9273	387.4353	297.1641	212.3930	219.1150	294.1146	329.5900	328.0320	328.8657 (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	781.3442	759.4853	692.0222	584.2865	457.5836	315.5086	216.8827	226.1502	337.7783	496.1275	648.9786	777.5062 (97)
Space heating kWh	327.6304	255.9019	215.3843	119.7786	52.1903	0.0000	0.0000	0.0000	0.0000	123.9039	231.0815	333.7885 (98a)
Space heating requirement - total per year (kWh/year)												1659.6594
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	327.6304	255.9019	215.3843	119.7786	52.1903	0.0000	0.0000	0.0000	0.0000	123.9039	231.0815	333.7885 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1659.6594
Space heating per m2										(98c) / (4) =		44.1399 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.4000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	327.6304	255.9019	215.3843	119.7786	52.1903	0.0000	0.0000	0.0000	0.0000	123.9039	231.0815	333.7885 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	354.5783	276.9501	233.0999	129.6305	56.4831	0.0000	0.0000	0.0000	0.0000	134.0952	250.0882	361.2430 (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	178.2895	156.9820	166.1654	145.7860	140.6676	126.0223	124.3607	130.1873	132.4216	148.3185	158.0553	176.4550 (64)
Efficiency of water heater	85.6668	85.4217	84.9383	83.9635	82.4587	80.3000	80.3000	80.3000	80.3000	83.9985	85.1941	80.3000 (216)
Fuel for water heating, kWh/month	208.1198	183.7731	195.6306	173.6301	170.5917	156.9394	154.8701	162.1262	164.9086	176.5727	185.5239	85.7250 (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	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	12.1176	9.7212	8.7528	6.4127	4.9533	4.0469	4.5186	5.8735	7.6290	10.0097	11.3060	12.4543 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-13.1031	-19.2384	-28.8031	-33.8052	-37.7348	-35.7391	-35.3469	-32.7542	-28.3652	-22.6640	-14.6902	-11.2441 (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	-5.2481	-11.2307	-22.6636	-34.5269	-46.1050	-46.4461	-45.8551	-38.5828	-27.9919	-16.1728	-7.0470	-4.1328 (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)

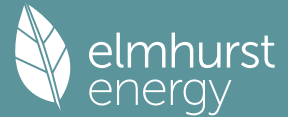
elmhurst
energy

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

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	1796.1682	1.1300	2029.6700	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2138.5247	1.1300	2416.5329	(278)
Space and water heating			4446.2030	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	97.7956	1.5338	150.0022	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-313.4884	1.4940	-468.3666	
PV Unit electricity exported	-306.0029	0.4607	-140.9677	
Total			-609.3343	(283)
Total Primary energy kWh/year			4116.9716	(286)
Target Primary Energy Rate (TPER)			109.4900	(287)

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Property Reference	Studio Mid MF - Apt_Be Lean				Issued on Date	30/08/2024
Assessment Reference	Studio Mid MF_Copy		Prop Type Ref			
Property	Apartment, Studio Mid MF, Edmansons Close, Tottenham, N17 6XD					
SAP Rating	83 B	DER	17.60	TER	16.92	
Environmental	90 B	% DER < TER				-4.02
CO ₂ Emissions (t/year)	0.59	DFEE	46.00	TFEE	39.41	
Compliance Check	See BREL	% DFEE < TFEE				-16.73
% DPER < TPER	-11.88	DPER	100.08	TPER	89.45	
Assessor Details	Miss Eleanor Ballinger				Assessor ID	M976-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	37.6000	2.5000	94.0000
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	37.6000		
Dwelling volume			94.0000

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)

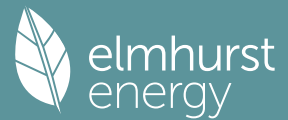
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.0000	(17)
Infiltration rate	0.1500	(18)
Number of sides sheltered	3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (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	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366 (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) =												81.0000 (23c)
Effective ac	0.2432	0.2403	0.2374	0.2229	0.2200	0.2054	0.2054	0.2025	0.2112	0.2200	0.2258	0.2316 (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
Door to corridor			1.2000	1.0000	1.2000		(26)
Window (Uw = 0.90)			11.0400	0.8687	9.5907		(27)
External Wall	37.6000	11.0400	26.5600	0.1800	4.7808	60.0000	1593.6000 (29a)
Corridor Wall	27.2700	1.2000	26.0700	0.1800	4.6926	60.0000	1564.2000 (29a)
Total net area of external elements Aum(A, m ²)			64.8700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	20.2641		(33)
Party Wall 1			15.6600	0.0000	0.0000	45.0000	704.7000 (32)
Party Floor 1			37.6000			40.0000	1504.0000 (32d)
Party Ceiling 1			37.6000			30.0000	1128.0000 (32b)
Internal Wall 1			21.8000			9.0000	196.2000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	6690.7000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							177.9442 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	

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E2 Other lintels (including other steel lintels)	6.3000	0.1500	0.9450
E3 Sill	5.1000	0.0400	0.2040
E4 Jamb	18.1400	0.0500	0.9070
E7 Party floor between dwellings (in blocks of flats)	15.3000	0.1000	1.5300
E7 Party floor between dwellings (in blocks of flats)	20.2000	0.1400	2.8280
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	10.3000	0.2500	2.5750
E16 Corner (normal)	5.0000	0.0900	0.4500
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250
E18 Party wall between dwellings	2.5000	0.0600	0.1500
E25 Staggered party wall between dwellings	7.5000	0.1200	0.9000
P2 Party wall - Intermediate floor within a dwelling	11.6000	0.0000	0.0000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			10.2640 (36)
Point Thermal Bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	30.5281 (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	7.5446	7.4545	7.3643	6.9136	6.8234	6.3727	6.3727	6.2825	6.5530	6.8234	7.0037	7.1840 (38)
Average = Sum(39)m / 12 =	38.0728	37.9826	37.8925	37.4417	37.3516	36.9008	36.9008	36.8107	37.0811	37.3516	37.5319	37.7122 (39)
												37.4192
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0126	1.0102	1.0078	0.9958	0.9934	0.9814	0.9814	0.9790	0.9862	0.9934	0.9982	1.0030 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.3441 (42)
Hot water usage for mixer showers	52.6002	51.8097	50.6578	48.4539	46.8275	45.0137	43.9827	45.1259	46.3790	48.3265	50.5777	52.3986	(42a)
Hot water usage for baths	20.2297	19.9293	19.5062	18.7261	18.1420	17.4943	17.1444	17.5646	18.0220	18.7151	19.5112	20.1613	(42b)
Hot water usage for other uses	28.3950	27.3625	26.3300	25.2974	24.2649	23.2323	23.2323	24.2649	25.2974	26.3300	27.3625	28.3950	(42c)
Average daily hot water use (litres/day)												93.0654	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	101.2250	99.1015	96.4940	92.4774	89.2343	85.7403	84.3595	86.9553	89.6984	93.3715	97.4514	100.9550	(44)
Energy content (annual)	160.3156	141.1192	148.3076	126.5970	120.1265	105.4277	102.0255	107.6688	110.6071	126.7042	138.8374	158.0712	(45)
Distribution loss (46)m = 0.15 x (45)m	24.0473	21.1679	22.2461	18.9895	18.0190	15.8142	15.3038	16.1503	16.5911	19.0056	20.8256	23.7107	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	14.1413	12.7609	14.1000	13.5938	14.0138	13.5297	13.9631	13.9813	13.5509	14.0405	13.6375	14.1359	(61)
Total heat required for water heating calculated for each month	174.4569	153.8801	162.4077	140.1907	134.1404	118.9574	115.9886	121.6501	124.1580	140.7447	152.4749	172.2071	(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	174.4569	153.8801	162.4077	140.1907	134.1404	118.9574	115.9886	121.6501	124.1580	140.7447	152.4749	172.2071	(64)
12Total per year (kWh/year)												1711.2567	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
												0.0000	(64a)
Heat gains from water heating, kWh/month	56.8403	50.1124	52.8373	45.4919	43.4455	38.4371	37.4143	39.2952	40.1646	45.6393	49.5728	56.0926	(65)

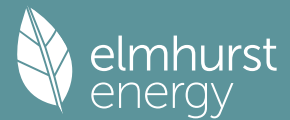
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	67.2056	67.2056	67.2056	67.2056	67.2056	67.2056	67.2056	67.2056	67.2056	67.2056	67.2056	67.2056 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	58.2808	64.5252	58.2808	60.2235	58.2808	60.2235	58.2808	58.2808	60.2235	58.2808	60.2235	58.2808 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	115.5483	116.7473	113.7258	107.2933	99.1735	91.5420	86.4437	85.2447	88.2662	94.6987	102.8185	110.4500 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.7206	29.7206	29.7206	29.7206	29.7206	29.7206	29.7206	29.7206	29.7206	29.7206	29.7206	29.7206 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-53.7645	-53.7645	-53.7645	-53.7645	-53.7645	-53.7645	-53.7645	-53.7645	-53.7645	-53.7645	-53.7645	-53.7645 (71)
Water heating gains (Table 5)	76.3982	74.5720	71.0179	63.1832	58.3945	53.3849	50.2880	52.8161	55.7842	61.3431	68.8511	75.3933 (72)
Total internal gains	296.3890	302.0061	289.1862	276.8618	262.0106	248.3122	238.1742	239.5033	247.4356	260.4843	278.0548	290.2858 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
Southwest				2.8800	36.7938	0.3500	0.8000	0.7700	20.5617 (79)			
Northwest				8.1600	11.2829	0.3500	0.8000	0.7700	17.8650 (81)			
Solar gains	38.4267	71.3889	113.4394	166.9762	211.1416	220.2218	207.9031	173.3321	131.7234	83.1498	47.1070	32.1860 (83)
Total gains	334.8157	373.3951	402.6255	443.8380	473.1521	468.5339	446.0773	412.8355	379.1590	343.6341	325.1618	322.4718 (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	48.8151	48.9310	49.0474	49.6379	49.7577	50.3655	50.3655	50.4889	50.1206	49.7577	49.5187	49.2819	
alpha	4.2543	4.2621	4.2698	4.3092	4.3172	4.3577	4.3577	4.3659	4.3414	4.3172	4.3012	4.2855	
util living area	0.9680	0.9486	0.9121	0.8199	0.6704	0.4911	0.3611	0.4052	0.6295	0.8581	0.9463	0.9720 (86)	
MIT	19.8105	20.0175	20.3038	20.6584	20.8844	20.9767	20.9951	20.9921	20.9340	20.6412	20.1806	19.7756 (87)	
Th 2	20.0729	20.0749	20.0769	20.0868	20.0888	20.0989	20.0989	20.1009	20.0948	20.0888	20.0848	20.0808 (88)	
util rest of house	0.9614	0.9384	0.8947	0.7874	0.6197	0.4266	0.2885	0.3282	0.5609	0.8243	0.9339	0.9662 (89)	
MIT 2	19.0096	19.2119	19.4877	19.8210	20.0118	20.0872	20.0973	20.0981	20.0579	19.8160	19.3814	18.9818 (90)	
Living area fraction									fLA = Living area / (4) =				0.8750 (91)
MIT	19.7104	19.9168	20.2018	20.5537	20.7753	20.8655	20.8829	20.8803	20.8245	20.5380	20.0807	19.6764 (92)	
Temperature adjustment												-0.1500	
adjusted MIT	19.5604	19.7668	20.0518	20.4037	20.6253	20.7155	20.7329	20.7303	20.6745	20.3880	19.9307	19.5264 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9570	0.9345	0.8942	0.7993	0.6502	0.4711	0.3398	0.3824	0.6057	0.8362	0.9315	0.9620 (94)
Useful gains	320.4212	348.9200	360.0381	354.7484	307.6583	220.7197	151.5700	157.8577	229.6596	287.3433	302.8802	310.2179 (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	581.0044	564.6807	513.5119	430.7197	333.3745	225.6657	152.5070	159.4024	243.7890	365.5989	481.5588	577.9912 (97)
Space heating kWh	193.8739	144.9912	114.1845	54.6994	19.1328	0.0000	0.0000	0.0000	0.0000	58.2222	128.6486	199.2234 (98a)
Space heating requirement - total per year (kWh/year)												912.9759
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	193.8739	144.9912	114.1845	54.6994	19.1328	0.0000	0.0000	0.0000	0.0000	58.2222	128.6486	199.2234 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												912.9759
Space heating per m2										(98c) / (4) =		24.2813 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													89.0000 (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	193.8739	144.9912	114.1845	54.6994	19.1328	0.0000	0.0000	0.0000	0.0000	58.2222	128.6486	199.2234 (98)	
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000 (210)	
Space heating fuel (main heating system)	217.8358	162.9114	128.2972	61.4600	21.4976	0.0000	0.0000	0.0000	0.0000	65.4182	144.5490	223.8465 (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	174.4569	153.8801	162.4077	140.1907	134.1404	118.9574	115.9886	121.6501	124.1580	140.7447	152.4749	172.2071 (64)	
Efficiency of water heater	88.1866	88.1165	87.9939	87.7705	87.5087	87.3000	87.3000	87.3000	87.3000	87.7907	88.0698	88.2037 (217)	
Fuel for water heating, kWh/month	197.8269	174.6325	184.5670	159.7241	153.2881	136.2628	132.8621	139.3472	142.2200	160.3185	173.1296	195.2380 (219)	
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)	
Pumps and Fa	13.5182	12.2100	13.5182	13.0821	13.5182	13.0821	13.5182	13.5182	13.0821	13.5182	13.0821	13.5182 (231)	
Lighting	12.9335	10.3758	9.3422	6.8445	5.2869	4.3194	4.8229	6.2690	8.1428	10.6838	12.0673	13.2930 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)	
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)	
Annual totals kWh/year													
Space heating fuel - main system 1													1025.8156 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													87.3000
Water heating fuel used													1949.4169 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.6380)													
mechanical ventilation fans (SFP = 0.6380)													73.1658 (230a)
central heating pump													41.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													159.1658 (231)
Electricity for lighting (calculated in Appendix L)													104.3811 (232)

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

PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	3238.7794 (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	1025.8156	0.2100	215.4213 (261)
Total CO2 associated with community systems			0.0000 (263)
Water heating (other fuel)	1949.4169	0.2100	409.3775 (264)
Space and water heating			624.7988 (265)
Pumps, fans and electric keep-hot	159.1658	0.1387	22.0783 (267)
Energy for lighting	104.3811	0.1443	15.0654 (268)
Total CO2, kg/year			661.9425 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			17.6000 (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	1025.8156	1.1300	1159.1716 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1949.4169	1.1300	2202.8411 (278)
Space and water heating			3362.0127 (279)
Pumps, fans and electric keep-hot	159.1658	1.5128	240.7861 (281)
Energy for lighting	104.3811	1.5338	160.1032 (282)
Total Primary energy kWh/year			3762.9020 (286)
Dwelling Primary energy Rate (DPER)			100.0800 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	37.6000 (1b)	x 2.5000 (2b)	= 94.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	37.6000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 94.0000 (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)

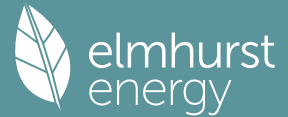
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.2128 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.4628	(18)
Number of sides sheltered	3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3586 (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	0.4573	0.4483	0.4393	0.3945	0.3855	0.3407	0.3407	0.3317	0.3586	0.3855	0.4035	0.4214 (22b)
Effective ac	0.6045	0.6005	0.5965	0.5778	0.5743	0.5580	0.5580	0.5550	0.5643	0.5743	0.5814	0.5888 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opaque door			1.2000	1.0000	1.2000		(26)

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TER Opening Type (Uw = 1.20)			8.2000	1.1450	9.3893	(27)
External Wall	37.6000	8.2000	29.4000	0.1800	5.2920	(29a)
Corridor Wall	27.2700	1.2000	26.0700	0.1800	4.6926	(29a)
Total net area of external elements Aum(A, m2)			64.8700			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		20.5739	(33)
Party Wall 1			15.6600	0.0000	0.0000	(32)

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

187.9442 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.3000	0.0500	0.3150
E3 Sill	5.1000	0.0500	0.2550
E4 Jamb	18.1400	0.0500	0.9070
E7 Party floor between dwellings (in blocks of flats)	15.3000	0.0700	1.0710
E7 Party floor between dwellings (in blocks of flats)	20.2000	0.0700	1.4140
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	10.3000	0.0200	0.2060
E16 Corner (normal)	5.0000	0.0900	0.4500
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250
E18 Party wall between dwellings	2.5000	0.0600	0.1500
E25 Staggered party wall between dwellings	7.5000	0.0600	0.4500
P2 Party wall - Intermediate floor within a dwelling	11.6000	0.0000	0.0000

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

4.9930 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 25.5669 (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
(38)m	18.7531	18.6272	18.5037	17.9239	17.8154	17.3105	17.3105	17.2170	17.5050	17.8154	18.0349	18.2643 (38)
Heat transfer coeff	44.3200	44.1941	44.0706	43.4908	43.3824	42.8774	42.8774	42.7839	43.0719	43.3824	43.6018	43.8312 (39)
Average = Sum(39)m / 12 =												43.4903

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1787	1.1754	1.1721	1.1567	1.1538	1.1404	1.1404	1.1379	1.1455	1.1538	1.1596	1.1657 (40)
HLP (average)												1.1567
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy

1.3441 (42)

Hot water usage for mixer showers

46.5766 (42a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot water usage for baths	20.2297	19.9293	19.5062	18.7261	18.1420	17.4943	17.1444	17.5646	18.0220	18.7151	19.5112	20.1613 (42b)
Hot water usage for other uses	28.3950	27.3625	26.3300	25.2974	24.2649	23.2323	23.2323	24.2649	25.2974	26.3300	27.3625	28.3950 (42c)

Average daily hot water use (litres/day)

87.6770 (43)

Average daily hot water use (litres/day)	28.3950	27.3625	26.3300	25.2974	24.2649	23.2323	23.2323	24.2649	25.2974	26.3300	27.3625	28.3950 (42c)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	95.3805	93.3449	90.8653	87.0937	84.0313	80.7388	79.4725	81.9413	84.5452	88.0019	91.8317	95.1330 (44)
Energy content (annual)	151.0594	132.9218	139.6566	119.2269	113.1222	99.2777	96.1151	101.4605	104.2527	119.4177	130.8311	148.9552 (45)
Distribution loss (46)m = 0.15 x (45)m	22.6589	19.9383	20.9485	17.8840	16.9683	14.8917	14.4173	15.2191	15.6379	17.9127	19.6247	22.3433 (46)
									Total =	Sum (45)m =		1456.2969

Water storage loss:

Total storage loss

0.0000 (56)

If cylinder contains dedicated solar storage

0.0000 (57)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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	48.6049	42.9642	46.3040	42.9503	42.8214	39.8164	40.4983	41.7564	41.6935	44.8448	45.2869	48.4787 (61)

Total heat required for water heating calculated for each month

197.4339 (62)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
WWHRS	-21.3748	-18.9040	-19.7952	-16.3912	-15.2760	-13.0718	-12.2527	-13.0295	-13.5246	-15.9440	-18.0626	-20.9789 (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

176.4550 (64)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat gains from water heating, kWh/month	62.3785	54.9376	58.0118	50.3805	48.3185	42.9639	42.0829	44.1747	45.0874	50.9176	54.8230	61.6473 (65)

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

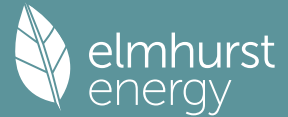
Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	67.2056	67.2056	67.2056	67.2056	67.2056	67.2056	67.2056	67.2056	67.2056	67.2056	67.2056	67.2056 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	58.3191	64.5676	58.3191	60.2631	58.3191	60.2631	58.3191	58.3191	60.2631	58.3191	60.2631	58.3191 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	115.5483	116.7473	113.7258	107.2933	99.1735	91.5420	86.4437	85.2447	88.2662	94.6987	102.8185	110.4500 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.7206	29.7206	29.7206	29.7206	29.7206	29.7206	29.7206	29.7206	29.7206	29.7206	29.7206	29.7206 (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)	-53.7645	-53.7645	-53.7645	-53.7645	-53.7645	-53.7645	-53.7645	-53.7645	-53.7645	-53.7645	-53.7645	-53.7645 (71)
Water heating gains (Table 5)	83.8420	81.7523	77.9729	69.9729	64.9442	59.6721	56.5630	59.3746	62.6214	68.4376	76.1431	82.8593 (72)
Total internal gains	303.8710	309.2288	296.1794	283.6910	268.5985	254.6389	244.4875	246.1001	254.3123	267.6170	285.3863	297.7900 (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		
Southwest	2.1400		36.7938		0.6300		0.7700		24.0636 (79)
Northwest	6.0600		11.2829		0.6300		0.7700		20.8962 (81)

Solar gains	44.9598	83.5240	132.7174	195.3451	247.0086	257.6291	243.2188	202.7788	154.1062	97.2827	55.1154	37.6583 (83)
Total gains	348.8308	392.7528	428.8968	479.0361	515.6070	512.2680	487.7063	448.8788	408.4185	364.8997	340.5018	335.4483 (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	44.2909	44.4171	44.5415	45.1353	45.2482	45.7811	45.7811	45.8811	45.5743	45.2482	45.0204	44.7848
alpha	3.9527	3.9611	3.9694	4.0090	4.0165	4.0521	4.0521	4.0587	4.0383	4.0165	4.0014	3.9857
util living area	0.9723	0.9551	0.9217	0.8361	0.6927	0.5150	0.3817	0.4296	0.6589	0.8756	0.9538	0.9758 (86)
MIT	19.5869	19.8136	20.1398	20.5547	20.8359	20.9623	20.9912	20.9859	20.9003	20.5333	20.0044	19.5543 (87)
Th 2	20.4106	20.4123	20.4140	20.4217	20.4231	20.4298	20.4298	20.4311	20.4272	20.4231	20.4202	20.4171 (88)
util rest of house	0.9690	0.9498	0.9125	0.8180	0.6624	0.4739	0.3340	0.3793	0.6174	0.8575	0.9475	0.9729 (89)
MIT 2	19.0855	19.3102	19.6310	20.0347	20.2924	20.4043	20.4251	20.4232	20.3550	20.0218	19.5065	19.0583 (90)
Living area fraction	FLA = Living area / (4) = 0.8750 (91)											
MIT	19.5243	19.7506	20.0762	20.4897	20.7680	20.8925	20.9204	20.9156	20.8321	20.4694	19.9422	19.4923 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.5243	19.7506	20.0762	20.4897	20.7680	20.8925	20.9204	20.9156	20.8321	20.4694	19.9422	19.4923 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9630	0.9430	0.9066	0.8202	0.6808	0.5074	0.3751	0.4223	0.6472	0.8591	0.9416	0.9673 (94)
Useful gains	335.9214	370.3657	388.8405	392.9009	351.0319	259.9153	182.9567	189.5502	264.3091	313.4690	320.6142	324.4840 (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	674.7390	656.3099	598.3111	504.0475	393.3914	269.8075	185.2477	193.1950	289.9661	428.1562	559.9418	670.2804 (97)
Space heating kWh	252.0803	192.1545	155.8462	80.0256	31.5154	0.0000	0.0000	0.0000	0.0000	85.3273	172.3158	257.2725 (98a)
Space heating requirement - total per year (kWh/year)	1226.5377											
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	252.0803	192.1545	155.8462	80.0256	31.5154	0.0000	0.0000	0.0000	0.0000	85.3273	172.3158	257.2725 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	1226.5377											
Space heating per m2	(98c) / (4) = 32.6207 (99)											

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

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)

Fraction of space heat from main system(s)	1.0000 (202)											
Efficiency of main space heating system 1 (in %)	92.4000 (206)											
Efficiency of main space heating system 2 (in %)	0.0000 (207)											
Efficiency of secondary/supplementary heating system, %	0.0000 (208)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	252.0803	192.1545	155.8462	80.0256	31.5154	0.0000	0.0000	0.0000	0.0000	85.3273	172.3158	257.2725 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	272.8142	207.9594	168.6647	86.6078	34.1076	0.0000	0.0000	0.0000	0.0000	92.3456	186.4890	278.4335 (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	178.2895	156.9820	166.1654	145.7860	140.6676	126.0223	124.3607	130.1873	132.4216	148.3185	158.0553	176.4550 (64)
Efficiency of water heater (217)m	85.1233	84.8157	84.2442	83.1507	81.7475	80.3000	80.3000	80.3000	80.3000	83.2408	84.5670	85.1882 (216)
Fuel for water heating, kWh/month	209.4485	185.0860	197.2425	175.3275	172.0759	156.9394	154.8701	162.1262	164.9086	178.1801	186.8996	207.1354 (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	12.1176	9.7212	8.7528	6.4127	4.9533	4.0469	4.5186	5.8735	7.6290	10.0097	11.3060	12.4543 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-18.1881	-25.9590	-37.8003	-43.1231	-47.0993	-44.2564	-43.7809	-41.0707	-36.3274	-30.0315	-20.1345	-15.6935 (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	-9.3388	-19.7446	-39.3998	-59.3751	-78.6604	-79.0215	-78.0222	-65.9348	-48.2083	-28.2236	-12.4714	-7.3719 (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	1327.4217 (211)											
Space heating fuel - main system 2	0.0000 (213)											
Space heating fuel - secondary	0.0000 (215)											
Efficiency of water heater	80.3000											

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Water heating fuel used	2150.2397 (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)	97.7956 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-929.2371 (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	2732.2199 (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	1327.4217	0.2100	278.7586 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2150.2397	0.2100	451.5503 (264)
Space and water heating			730.3089 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	97.7956	0.1443	14.1149 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-403.4648	0.1343	-54.1702
PV Unit electricity exported	-525.7722	0.1258	-66.1524
Total			-120.3226 (269)
Total CO2, kg/year			636.0305 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.9200 (273)

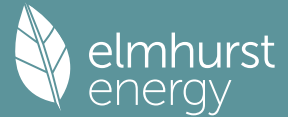
13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1327.4217	1.1300	1499.9865 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2150.2397	1.1300	2429.7708 (278)
Space and water heating			3929.7574 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	97.7956	1.5338	150.0022 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-403.4648	1.4962	-603.6612
PV Unit electricity exported	-525.7722	0.4618	-242.8239
Total			-846.4851 (283)
Total Primary energy kWh/year			3363.3752 (286)
Target Primary Energy Rate (TPER)			89.4500 (287)

Appendix B

SAP TER/DER Worksheets – *Refurbishment, Baseline*

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Property Reference	House Type 1 End - Refurb				Issued on Date	30/08/2024
Assessment Reference	House Type 1 End Baseline	Prop Type Ref				
Property	House Type 1, Edmansons Close, Tottenham, N17 6XD					
SAP Rating	1 G	DER	45.57	TER	14.58	
Environmental	69 C	% DER < TER				-212.55
CO ₂ Emissions (t/year)	1.88	DFEE	268.52	TFEE	42.76	
Compliance Check	See BREL	% DFEE < TFEE				-527.94
% DPER < TPER	-512.54	DPER	470.31	TPER	76.78	
Assessor Details	Miss Eleanor Ballinger				Assessor ID	M976-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	30.0000 (1b)	x 2.4000 (2b)	= 72.0000 (1b) - (3b)
First floor	17.8000 (1c)	x 2.6000 (2c)	= 46.2800 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	47.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 118.2800 (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	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) = 0.2536 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	1.0036 (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) = 0.9284 (21)

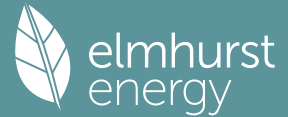
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	1.1837	1.1605	1.1372	1.0212	0.9980	0.8819	0.8819	0.8587	0.9284	0.9980	1.0444	1.0908 (22b)
Effective ac	1.1837	1.1605	1.1372	1.0212	0.9980	0.8889	0.8889	0.8687	0.9309	0.9980	1.0444	1.0908 (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
Front door			1.8900	3.0000	5.6700		(26)
Window (Uw = 4.80)			8.1300	4.0268	32.7383		(27)
Ground Floor			30.0000	0.6800	20.4000		(28a)
External Wall	71.4800	10.0200	61.4600	2.1000	129.0660		(29a)
1st Floor	17.8000		17.8000	2.3000	40.9400		(30)
Ground floor	12.2000		12.2000	2.3000	28.0600		(30)
Total net area of external elements Aum (A, m ²)			131.4800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	256.8743		(33)
Party Wall			26.1100	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							26.2960 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	283.1703 (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	46.2012	45.2953	44.3894	39.8599	38.9540	34.6964	34.6964	33.9080	36.3364	38.9540	40.7658	42.5776 (38)
Heat transfer coeff												

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Average = Sum(39)m / 12 =	329.3714	328.4655	327.5596	323.0301	322.1243	317.8667	317.8667	317.0782	319.5066	322.1243	323.9360	325.7478 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	6.8906	6.8717	6.8527	6.7580	6.7390	6.6499	6.6499	6.6334	6.6842	6.7390	6.7769	6.8148 (40)
HLP (average)												6.7550
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.6256 (42)
Hot water usage for mixer showers												
70.7781	69.7145	68.1645	65.1989	63.0104	60.5698	59.1826	60.7208	62.4070	65.0275	68.0567	70.5069	(42a)
Hot water usage for baths												
23.4307	23.0827	22.5927	21.6892	21.0126	20.2624	19.8572	20.3438	20.8736	21.6764	22.5985	23.3515	(42b)
Hot water usage for other uses												
32.9237	31.7265	30.5292	29.3320	28.1348	26.9376	26.9376	28.1348	29.3320	30.5292	31.7265	32.9237	(42c)
Average daily hot water use (litres/day)												116.9096 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
127.1325	124.5236	121.2864	116.2201	112.1578	107.7698	105.9774	109.1994	112.6126	117.2331	122.3817	126.7821	(44)
Energy content	201.3468	177.3200	186.4127	159.0995	150.9860	132.5156	128.1704	135.2117	138.8626	159.0841	174.3551	198.5101 (45)
Energy content (annual)										Total = Sum(45)m =	1941.8747	
Distribution loss (46)m = 0.15 x (45)m												
30.2020	26.5980	27.9619	23.8649	22.6479	19.8773	19.2256	20.2818	20.8294	23.8626	26.1533	29.7765	(46)
Water storage loss:												
Store volume												170.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.2000 (48)
Temperature factor from Table 2b												0.6000 (49)
Enter (49) or (54) in (55)												0.7200 (55)
Total storage loss												
22.3200	20.1600	22.3200	21.6000	22.3200	21.6000	22.3200	22.3200	21.6000	22.3200	21.6000	22.3200	(56)
If cylinder contains dedicated solar storage												
22.3200	20.1600	22.3200	21.6000	22.3200	21.6000	22.3200	22.3200	21.6000	22.3200	21.6000	22.3200	(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	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month												
223.6668	197.4800	208.7327	180.6995	173.3060	154.1156	150.4904	157.5317	160.4626	181.4041	195.9551	220.8301	(62)
WWHRS	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	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h												
223.6668	197.4800	208.7327	180.6995	173.3060	154.1156	150.4904	157.5317	160.4626	181.4041	195.9551	220.8301	(64)
												2204.6747 (64)
12Total per year (kWh/year)												2205 (64)
Electric shower(s)												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
												0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												
Heat gains from water heating, kWh/month												
84.8038	75.0869	79.8382	70.1806	68.0588	61.3414	60.4727	62.8139	63.4518	70.7515	75.2531	83.8606	(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	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	73.6144	81.5017	73.6144	76.0682	73.6144	76.0682	73.6144	73.6144	76.0682	73.6144	76.0682	73.6144 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	141.5228	142.9913	139.2906	131.4122	121.4671	112.1201	105.8757	104.4072	108.1079	115.9863	125.9314	135.2784 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279 (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)												
	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229 (71)
Water heating gains (Table 5)												
	113.9836	111.7365	107.3094	97.4730	91.4769	85.1964	81.2805	84.4273	88.1275	95.0961	104.5182	112.7159 (72)
Total internal gains												
	376.5044	383.6131	367.5981	352.3371	333.9420	320.7684	308.1542	309.8325	319.6873	332.0804	353.9014	368.9923 (73)

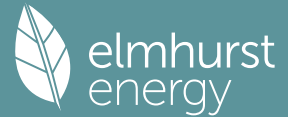
6. Solar gains

[Jan]													
					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d	Gains W	
Northeast					4.7400	11.2829	0.8500		0.7000		0.7700	22.0521 (75)	
Southwest					3.3900	36.7938	0.8500		0.7000		0.7700	51.4310 (79)	
Solar gains	73.4831	132.4938	200.7399	281.3378	344.8879	355.4869	337.2786	287.8657	228.3356	151.6797	89.3498	62.0231 (83)	
Total gains	449.9875	516.1069	568.3379	633.6748	678.8299	676.2553	645.4328	597.6981	548.0228	483.7602	443.2512	431.0154 (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	10.0781	10.1059	10.1339	10.2760	10.3049	10.4429	10.4429	10.4689	10.3893	10.3049	10.2472	10.1902
alpha	1.6719	1.6737	1.6756	1.6851	1.6870	1.6962	1.6962	1.6979	1.6926	1.6870	1.6831	1.6793
util living area												
	0.9860	0.9816	0.9748	0.9606	0.9356	0.8913	0.8344	0.8574	0.9271	0.9671	0.9818	0.9871 (86)
MIT	15.5750	15.8602	16.4815	17.4114	18.4278	19.4257	20.0542	19.9578	19.1409	17.8595	16.5852	15.5433 (87)
Th 2	18.0000	18.0000	18.0000	18.0000	18.0000	18.0000	18.0000	18.0000	18.0000	18.0000	18.0000	18.0000 (88)
util rest of house												

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MIT 2	0.9809	0.9746	0.9641	0.9399	0.8893	0.7645	0.5095	0.5770	0.8434	0.9452	0.9733	0.9823 (89)
Living area fraction	12.6026	12.9515	13.7143	14.8463	16.0777	17.2323	17.8418	17.7783	16.9366	15.4025	13.8386	12.5559 (90)
MIT	13.7126	14.0377	14.7476	15.8042	16.9553	18.0514	18.6680	18.5922	fLA = Living area / (4) =			0.3734 (91)
Temperature adjustment									17.7598	16.3200	14.8642	13.6715 (92)
adjusted MIT	13.7126	14.0377	14.7476	15.8042	16.9553	18.0514	18.6680	18.5922	17.7598	16.3200	14.8642	13.6715 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9659	0.9561	0.9411	0.9111	0.8597	0.7683	0.6348	0.6759	0.8307	0.9206	0.9552	0.9683	(94)
Useful gains	434.6327	493.4592	534.8884	577.3240	583.6234	519.5754	409.7472	403.9657	455.2284	445.3285	423.4060	417.3427	(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	3100.2364	3001.4218	2701.5905	2230.2506	1692.8549	1097.0730	657.3331	695.1035	1169.3145	1842.5528	2515.1145	3085.3176	(97)
Space heating kWh	1983.2092	1685.3508	1612.0264	1190.1071	825.2682	0.0000	0.0000	0.0000	0.0000	1039.5349	1506.0301	1984.9734	(98a)
Space heating requirement - total per year (kWh/year)												11826.5000	
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	1983.2092	1685.3508	1612.0264	1190.1071	825.2682	0.0000	0.0000	0.0000	0.0000	1039.5349	1506.0301	1984.9734	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												11826.5000	
Space heating per m2											(98c) / (4) =	247.4163	(99)

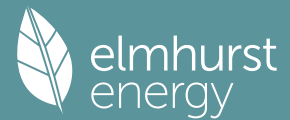
9a. Energy requirements - Individual heating systems, including micro-CHP

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 %)													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	1983.2092	1685.3508	1612.0264	1190.1071	825.2682	0.0000	0.0000	0.0000	0.0000	1039.5349	1506.0301	1984.9734	(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)	1983.2092	1685.3508	1612.0264	1190.1071	825.2682	0.0000	0.0000	0.0000	0.0000	1039.5349	1506.0301	1984.9734	(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 requirement	223.6668	197.4800	208.7327	180.6995	173.3060	154.1156	150.4904	157.5317	160.4626	181.4041	195.9551	220.8301	(64)
Efficiency of water heater	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(216)
Fuel for water heating, kWh/month	223.6668	197.4800	208.7327	180.6995	173.3060	154.1156	150.4904	157.5317	160.4626	181.4041	195.9551	220.8301	(217)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(219)
(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	47.9436	38.4622	34.6309	25.3721	19.5981	16.0118	17.8781	23.2386	30.1846	39.6039	44.7325	49.2761	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	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)
(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)	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)
(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)	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)
(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)	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)
(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)	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)
(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)	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)
(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)	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)
(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													11826.5000 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													100.0000
Water heating fuel used													2204.6747 (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)													386.9326 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													0.0000 (233)
Wind generation													0.0000 (234)
Hydro-electric generation (Appendix N)													0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)													0.0000 (235)
Appendix Q - special features													
Energy saved or generated													-0.0000 (236)
Energy used													0.0000 (237)
Total delivered energy for all uses													14418.1073 (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	11826.5000	0.1531	1811.0179 (261)	

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Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2204.6747	0.1412	311.3808 (264)
Space and water heating			2122.3987 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	386.9326	0.1443	55.8463 (268)
Total CO2, kg/year			2178.2451 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			45.5700 (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	11826.5000	1.5669	18531.3127 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2204.6747	1.5223	3356.0850 (278)
Space and water heating			21887.3977 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	386.9326	1.5338	593.4902 (282)
Total Primary energy kWh/year			22480.8879 (286)
Dwelling Primary energy Rate (DPER)			470.3100 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	30.0000 (1b)	x 2.4000 (2b)	= 72.0000 (1b) - (3b)
First floor	17.8000 (1c)	x 2.6000 (2c)	= 46.2800 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	47.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	118.2800 (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) = 0.1691 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4191 (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) = 0.3877 (21)

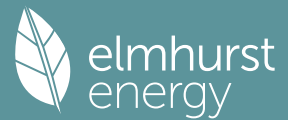
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4943	0.4846	0.4749	0.4264	0.4167	0.3683	0.3683	0.3586	0.3877	0.4167	0.4361	0.4555 (22b)
Effective ac	0.6221	0.6174	0.6128	0.5909	0.5868	0.5678	0.5678	0.5643	0.5751	0.5868	0.5951	0.6037 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.20)			8.1300	1.1450	9.3092		(27)
Ground Floor			30.0000	0.1300	3.9000		(28a)
External Wall	71.4800	10.0200	61.4600	0.1800	11.0628		(29a)
1st Floor	17.8000		17.8000	0.1100	1.9580		(30)
Ground floor	12.2000		12.2000	0.1100	1.3420		(30)
Total net area of external elements Aum(A, m2)			131.4800				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	29.4620	(33)
Party Wall			26.1100	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (User defined value 0.050 * total exposed area)							6.5740 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	36.0360 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	24.2840	24.0988	23.9173	23.0650	22.9055	22.1631	22.1631	22.0256	22.4491	22.9055	23.2281	23.5654 (38)
Heat transfer coeff												

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Average = Sum(39)m / 12 =	60.3199	60.1348	59.9533	59.1009	58.9415	58.1991	58.1991	58.0616	58.4850	58.9415	59.2641	59.6014 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2619	1.2580	1.2543	1.2364	1.2331	1.2176	1.2176	1.2147	1.2235	1.2331	1.2398	1.2469 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.6256 (42)
Hot water usage for mixer showers												
51.4750	50.7014	49.5742	47.4174	45.8258	44.0508	43.0419	44.1606	45.3869	47.2927	49.4958	51.2778	(42a)
Hot water usage for baths												
22.2592	21.9286	21.4631	20.6047	19.9620	19.2493	18.8644	19.3266	19.8300	20.5925	21.4686	22.1839	(42b)
Hot water usage for other uses												
31.2775	30.1401	29.0028	27.8654	26.7280	25.5907	25.5907	26.7280	27.8654	29.0028	30.1401	31.2775	(42c)
Average daily hot water use (litres/day)												96.5301 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	105.0116	102.7701	100.0400	95.8875	92.5158	88.8908	87.4969	90.2153	93.0823	96.8880	101.1045	104.7392 (44)
Energy conte	166.3128	146.3433	153.7578	131.2652	124.5440	109.3016	105.8199	111.7053	114.7797	131.4761	144.0419	163.9962 (45)
Energy content (annual)										Total = Sum(45)m =		1603.3439
Distribution loss (46)m = 0.15 x (45)m												
24.9469	21.9515	23.0637	19.6898	18.6816	16.3952	15.8730	16.7558	17.2170	19.7214	21.6063	24.5994	(46)
Water storage loss:												
Store volume												170.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5003 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8102 (55)
Total storage loss												
25.1153	22.6848	25.1153	24.3051	25.1153	24.3051	25.1153	25.1153	24.3051	25.1153	24.3051	25.1153	(56)
If cylinder contains dedicated solar storage												
25.1153	22.6848	25.1153	24.3051	25.1153	24.3051	25.1153	25.1153	24.3051	25.1153	24.3051	25.1153	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month												
214.6905	190.0393	202.1355	178.0824	172.9217	156.1187	154.1976	160.0830	161.5969	179.8538	190.8590	212.3739	(62)
WWHRS	-23.5322	-20.8121	-21.7932	-18.0456	-16.8179	-14.3912	-13.4894	-14.3447	-14.8897	-17.5533	-19.8857	-23.0964 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	191.1583	169.2272	180.3422	160.0367	156.1039	141.7275	140.7082	145.7384	146.7072	162.3005	170.9733	189.2775 (64)
								Total per year (kWh/year) = Sum(64)m =				1954.3009 (64)
12Total per year (kWh/year)												1954 (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												
94.0012	83.6159	89.8266	81.0994	80.1131	73.7965	73.8873	75.8442	75.6180	82.4180	85.3476	93.2309	(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	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
73.6144	81.5017	73.6144	76.0682	73.6144	76.0682	73.6144	73.6144	76.0682	73.6144	76.0682	73.6144	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
141.5228	142.9913	139.2906	131.4122	121.4671	112.1201	105.8757	104.4072	108.1079	115.9863	125.9314	135.2784	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	(71)
Water heating gains (Table 5)												
126.3456	124.4285	120.7347	112.6380	107.6788	102.4951	99.3109	101.9411	105.0250	110.7768	118.5384	125.3104	(72)
Total internal gains	391.8664	399.3051	384.0233	370.5021	353.1440	338.0671	326.1846	327.3463	336.5847	350.7612	370.9216	384.5868 (73)

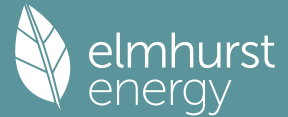
6. Solar gains

[Jan]												
				Area	Solar flux	g		FF		Access	Gains	
				m2	Table 6a	Specific data		Specific data		factor	W	
					W/m2	or Table 6b		or Table 6c		Table 6d		
Northeast				4.7400	11.2829	0.6300		0.7000		0.7700	16.3445 (75)	
Southwest				3.3900	36.7938	0.6300		0.7000		0.7700	38.1194 (79)	
Solar gains	54.4640	98.2013	148.7837	208.5209	255.6228	263.4786	249.9830	213.3593	169.2369	112.4215	66.2240	45.9701 (83)
Total gains	446.3304	497.5064	532.8070	579.0230	608.7667	601.5456	576.1676	540.7056	505.8217	463.1827	437.1456	430.5569 (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	55.0307	55.2001	55.3672	56.1657	56.3176	57.0360	57.0360	57.1711	56.7572	56.3176	56.0111	55.6941
alpha	4.6687	4.6800	4.6911	4.7444	4.7545	4.8024	4.8024	4.8114	4.7838	4.7545	4.7341	4.7129
util living area	0.9874	0.9779	0.9585	0.9005	0.7803	0.5940	0.4394	0.4854	0.7227	0.9195	0.9760	0.9892 (86)
MIT	19.7547	19.9407	20.2107	20.5723	20.8384	20.9665	20.9935	20.9898	20.9160	20.5866	20.1237	19.7320 (87)
Th 2	19.8708	19.8738	19.8768	19.8910	19.8936	19.9060	19.9060	19.9083	19.9012	19.8936	19.8883	19.8827 (88)
util rest of house												

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MIT 2	0.9835	0.9712	0.9454	0.8698	0.7192	0.5030	0.3328	0.3746	0.6345	0.8876	0.9673	0.9859 (89)
Living area fraction	18.4599	18.6962	19.0345	19.4775	19.7658	19.8882	19.9041	19.9050	19.8491	19.5063	18.9397	18.4398 (90)
MIT	18.9434	19.1609	19.4737	19.8863	20.1663	20.2909	20.3109	20.3101	fLA = Living area / (4) =			0.3734 (91)
Temperature adjustment									20.2475	19.9097	19.3819	18.9224 (92)
adjusted MIT	18.9434	19.1609	19.4737	19.8863	20.1663	20.2909	20.3109	20.3101	20.2475	19.9097	19.3819	18.9224 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9791	0.9656	0.9396	0.8696	0.7354	0.5360	0.3727	0.4161	0.6642	0.8882	0.9622	0.9819	(94)
Useful gains	437.0165	480.3913	500.6192	503.5375	447.7132	322.4561	214.7554	224.9875	335.9510	411.3973	420.6342	422.7717	(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	883.2897	857.5776	777.8178	649.3021	499.0176	331.2044	215.9725	227.0248	359.5363	548.7286	727.8732	877.4731	(97)
Space heating kWh	332.0272	253.4691	206.2357	104.9505	38.1704	0.0000	0.0000	0.0000	0.0000	102.1745	221.2120	338.2978	(98a)
Space heating requirement - total per year (kWh/year)												1596.5375	
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	332.0272	253.4691	206.2357	104.9505	38.1704	0.0000	0.0000	0.0000	0.0000	102.1745	221.2120	338.2978	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1596.5375	
Space heating per m2											(98c) / (4) =	33.4004	(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	332.0272	253.4691	206.2357	104.9505	38.1704	0.0000	0.0000	0.0000	0.0000	102.1745	221.2120	338.2978 (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)	359.7262	274.6145	223.4407	113.7059	41.3548	0.0000	0.0000	0.0000	0.0000	110.6983	239.6664	366.5199 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	191.1583	169.2272	180.3422	160.0367	156.1039	141.7275	140.7082	145.7384	146.7072	162.3005	170.9733	189.2775 (64)
Efficiency of water heater (217)m	85.2856	84.9637	84.3614	83.1372	81.4214	79.8000	79.8000	79.8000	79.8000	83.0519	84.6385	79.8000 (216)
Fuel for water heating, kWh/month	224.1390	199.1759	213.7734	192.4971	191.7235	177.6034	176.3261	182.6295	183.8436	195.4206	202.0040	85.3466 (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	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	15.2956	12.2707	11.0484	8.0945	6.2525	5.1083	5.7037	7.4139	9.6299	12.6350	14.2712	15.7207 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-27.2033	-37.9156	-53.9188	-60.0080	-64.2650	-59.9066	-59.2351	-56.1708	-50.6383	-43.1382	-29.7804	-23.5767 (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	-16.7226	-35.0158	-69.2729	-103.5529	-136.4153	-136.8134	-135.1316	-114.5826	-84.2592	-49.8221	-22.2503	-13.2297 (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												1729.7264 (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												2360.9110 (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)												123.4445 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-1482.8252 (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												2817.2567 (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	1729.7264	0.2100	363.2425 (261)	

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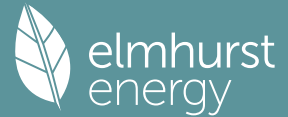


Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2360.9110	0.2100	495.7913 (264)
Space and water heating			859.0339 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	123.4445	0.1443	17.8168 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-565.7568	0.1348	-76.2539
PV Unit electricity exported	-917.0683	0.1260	-115.5956
Total			-191.8494 (269)
Total CO2, kg/year			696.9305 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.5800 (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	1729.7264	1.1300	1954.5908 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2360.9110	1.1300	2667.8294 (278)
Space and water heating			4622.4203 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	123.4445	1.5338	189.3432 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-565.7568	1.4981	-847.5841
PV Unit electricity exported	-917.0683	0.4627	-424.3228
Total			-1271.9070 (283)
Total Primary energy kWh/year			3669.9574 (286)
Target Primary Energy Rate (TPER)			76.7800 (287)

Full SAP Calculation Printout



Property Reference	House Type 1 End - Refurb				Issued on Date	30/08/2024
Assessment Reference	House Type 1 End GLA Baseline	Prop Type Ref				
Property	House Type 1, Edmansons Close, Tottenham, N17 6XD					
SAP Rating	70 C	DER	41.18	TER	15.12	
Environmental	72 C	% DER < TER				-172.35
CO ₂ Emissions (t/year)	1.66	DFEE	114.78	TFEE	42.76	
Compliance Check	See BREL	% DFEE < TFEE				-168.41
% DPER < TPER	-184.86	DPER	226.97	TPER	79.68	
Assessor Details	Miss Eleanor Ballinger				Assessor ID	M976-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	30.0000 (1b)	x 2.4000 (2b)	= 72.0000 (1b) - (3b)
First floor	17.8000 (1c)	x 2.6000 (2c)	= 46.2800 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	47.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 118.2800 (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	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) = 0.2536 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	1.0036 (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) = 0.9284 (21)

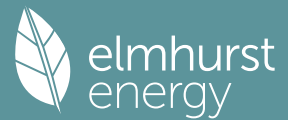
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	1.1837	1.1605	1.1372	1.0212	0.9980	0.8819	0.8819	0.8587	0.9284	0.9980	1.0444	1.0908 (22b)
Effective ac	1.1837	1.1605	1.1372	1.0212	0.9980	0.8889	0.8889	0.8687	0.9309	0.9980	1.0444	1.0908 (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
Front door			1.8900	3.0000	5.6700		(26)
Window (Uw = 1.60)			8.1300	1.5038	12.2256		(27)
Ground Floor			30.0000	0.2500	7.5000		(28a)
External Wall	71.4800	10.0200	61.4600	0.5500	33.8030		(29a)
1st Floor	17.8000		17.8000	0.1600	2.8480		(30)
Ground floor	12.2000		12.2000	0.1600	1.9520		(30)
Total net area of external elements Aum (A, m ²)			131.4800				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 63.9986		(33)
Party Wall			26.1100	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							26.2960 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	90.2946 (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	46.2012	45.2953	44.3894	39.8599	38.9540	34.6964	34.6964	33.9080	36.3364	38.9540	40.7658	42.5776 (38)
Heat transfer coeff												

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Average = Sum(39)m / 12 =	136.4958	135.5898	134.6839	130.1544	129.2486	124.9910	124.9910	124.2025	126.6309	129.2486	131.0603	132.8721 (39)
	130.0141											
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	2.8556	2.8366	2.8177	2.7229	2.7039	2.6149	2.6149	2.5984	2.6492	2.7039	2.7418	2.7798 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.6256 (42)											
Hot water usage for mixer showers	70.7781	69.7145	68.1645	65.1989	63.0104	60.5698	59.1826	60.7208	62.4070	65.0275	68.0567	70.5069 (42a)
Hot water usage for baths	23.4307	23.0827	22.5927	21.6892	21.0126	20.2624	19.8572	20.3438	20.8736	21.6764	22.5985	23.3515 (42b)
Hot water usage for other uses	32.9237	31.7265	30.5292	29.3320	28.1348	26.9376	26.9376	28.1348	29.3320	30.5292	31.7265	32.9237 (42c)
Average daily hot water use (litres/day)	116.9096 (43)											
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	127.1325	124.5236	121.2864	116.2201	112.1578	107.7698	105.9774	109.1994	112.6126	117.2331	122.3817	126.7821 (44)
Energy content (annual)	201.3468	177.3200	186.4127	159.0995	150.9860	132.5156	128.1704	135.2117	138.8626	159.0841	174.3551	198.5101 (45)
Distribution loss (46)m = 0.15 x (45)m	30.2020	26.5980	27.9619	23.8649	22.6479	19.8773	19.2256	20.2818	20.8294	23.8626	26.1533	29.7765 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (59)
Total heat required for water heating calculated for each month	252.3057	223.3474	237.3716	208.4146	201.9449	181.8306	179.1293	186.1706	188.1777	210.0430	223.6702	249.4690 (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	252.3057	223.3474	237.3716	208.4146	201.9449	181.8306	179.1293	186.1706	188.1777	210.0430	223.6702	249.4690 (64)
12Total per year (kWh/year)	2541.8747 (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	79.6875	70.4657	74.7220	65.2294	62.9426	56.3902	55.3564	57.6976	58.5006	65.6352	70.3018	78.7443 (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	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	73.6144	81.5017	73.6144	76.0682	73.6144	76.0682	73.6144	73.6144	76.0682	73.6144	76.0682	73.6144 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	141.5228	142.9913	139.2906	131.4122	121.4671	112.1201	105.8757	104.4072	108.1079	115.9863	125.9314	135.2784 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279 (69)
Pumps, fans	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229 (71)
Water heating gains (Table 5)	107.1069	104.8597	100.4327	90.5963	84.6002	78.3197	74.4038	77.5505	81.2508	88.2194	97.6415	105.8392 (72)
Total internal gains	379.6277	386.7364	370.7214	355.4603	337.0653	313.8916	301.2775	302.9558	312.8106	335.2037	357.0247	372.1156 (73)

6. Solar gains

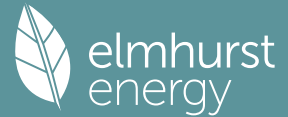
[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d				Gains W
Northeast				4.7400	11.2829	0.6300	0.7000	0.7700				16.3445 (75)
Southwest				3.3900	36.7938	0.6300	0.7000	0.7700				38.1194 (79)

Solar gains	54.4640	98.2013	148.7837	208.5209	255.6228	263.4786	249.9830	213.3593	169.2369	112.4215	66.2240	45.9701 (83)
Total gains	434.0917	484.9376	519.5050	563.9813	592.6881	577.3702	551.2605	516.3150	482.0475	447.6252	423.2487	418.0857 (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	24.3190	24.4815	24.6462	25.5039	25.6826	26.5575	26.5575	26.7261	26.2135	25.6826	25.3276	24.9822
alpha	2.6213	2.6321	2.6431	2.7003	2.7122	2.7705	2.7705	2.7817	2.7476	2.7122	2.6885	2.6655
util living area	0.9895	0.9851	0.9777	0.9590	0.9197	0.8406	0.7339	0.7716	0.9020	0.9656	0.9848	0.9906 (86)
MIT	17.8346	18.0744	18.5144	19.1975	19.8518	20.4431	20.7426	20.6931	20.2267	19.4060	18.5575	17.8560 (87)
Th 2	18.8240	18.8339	18.8439	18.8950	18.9053	18.9549	18.9549	18.9643	18.9357	18.9053	18.8846	18.8642 (88)
util rest of house	0.9854	0.9791	0.9678	0.9379	0.8687	0.7128	0.4857	0.5434	0.8138	0.9434	0.9775	0.9870 (89)
MIT 2	16.1637	16.4072	16.8490	17.5493	18.1775	18.7198	18.9078	18.8969	18.5480	17.7672	16.9187	16.2083 (90)
Living area fraction	FLA = Living area / (4) = 0.3734 (91)											
MIT	16.7877	17.0298	17.4709	18.1648	18.8027	19.3634	19.5930	19.5677	19.1749	18.3792	17.5307	16.8236 (92)

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Temperature adjustment												0.0000
adjusted MIT	16.7877	17.0298	17.4709	18.1648	18.8027	19.3634	19.5930	19.5677	19.1749	18.3792	17.5307	16.8236 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9792	0.9713	0.9581	0.9272	0.8653	0.7460	0.5816	0.6294	0.8281	0.9350	0.9701	0.9814	(94)
Useful gains	425.0568	471.0354	497.7623	522.9451	512.8459	430.6961	320.6325	324.9837	399.1634	418.5207	410.5860	410.3016	(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	1704.5158	1644.6812	1477.6027	1205.8523	918.0192	595.3776	374.0964	393.4357	642.6365	1005.4467	1367.0454	1677.3243	(97)
Space heating kWh	951.9175	788.6900	729.0013	491.6932	301.4489	0.0000	0.0000	0.0000	0.0000	436.6729	688.6508	942.6649	(98a)
Space heating requirement - total per year (kWh/year)												5330.7394	
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	951.9175	788.6900	729.0013	491.6932	301.4489	0.0000	0.0000	0.0000	0.0000	436.6729	688.6508	942.6649	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5330.7394	
Space heating per m2										(98c) / (4) =		111.5217	(99)

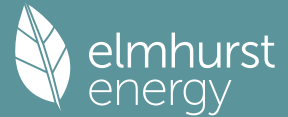
9a. Energy requirements - Individual heating systems, including micro-CHP

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 %)													84.5000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	951.9175	788.6900	729.0013	491.6932	301.4489	0.0000	0.0000	0.0000	0.0000	436.6729	688.6508	942.6649	(98)
Space heating efficiency (main heating system 1)	84.5000	84.5000	84.5000	84.5000	84.5000	0.0000	0.0000	0.0000	0.0000	84.5000	84.5000	84.5000	(210)
Space heating fuel (main heating system)	1126.5296	933.3609	862.7234	581.8854	356.7443	0.0000	0.0000	0.0000	0.0000	516.7727	814.9713	1115.5798	(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	252.3057	223.3474	237.3716	208.4146	201.9449	181.8306	179.1293	186.1706	188.1777	210.0430	223.6702	249.4690	(64)
Efficiency of water heater	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(216)
Fuel for water heating, kWh/month	281.9058	249.5501	265.2197	232.8655	225.6368	203.1627	200.1445	208.0118	210.2544	234.6850	249.9108	278.7363	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	17.8356	16.1096	17.8356	17.2603	17.8356	17.2603	17.8356	17.8356	17.2603	17.8356	17.2603	17.8356	(231)
Lighting	15.6499	12.5550	11.3044	8.2821	6.3973	5.2266	5.8358	7.5856	9.8530	12.9276	14.6018	16.0849	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												6308.5674	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												89.5000	
Water heating fuel used												2840.0834	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												165.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												210.0000	(231)
Electricity for lighting (calculated in Appendix L)												126.3040	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												9484.9548	(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	6308.5674	0.2100	1324.7992	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2840.0834	0.2100	596.4175	(264)

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Space and water heating			1921.2167 (265)
Pumps, fans and electric keep-hot	210.0000	0.1387	29.1296 (267)
Energy for lighting	126.3040	0.1443	18.2296 (268)
Total CO ₂ , kg/year			1968.5758 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			41.1800 (273)

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

	Energy kWh/year	Primary energy factor kg CO ₂ /kWh	Primary energy kWh/year
Space heating - main system 1	6308.5674	1.1300	7128.6811 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	2840.0834	1.1300	3209.2943 (278)
Space and water heating			10337.9754 (279)
Pumps, fans and electric keep-hot	210.0000	1.5128	317.6880 (281)
Energy for lighting	126.3040	1.5338	193.7293 (282)
Total Primary energy kWh/year			10849.3927 (286)
Dwelling Primary energy Rate (DPER)			226.9700 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	30.0000 (1b)	x 2.4000 (2b)	= 72.0000 (1b) - (3b)
First floor	17.8000 (1c)	x 2.6000 (2c)	= 46.2800 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	47.8000		(4)
Dwelling volume		(3a) + (3b) + (3c) + (3d) + (3e) ... (3n) =	118.2800 (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) = 0.1691 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4191 (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) =	0.3877 (21)

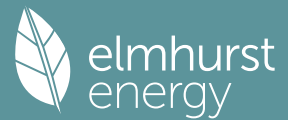
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4943	0.4846	0.4749	0.4264	0.4167	0.3683	0.3683	0.3586	0.3877	0.4167	0.4361	0.4555 (22b)
Effective ac	0.6221	0.6174	0.6128	0.5909	0.5868	0.5678	0.5678	0.5643	0.5751	0.5868	0.5951	0.6037 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.20)			8.1300	1.1450	9.3092		(27)
Ground Floor			30.0000	0.1300	3.9000		(28a)
External Wall	71.4800	10.0200	61.4600	0.1800	11.0628		(29a)
1st Floor	17.8000		17.8000	0.1100	1.9580		(30)
Ground floor	12.2000		12.2000	0.1100	1.3420		(30)
Total net area of external elements Aum(A, m ²)			131.4800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.4620		(33)
Party Wall			26.1100	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (User defined value 0.050 * total exposed area)							6.5740 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	36.0360 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	24.2840	24.0988	23.9173	23.0650	22.9055	22.1631	22.1631	22.0256	22.4491	22.9055	23.2281	23.5654 (38)
Heat transfer coeff	60.3199	60.1348	59.9533	59.1009	58.9415	58.1991	58.1991	58.0616	58.4850	58.9415	59.2641	59.6014 (39)
Average = Sum(39)m / 12 =												59.1002

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HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2619	1.2580	1.2543	1.2364	1.2331	1.2176	1.2176	1.2147	1.2235	1.2331	1.2398	1.2469 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	1.2364 (40)
												31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.6256 (42)
Hot water usage for mixer showers	51.4750	50.7014	49.5742	47.4174	45.8258	44.0508	43.0419	44.1606	45.3869	47.2927	49.4958	51.2778 (42a)
Hot water usage for baths	22.2592	21.9286	21.4631	20.6047	19.9620	19.2493	18.8644	19.3266	19.8300	20.5925	21.4686	22.1839 (42b)
Hot water usage for other uses	31.2775	30.1401	29.0028	27.8654	26.7280	25.5907	25.5907	26.7280	27.8654	29.0028	30.1401	31.2775 (42c)
Average daily hot water use (litres/day)												96.5301 (43)
Daily hot water use	105.0116	102.7701	100.0400	95.8875	92.5158	88.8908	87.4969	90.2153	93.0823	96.8880	101.1045	104.7392 (44)
Energy conte	166.3128	146.3433	153.7578	131.2652	124.5440	109.3016	105.8199	111.7053	114.7797	131.4761	144.0419	163.9962 (45)
Energy content (annual)										Total = Sum(45)m =		1603.3439
Distribution loss (46)m = 0.15 x (45)m	24.9469	21.9515	23.0637	19.6898	18.6816	16.3952	15.8730	16.7558	17.2170	19.7214	21.6063	24.5994 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	50.9589	46.0274	50.9589	47.2870	47.1450	43.8365	44.5875	45.9727	45.9036	49.3731	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	217.2717	192.3707	204.7167	178.5522	171.6891	153.1381	150.4074	157.6780	160.6833	180.8492	193.3570	214.9551 (62)
WWHRS	-23.5322	-20.8121	-21.7932	-18.0456	-16.8179	-14.3912	-13.4894	-14.3447	-14.8897	-17.5533	-19.8857	-23.0964 (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	193.7395	171.5586	182.9234	160.5066	154.8712	138.7469	136.9180	143.3334	145.7936	163.2959	173.4712	191.8587 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		1957.0170 (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	68.0387	60.1660	63.8642	55.4674	53.1972	47.3019	46.3320	48.6352	49.6402	56.0591	60.2227	67.2685 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	73.6144	81.5017	73.6144	76.0682	73.6144	76.0682	73.6144	73.6144	76.0682	73.6144	76.0682	73.6144 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	141.5228	142.9913	139.2906	131.4122	121.4671	112.1201	105.8757	104.4072	108.1079	115.9863	125.9314	135.2784 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229 (71)
Water heating gains (Table 5)	91.4499	89.5327	85.8390	77.0381	71.5015	65.6971	62.2742	65.3699	68.9447	75.3482	83.6426	90.4146 (72)
Total internal gains	356.9707	364.4094	349.1276	334.9021	316.9667	301.2690	289.1480	290.7751	300.5044	315.3326	336.0259	349.6911 (73)

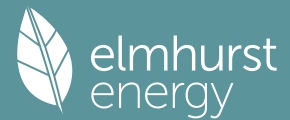
6. Solar gains

[Jan]												Gains
					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d	W
Northeast					4.7400	11.2829	0.6300		0.7000		0.7700	16.3445 (75)
Southwest					3.3900	36.7938	0.6300		0.7000		0.7700	38.1194 (79)
Solar gains	54.4640	98.2013	148.7837	208.5209	255.6228	263.4786	249.9830	213.3593	169.2369	112.4215	66.2240	45.9701 (83)
Total gains	411.4347	462.6106	497.9112	543.4231	572.5894	564.7476	539.1309	504.1344	469.7414	427.7540	402.2499	395.6611 (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	55.0307	55.2001	55.3672	56.1657	56.3176	57.0360	57.0360	57.1711	56.7572	56.3176	56.0111	55.6941
alpha	4.6687	4.6800	4.6911	4.7444	4.7545	4.8024	4.8024	4.8114	4.7838	4.7545	4.7341	4.7129
util living area	0.9909	0.9833	0.9673	0.9177	0.8077	0.6261	0.4679	0.5178	0.7589	0.9375	0.9825	0.9924 (86)
MIT	19.6821	19.8711	20.1468	20.5222	20.8108	20.9582	20.9915	20.9866	20.8959	20.5317	20.0544	19.6587 (87)
Th 2	19.8708	19.8738	19.8768	19.8910	19.8936	19.9060	19.9060	19.9083	19.9012	19.8936	19.8883	19.8827 (88)
util rest of house	0.9880	0.9780	0.9566	0.8907	0.7493	0.5327	0.3552	0.4010	0.6724	0.9109	0.9760	0.9899 (89)
MIT 2	18.3683	18.6094	18.9571	19.4219	19.7409	19.8834	19.9035	19.9038	19.8346	19.4454	18.8540	18.3471 (90)
Living area fraction									fLA = Living area / (4) =			0.3734 (91)
MIT	18.8589	19.0806	19.4014	19.8328	20.1404	20.2848	20.3098	20.3082	20.2310	19.8510	19.3022	18.8368 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8589	19.0806	19.4014	19.8328	20.1404	20.2848	20.3098	20.3082	20.2310	19.8510	19.3022	18.8368 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9844	0.9730	0.9509	0.8890	0.7636	0.5663	0.3975	0.4447	0.7005	0.9097	0.9714	0.9867	(94)
Useful gains	405.0020	450.1293	473.4508	483.1222	437.2066	319.8444	214.3013	224.2084	329.0668	389.1265	390.7417	390.3971	(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	878.1935	852.7453	773.4796	646.1400	497.4907	330.8477	215.9068	226.9144	358.5691	545.2704	723.1550	872.3762	(97)
Space heating kWh	352.0545	270.5580	223.2215	117.3728	44.8514	0.0000	0.0000	0.0000	0.0000	116.1711	239.3376	358.5924	(98a)
Space heating requirement - total per year (kWh/year)												1722.1592	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	352.0545	270.5580	223.2215	117.3728	44.8514	0.0000	0.0000	0.0000	0.0000	116.1711	239.3376	358.5924	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1722.1592	
Space heating per m2											(98c) / (4) =	36.0284	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													92.4000	(206)
Efficiency of main space heating system 2 (in %)													0.0000	(207)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	352.0545	270.5580	223.2215	117.3728	44.8514	0.0000	0.0000	0.0000	0.0000	116.1711	239.3376	358.5924	(98)	
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)	
Space heating fuel (main heating system)	381.0113	292.8117	241.5817	127.0269	48.5404	0.0000	0.0000	0.0000	0.0000	125.7263	259.0234	388.0870	(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	193.7395	171.5586	182.9234	160.5066	154.8712	138.7469	136.9180	143.3334	145.7936	163.2959	173.4712	191.8587	(64)	
Efficiency of water heater	85.6441	85.3529	84.8091	83.7209	82.0832	80.3000	80.3000	80.3000	80.3000	83.6644	85.0714	85.7009	(216)	
Fuel for water heating, kWh/month	226.2146	200.9992	215.6884	191.7162	188.6759	172.7857	170.5080	178.4973	181.5612	195.1797	203.9126	223.8702	(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	7.3041	7.0685	7.3041	7.0685	7.3041	(231)	
Lighting	15.2956	12.2707	11.0484	8.0945	6.2525	5.1083	5.7037	7.4139	9.6299	12.6350	14.2712	15.7207	(232)	
Electricity generated by PVs (Appendix M) (negative quantity)	-27.2033	-37.9156	-53.9188	-60.0080	-64.2650	-59.9066	-59.2351	-56.1708	-50.6383	-43.1382	-29.7804	-23.5767	(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)	-16.7226	-35.0158	-69.2729	-103.5529	-136.4153	-136.8134	-135.1316	-114.5826	-84.2592	-49.8221	-22.2503	-13.2297	(233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)	
Annual totals kWh/year														
Space heating fuel - main system 1												1863.8086	(211)	
Space heating fuel - main system 2												0.0000	(213)	
Space heating fuel - secondary												0.0000	(215)	
Efficiency of water heater												80.3000		
Water heating fuel used												2349.6091	(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)												123.4445	(232)	
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation												-1482.8252	(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												2940.0370	(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	1863.8086	0.2100	391.3998	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2349.6091	0.2100	493.4179	(264)
Space and water heating			884.8177	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	123.4445	0.1443	17.8168	(268)

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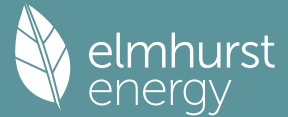


Energy saving/generation technologies			
PV Unit electricity used in dwelling	-565.7568	0.1348	-76.2539
PV Unit electricity exported	-917.0683	0.1260	-115.5956
Total			-191.8494 (269)
Total CO2, kg/year			722.7144 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.1200 (273)

----- 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	1863.8086	1.1300	2106.1037 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2349.6091	1.1300	2655.0582 (278)
Space and water heating			4761.1620 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	123.4445	1.5338	189.3432 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-565.7568	1.4981	-847.5841
PV Unit electricity exported	-917.0683	0.4627	-424.3228
Total			-1271.9070 (283)
Total Primary energy kWh/year			3808.6990 (286)
Target Primary Energy Rate (TPER)			79.6800 (287)

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Property Reference	House Type 1 Mid - Refurb				Issued on Date	30/08/2024
Assessment Reference	Type 1 Mid GLA Baseline		Prop Type Ref			
Property	House Type 1, Edmansons Close, Tottenham, N17 6XD					
SAP Rating	73 C	DER	35.65	TER	13.44	
Environmental	76 C	% DER < TER				-165.25
CO ₂ Emissions (t/year)	1.44	DFEE	92.95	TFEE	35.11	
Compliance Check	See BREL	% DFEE < TFEE				-164.71
% DPER < TPER	-179.07	DPER	197.19	TPER	70.66	
Assessor Details	Miss Eleanor Ballinger				Assessor ID	M976-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	30.0000 (1b)	x 2.4000 (2b)	= 72.0000 (1b) - (3b)
First floor	17.8000 (1c)	x 2.6000 (2c)	= 46.2800 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	47.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 118.2800 (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	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) = 0.2536 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	1.0036 (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) = 0.8531 (21)

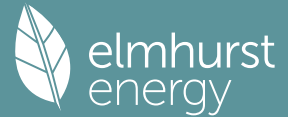
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	1.0877	1.0664	1.0450	0.9384	0.9171	0.8104	0.8104	0.7891	0.8531	0.9171	0.9597	1.0024 (22b)
Effective ac	1.0877	1.0664	1.0450	0.9403	0.9205	0.8284	0.8284	0.8113	0.8639	0.9205	0.9605	1.0024 (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
Front door			1.8900	3.0000	5.6700		(26)
Window (Uw = 1.60)			8.1300	1.5038	12.2256		(27)
Ground Floor			30.0000	0.2500	7.5000		(28a)
External Wall	45.0000	10.0200	34.9800	0.5500	19.2390		(29a)
1st Floor	17.8000		17.8000	0.1600	2.8480		(30)
Ground floor	12.2000		12.2000	0.1600	1.9520		(30)
Total net area of external elements Aum(A, m ²)			105.0000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 49.4346		(33)
Party Wall			52.2200	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							21.0000 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	70.4346 (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	42.4551	41.6227	40.7902	36.7020	35.9297	32.3346	32.3346	31.6688	33.7194	35.9297	37.4921	39.1253 (38)
Heat transfer coeff												

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Average = Sum(39)m / 12 =	112.8897	112.0573	111.2248	107.1366	106.3643	102.7691	102.7691	102.1033	104.1539	106.3643	107.9266	109.5599 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	2.3617	2.3443	2.3269	2.2414	2.2252	2.1500	2.1500	2.1361	2.1790	2.2252	2.2579	2.2920 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.6256 (42)
Hot water usage for mixer showers	70.7781	69.7145	68.1645	65.1989	63.0104	60.5698	59.1826	60.7208	62.4070	65.0275	68.0567	70.5069 (42a)
Hot water usage for baths	23.4307	23.0827	22.5927	21.6892	21.0126	20.2624	19.8572	20.3438	20.8736	21.6764	22.5985	23.3515 (42b)
Hot water usage for other uses	32.9237	31.7265	30.5292	29.3320	28.1348	26.9376	26.9376	28.1348	29.3320	30.5292	31.7265	32.9237 (42c)
Average daily hot water use (litres/day)												116.9096 (43)
Daily hot water use	127.1325	124.5236	121.2864	116.2201	112.1578	107.7698	105.9774	109.1994	112.6126	117.2331	122.3817	126.7821 (44)
Energy content (annual)	201.3468	177.3200	186.4127	159.0995	150.9860	132.5156	128.1704	135.2117	138.8626	159.0841	174.3551	198.5101 (45)
Distribution loss (46)m = 0.15 x (45)m	30.2020	26.5980	27.9619	23.8649	22.6479	19.8773	19.2256	20.2818	20.8294	23.8626	26.1533	29.7765 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	252.3057	223.3474	237.3716	208.4146	201.9449	181.8306	179.1293	186.1706	188.1777	210.0430	223.6702	249.4690 (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	252.3057	223.3474	237.3716	208.4146	201.9449	181.8306	179.1293	186.1706	188.1777	210.0430	223.6702	249.4690 (64)
12Total per year (kWh/year)												2541.8747 (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	79.6875	70.4657	74.7220	65.2294	62.9426	56.3902	55.3564	57.6976	58.5006	65.6352	70.3018	78.7443 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	73.6144	81.5017	73.6144	76.0682	73.6144	76.0682	73.6144	73.6144	76.0682	73.6144	76.0682	73.6144 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	141.5228	142.9913	139.2906	131.4122	121.4671	112.1201	105.8757	104.4072	108.1079	115.9863	125.9314	135.2784 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279 (69)
Pumps, fans	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229 (71)
Water heating gains (Table 5)	107.1069	104.8597	100.4327	90.5963	84.6002	78.3197	74.4038	77.5505	81.2508	88.2194	97.6415	105.8392 (72)
Total internal gains	379.6277	386.7364	370.7214	355.4603	337.0653	313.8916	301.2775	302.9558	312.8106	335.2037	357.0247	372.1156 (73)

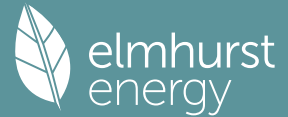
6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W
Northeast					4.7400	11.2829	0.6300	0.7000			0.7700	16.3445 (75)
Southwest					3.3900	36.7938	0.6300	0.7000			0.7700	38.1194 (79)
Solar gains	54.4640	98.2013	148.7837	208.5209	255.6228	263.4786	249.9830	213.3593	169.2369	112.4215	66.2240	45.9701 (83)
Total gains	434.0917	484.9376	519.5050	563.9813	592.6881	577.3702	551.2605	516.3150	482.0475	447.6252	423.2487	418.0857 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	29.4043	29.6228	29.8445	30.9833	31.2083	32.3000	32.3000	32.5106	31.8706	31.2083	30.7565	30.2980
alpha	2.9603	2.9749	2.9896	3.0656	3.0806	3.1533	3.1533	3.1674	3.1247	3.0806	3.0504	3.0199
util living area	0.9900	0.9852	0.9768	0.9544	0.9056	0.8062	0.6795	0.7229	0.8829	0.9624	0.9848	0.9912 (86)
MIT	18.3260	18.5570	18.9588	19.5818	20.1515	20.6353	20.8528	20.8167	20.4465	19.7334	18.9784	18.3523 (87)
Th 2	19.1031	19.1137	19.1243	19.1773	19.1874	19.2352	19.2352	19.2442	19.2167	19.1874	19.1670	19.1457 (88)
util rest of house	0.9862	0.9796	0.9671	0.9328	0.8530	0.6820	0.4632	0.5187	0.7941	0.9401	0.9779	0.9879 (89)
MIT 2	16.8195	17.0549	17.4591	18.1017	18.6420	19.0785	19.2059	19.2012	18.9332	18.2636	17.5090	16.8726 (90)
Living area fraction												0.3734 (91)
MIT	17.3821	17.6158	18.0191	18.6544	19.2057	19.6598	19.8209	19.8045	19.4983	18.8125	18.0577	17.4252 (92)

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Temperature adjustment												0.0000
adjusted MIT	17.3821	17.6158	18.0191	18.6544	19.2057	19.6598	19.8209	19.8045	19.4983	18.8125	18.0577	17.4252 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9810	0.9729	0.9589	0.9244	0.8537	0.7181	0.5459	0.5955	0.8124	0.9335	0.9716	0.9832	(94)
Useful gains	425.8558	471.8001	498.1381	521.3176	505.9824	414.6250	300.9135	307.4476	391.5942	417.8515	411.2327	411.0667	(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	1476.8336	1424.9019	1281.2128	1045.0525	798.3400	519.9959	331.0098	347.6104	562.2547	873.5152	1182.6301	1448.9514	(97)
Space heating kWh	781.9275	640.4844	582.6076	377.0891	217.5140	0.0000	0.0000	0.0000	0.0000	339.0138	555.4061	772.1862	(98a)
Space heating requirement - total per year (kWh/year)												4266.2288	
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	781.9275	640.4844	582.6076	377.0891	217.5140	0.0000	0.0000	0.0000	0.0000	339.0138	555.4061	772.1862	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4266.2288	
Space heating per m2										(98c) / (4) =		89.2516	(99)

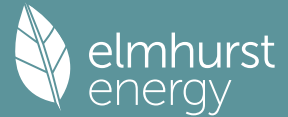
9a. Energy requirements - Individual heating systems, including micro-CHP

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 %)													84.5000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	781.9275	640.4844	582.6076	377.0891	217.5140	0.0000	0.0000	0.0000	0.0000	339.0138	555.4061	772.1862	(98)
Space heating efficiency (main heating system 1)	84.5000	84.5000	84.5000	84.5000	84.5000	0.0000	0.0000	0.0000	0.0000	84.5000	84.5000	84.5000	(210)
Space heating fuel (main heating system)	925.3580	757.9698	689.4765	446.2593	257.4130	0.0000	0.0000	0.0000	0.0000	401.1998	657.2854	913.8298	(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	252.3057	223.3474	237.3716	208.4146	201.9449	181.8306	179.1293	186.1706	188.1777	210.0430	223.6702	249.4690	(64)
Efficiency of water heater	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(216)
Fuel for water heating, kWh/month	281.9058	249.5501	265.2197	232.8655	225.6368	203.1627	200.1445	208.0118	210.2544	234.6850	249.9108	278.7363	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	17.8356	16.1096	17.8356	17.2603	17.8356	17.2603	17.8356	17.8356	17.2603	17.8356	17.2603	17.8356	(231)
Lighting	15.6499	12.5550	11.3044	8.2821	6.3973	5.2266	5.8358	7.5856	9.8530	12.9276	14.6018	16.0849	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												5048.7914	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												89.5000	
Water heating fuel used												2840.0834	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												165.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												210.0000	(231)
Electricity for lighting (calculated in Appendix L)												126.3040	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												8225.1789	(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	5048.7914	0.2100	1060.2462	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2840.0834	0.2100	596.4175	(264)

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Space and water heating			1656.6637 (265)
Pumps, fans and electric keep-hot	210.0000	0.1387	29.1296 (267)
Energy for lighting	126.3040	0.1443	18.2296 (268)
Total CO ₂ , kg/year			1704.0229 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			35.6500 (273)

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

	Energy kWh/year	Primary energy factor kg CO ₂ /kWh	Primary energy kWh/year
Space heating - main system 1	5048.7914	1.1300	5705.1343 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	2840.0834	1.1300	3209.2943 (278)
Space and water heating			8914.4286 (279)
Pumps, fans and electric keep-hot	210.0000	1.5128	317.6880 (281)
Energy for lighting	126.3040	1.5338	193.7293 (282)
Total Primary energy kWh/year			9425.8459 (286)
Dwelling Primary energy Rate (DPER)			197.1900 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	30.0000 (1b)	x 2.4000 (2b)	= 72.0000 (1b) - (3b)
First floor	17.8000 (1c)	x 2.6000 (2c)	= 46.2800 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	47.8000		(4)
Dwelling volume		(3a) + (3b) + (3c) + (3d) + (3e) ... (3n) =	118.2800 (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) = 0.1691 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4191 (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) =	0.3562 (21)

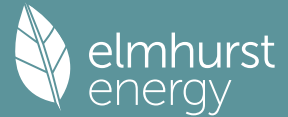
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4542	0.4453	0.4364	0.3918	0.3829	0.3384	0.3384	0.3295	0.3562	0.3829	0.4008	0.4186 (22b)
Effective ac	0.6031	0.5991	0.5952	0.5768	0.5733	0.5573	0.5573	0.5543	0.5634	0.5733	0.5803	0.5876 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.20)			8.1300	1.1450	9.3092		(27)
Ground Floor			30.0000	0.1300	3.9000		(28a)
External Wall	45.0000	10.0200	34.9800	0.1800	6.2964		(29a)
1st Floor	17.8000		17.8000	0.1100	1.9580		(30)
Ground floor	12.2000		12.2000	0.1100	1.3420		(30)
Total net area of external elements Aum(A, m ²)			105.0000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	24.6956	(33)
Party Wall			52.2200	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (User defined value 0.050 * total exposed area)							5.2500 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	29.9456 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	23.5422	23.3858	23.2326	22.5128	22.3782	21.7513	21.7513	21.6352	21.9928	22.3782	22.6506	22.9354 (38)
Heat transfer coeff	53.4877	53.3314	53.1781	52.4584	52.3237	51.6969	51.6969	51.5808	51.9383	52.3237	52.5962	52.8810 (39)
Average = Sum(39)m / 12 =												52.4577

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HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1190	1.1157	1.1125	1.0975	1.0946	1.0815	1.0815	1.0791	1.0866	1.0946	1.1003	1.1063 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	1.0974 31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.6256 (42)
Hot water usage for mixer showers	51.4750	50.7014	49.5742	47.4174	45.8258	44.0508	43.0419	44.1606	45.3869	47.2927	49.4958	51.2778 (42a)
Hot water usage for baths	22.2592	21.9286	21.4631	20.6047	19.9620	19.2493	18.8644	19.3266	19.8300	20.5925	21.4686	22.1839 (42b)
Hot water usage for other uses	31.2775	30.1401	29.0028	27.8654	26.7280	25.5907	25.5907	26.7280	27.8654	29.0028	30.1401	31.2775 (42c)
Average daily hot water use (litres/day)												96.5301 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	105.0116	102.7701	100.0400	95.8875	92.5158	88.8908	87.4969	90.2153	93.0823	96.8880	101.1045	104.7392 (44)
Energy content (annual)	166.3128	146.3433	153.7578	131.2652	124.5440	109.3016	105.8199	111.7053	114.7797	131.4761	144.0419	163.9962 (45)
Distribution loss (46)m = 0.15 x (45)m	24.9469	21.9515	23.0637	19.6898	18.6816	16.3952	15.8730	16.7558	17.2170	19.7214	21.6063	24.5994 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	50.9589	46.0274	50.9589	47.2870	47.1450	43.8365	44.5875	45.9727	45.9036	49.3731	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	217.2717	192.3707	204.7167	178.5522	171.6891	153.1381	150.4074	157.6780	160.6833	180.8492	193.3570	214.9551 (62)
WWHRS	-23.5322	-20.8121	-21.7932	-18.0456	-16.8179	-14.3912	-13.4894	-14.3447	-14.8897	-17.5533	-19.8857	-23.0964 (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	193.7395	171.5586	182.9234	160.5066	154.8712	138.7469	136.9180	143.3334	145.7936	163.2959	173.4712	191.8587 (64)
12Total per year (kWh/year)												1957.0170 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
												0.0000 (64a)
Heat gains from water heating, kWh/month	68.0387	60.1660	63.8642	55.4674	53.1972	47.3019	46.3320	48.6352	49.6402	56.0591	60.2227	67.2685 (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	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	73.6144	81.5017	73.6144	76.0682	73.6144	76.0682	73.6144	73.6144	76.0682	73.6144	76.0682	73.6144 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	141.5228	142.9913	139.2906	131.4122	121.4671	112.1201	105.8757	104.4072	108.1079	115.9863	125.9314	135.2784 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229 (71)
Water heating gains (Table 5)	91.4499	89.5327	85.8390	77.0381	71.5015	65.6971	62.2742	65.3699	68.9447	75.3482	83.6426	90.4146 (72)
Total internal gains	356.9707	364.4094	349.1276	334.9021	316.9667	301.2690	289.1480	290.7751	300.5044	315.3326	336.0259	349.6911 (73)

6. Solar gains

[Jan]												Area m2		Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W																		
															Northeast		4.7400		11.2829		0.6300		0.7000		0.7700		16.3445 (75)													
															Southwest		3.3900		36.7938		0.6300		0.7000		0.7700		38.1194 (79)													
															Solar gains		54.4640		98.2013		148.7837		208.5209		255.6228		263.4786		249.9830		213.3593		169.2369		112.4215		66.2240		45.9701 (83)	
															Total gains		411.4347		462.6106		497.9112		543.4231		572.5894		564.7476		539.1309		504.1344		469.7414		427.7540		402.2499		395.6611 (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	62.0599	62.2419	62.4212	63.2777	63.4405	64.2098	64.2098	64.3543	63.9113	63.4405	63.1119	62.7720
alpha	5.1373	5.1495	5.1614	5.2185	5.2294	5.2807	5.2807	5.2903	5.2608	5.2294	5.2075	5.1848
util living area	0.9899	0.9805	0.9603	0.8967	0.7643	0.5709	0.4193	0.4660	0.7095	0.9218	0.9795	0.9916 (86)
MIT	19.9039	20.0859	20.3385	20.6661	20.8890	20.9809	20.9969	20.9947	20.9431	20.6605	20.2371	19.8786 (87)
Th 2	19.9854	19.9880	19.9906	20.0029	20.0052	20.0160	20.0160	20.0179	20.0118	20.0052	20.0006	19.9957 (88)
util rest of house	0.9867	0.9746	0.9481	0.8668	0.7062	0.4895	0.3269	0.3690	0.6277	0.8921	0.9722	0.9890 (89)
MIT 2	18.7322	18.9634	19.2797	19.6793	19.9175	20.0057	20.0150	20.0162	19.9763	19.6839	19.1658	18.7078 (90)
Living area fraction	fLA = Living area / (4) = 0.3734 (91)											
MIT	19.1698	19.3826	19.6751	20.0478	20.2803	20.3699	20.3817	20.3816	20.3373	20.0486	19.5658	19.1450 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.1698	19.3826	19.6751	20.0478	20.2803	20.3699	20.3817	20.3816	20.3373	20.0486	19.5658	19.1450 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9834	0.9701	0.9435	0.8683	0.7233	0.5194	0.3615	0.4053	0.6561	0.8936	0.9681	0.9860	(94)
Useful gains	404.5948	448.7731	469.7666	471.8676	414.1339	293.3580	194.9108	204.3159	308.1788	382.2427	389.4217	390.1160	(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	795.3508	772.3775	700.6277	584.7951	448.9536	298.2833	195.4995	205.3718	323.9557	494.3863	655.6553	790.3044	(97)
Space heating kWh	290.7224	217.4621	171.7606	81.3078	25.9059	0.0000	0.0000	0.0000	0.0000	83.4348	191.6882	297.7402	(98a)
Space heating requirement - total per year (kWh/year)												1360.0221	
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	290.7224	217.4621	171.7606	81.3078	25.9059	0.0000	0.0000	0.0000	0.0000	83.4348	191.6882	297.7402	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1360.0221	
Space heating per m2										(98c) / (4) =		28.4523	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													92.4000	(206)
Efficiency of main space heating system 2 (in %)													0.0000	(207)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	290.7224	217.4621	171.7606	81.3078	25.9059	0.0000	0.0000	0.0000	0.0000	83.4348	191.6882	297.7402	(98)	
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)	
Space heating fuel (main heating system)	314.6347	235.3486	185.8881	87.9955	28.0367	0.0000	0.0000	0.0000	0.0000	90.2975	207.4548	322.2296	(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	193.7395	171.5586	182.9234	160.5066	154.8712	138.7469	136.9180	143.3334	145.7936	163.2959	173.4712	191.8587	(64)	
Efficiency of water heater (217)m	85.2488	84.8906	84.2467	82.9998	81.4288	80.3000	80.3000	80.3000	80.3000	83.0157	84.5959	85.3193	(216)	
Fuel for water heating, kWh/month	227.2634	202.0938	217.1284	193.3820	190.1921	172.7857	170.5080	178.4973	181.5612	196.7048	205.0585	224.8715	(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	15.2956	12.2707	11.0484	8.0945	6.2525	5.1083	5.7037	7.4139	9.6299	12.6350	14.2712	15.7207	(232)	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-27.2033	-37.9156	-53.9188	-60.0080	-64.2650	-59.9066	-59.2351	-56.1708	-50.6383	-43.1382	-29.7804	-23.5767	(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	-16.7226	-35.0158	-69.2729	-103.5529	-136.4153	-136.8134	-135.1316	-114.5826	-84.2592	-49.8221	-22.2503	-13.2297	(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												1471.8854	(211)	
Space heating fuel - main system 2												0.0000	(213)	
Space heating fuel - secondary												0.0000	(215)	
Efficiency of water heater												80.3000		
Water heating fuel used												2360.0469	(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)												123.4445	(232)	
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation												-1482.8252	(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												2558.5516	(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	1471.8854	0.2100	309.0959	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2360.0469	0.2100	495.6098	(264)
Space and water heating			804.7058	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	123.4445	0.1443	17.8168	(268)

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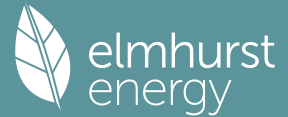


Energy saving/generation technologies			
PV Unit electricity used in dwelling	-565.7568	0.1348	-76.2539
PV Unit electricity exported	-917.0683	0.1260	-115.5956
Total			-191.8494 (269)
Total CO2, kg/year			642.6025 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.4400 (273)

----- 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	1471.8854	1.1300	1663.2305 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2360.0469	1.1300	2666.8530 (278)
Space and water heating			4330.0835 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	123.4445	1.5338	189.3432 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-565.7568	1.4981	-847.5841
PV Unit electricity exported	-917.0683	0.4627	-424.3228
Total			-1271.9070 (283)
Total Primary energy kWh/year			3377.6205 (286)
Target Primary Energy Rate (TPER)			70.6600 (287)

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Property Reference	House Type 2 End - Refurb				Issued on Date	30/08/2024	
Assessment Reference	House Type 2 End GLA Baseline			Prop Type Ref			
Property	House Type 2, Edmansons Close, Tottenham, N17 6XD						
SAP Rating	70 C	DER	33.96	TER	10.69		
Environmental	69 C	% DER < TER				-217.68	
CO ₂ Emissions (t/year)	2.77	DFEE	100.29	TFEE	40.09		
Compliance Check	See BREL	% DFEE < TFEE				-150.15	
% DPER < TPER	-233.07	DPER	186.35	TPER	55.95		
Assessor Details	Miss Eleanor Ballinger				Assessor ID	M976-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	61.1500 (1b)	x 2.4000 (2b)	= 146.7600 (1b) - (3b)
First floor	36.5000 (1c)	x 2.6000 (2c)	= 94.9000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	97.6500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 241.6600 (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	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) = 0.1241 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8741 (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) = 0.8086 (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	1.0309	1.0107	0.9905	0.8894	0.8692	0.7682	0.7682	0.7479	0.8086	0.8692	0.9097	0.9501 (22b)
Effective ac	1.0309	1.0107	0.9906	0.8956	0.8778	0.7950	0.7950	0.7797	0.8269	0.8778	0.9137	0.9513 (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
Front door			1.8900	3.0000	5.6700		(26)
Window (Uw = 1.60)			18.1500	1.5038	27.2932		(27)
Ground Floor			61.1500	0.2500	15.2875		(28a)
External Wall	118.8600	20.0400	98.8200	0.5500	54.3510		(29a)
1st Floor	36.5000		36.5000	0.1600	5.8400		(30)
Ground floor	24.6500		24.6500	0.1600	3.9440		(30)
Total net area of external elements Aum (A, m ²)			241.1600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	112.3857		(33)
Party Wall			25.9800	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							48.2320 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	160.6177 (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	82.2152	80.6032	78.9947	71.4182	70.0007	63.4018	63.4018	62.1798	65.9436	70.0007	72.8683	75.8663 (38)
Heat transfer coeff												

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Average = Sum(39)m / 12 =	242.8330	241.2209	239.6124	232.0359	230.6184	224.0195	224.0195	222.7975	226.5613	230.6184	233.4861	236.4841 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	2.4868	2.4703	2.4538	2.3762	2.3617	2.2941	2.2941	2.2816	2.3201	2.3617	2.3911	2.4218 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7167 (42)
Hot water usage for mixer showers	95.9332	94.4915	92.3907	88.3711	85.4048	82.0968	80.2165	82.3014	84.5869	88.1387	92.2446	95.5656 (42a)
Hot water usage for baths	31.7120	31.2411	30.5778	29.3550	28.4393	27.4240	26.8756	27.5341	28.2512	29.3376	30.5857	31.6048 (42b)
Hot water usage for other uses	44.6858	43.0609	41.4359	39.8110	38.1861	36.5611	36.5611	38.1861	39.8110	41.4359	43.0609	44.6858 (42c)
Average daily hot water use (litres/day)												158.4727 (43)
Daily hot water use	172.3310	168.7934	164.4044	157.5371	152.0301	146.0819	143.6532	148.0216	152.6491	158.9123	165.8911	171.8562 (44)
Energy conte	272.9302	240.3596	252.6835	215.6604	204.6618	179.6247	173.7360	183.2817	188.2316	215.6424	236.3423	269.0853 (45)
Energy content (annual)												Total = Sum(45)m = 2632.2395
Distribution loss (46)m = 0.15 x (45)m	40.9395	36.0539	37.9025	32.3491	30.6993	26.9437	26.0604	27.4923	28.2347	32.3464	35.4513	40.3628 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (59)
Total heat required for water heating calculated for each month	323.8891	286.3870	303.6424	264.9755	255.6207	228.9398	224.6950	234.2406	237.5467	266.6013	285.6574	320.0442 (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	323.8891	286.3870	303.6424	264.9755	255.6207	228.9398	224.6950	234.2406	237.5467	266.6013	285.6574	320.0442 (64)
12Total per year (kWh/year)												Total per year (kWh/year) = Sum(64)m = 3232.2395 (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	103.4890	91.4264	96.7570	84.0358	80.7898	72.0540	70.5070	73.6809	74.9158	84.4408	90.9126	102.2106 (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	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	129.4273	143.2945	129.4273	133.7416	129.4273	133.7416	129.4273	129.4273	133.7416	129.4273	133.7416	129.4273 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	252.4717	255.0916	248.4896	234.4348	216.6931	200.0184	188.8787	186.2588	192.8608	206.9156	224.6573	241.3320 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834 (69)
Pumps, fans	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672 (71)
Water heating gains (Table 5)	139.0981	136.0512	130.0497	116.7165	108.5884	100.0750	94.7674	99.0334	104.0497	113.4957	126.2675	137.3798 (72)
Total internal gains	594.7474	608.1875	581.7168	558.6430	528.4590	497.5851	476.8236	478.4697	494.4022	523.5889	558.4165	581.8894 (73)

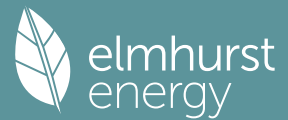
6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d	Gains W		
Southeast				8.6700	36.7938	0.6300	0.7000		0.7700	97.4913 (77)		
Northwest				9.4800	11.2829	0.6300	0.7000		0.7700	32.6891 (81)		
Solar gains	130.1804	232.6033	347.0988	478.4137	579.9872	595.2016	565.7609	487.0153	392.1060	264.8524	157.9034	110.1278 (83)
Total gains	724.9278	840.7908	928.8156	1037.0567	1108.4462	1092.7867	1042.5845	965.4851	886.5082	788.4413	716.3200	692.0171 (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	27.9256	28.1122	28.3009	29.2250	29.4046	30.2708	30.2708	30.4368	29.9312	29.4046	29.0435	28.6753
alpha	2.8617	2.8741	2.8867	2.9483	2.9603	3.0181	3.0181	3.0291	2.9954	2.9603	2.9362	2.9117
util living area	0.9940	0.9903	0.9836	0.9659	0.9261	0.8422	0.7297	0.7738	0.9117	0.9748	0.9907	0.9949 (86)
MIT	18.0561	18.3000	18.7283	19.3794	19.9944	20.5336	20.7956	20.7472	20.3167	19.5343	18.7295	18.0725 (87)
Th 2	19.7566	19.7649	19.7731	19.8119	19.8192	19.8529	19.8529	19.8592	19.8399	19.8192	19.8045	19.7891 (88)
util rest of house	0.9927	0.9881	0.9796	0.9562	0.9012	0.7782	0.6054	0.6619	0.8711	0.9660	0.9883	0.9938 (89)
MIT 2	17.0784	17.3269	17.7589	18.4297	19.0336	19.5565	19.7643	19.7393	19.3620	18.5921	17.7824	17.1162 (90)
Living area fraction												FLA = Living area / (4) = 0.1331 (91)
MIT	17.2085	17.4564	17.8879	18.5561	19.1615	19.6866	19.9016	19.8735	19.4891	18.7175	17.9085	17.2435 (92)

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Temperature adjustment												0.0000
adjusted MIT	17.2085	17.4564	17.8879	18.5561	19.1615	19.6866	19.9016	19.8735	19.4891	18.7175	17.9085	17.2435 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9883	0.9817	0.9702	0.9418	0.8827	0.7666	0.6117	0.6636	0.8545	0.9537	0.9821	0.9900	(94)
Useful gains	716.4581	825.4170	901.0955	976.6946	978.3732	837.7431	637.7131	640.6674	757.5160	751.9687	703.5173	685.0809	(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	3134.6147	3028.8720	2728.6903	2240.5726	1720.7636	1139.4878	739.6259	773.8888	1220.9533	1872.0432	2523.6237	3084.5839	(97)
Space heating kWh	1799.1085	1480.7217	1359.7305	909.9922	552.3385	0.0000	0.0000	0.0000	0.0000	833.3354	1310.4766	1785.2302	(98a)
Space heating requirement - total per year (kWh/year)												10030.9338	
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	1799.1085	1480.7217	1359.7305	909.9922	552.3385	0.0000	0.0000	0.0000	0.0000	833.3354	1310.4766	1785.2302	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												10030.9338	
Space heating per m2										(98c) / (4) =		102.7233	(99)

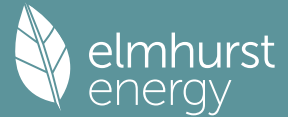
9a. Energy requirements - Individual heating systems, including micro-CHP

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 %)													84.5000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1799.1085	1480.7217	1359.7305	909.9922	552.3385	0.0000	0.0000	0.0000	0.0000	833.3354	1310.4766	1785.2302	(98)
Space heating efficiency (main heating system 1)	84.5000	84.5000	84.5000	84.5000	84.5000	0.0000	0.0000	0.0000	0.0000	84.5000	84.5000	84.5000	(210)
Space heating fuel (main heating system)	2129.1225	1752.3334	1609.1485	1076.9138	653.6550	0.0000	0.0000	0.0000	0.0000	986.1958	1550.8599	2112.6985	(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	323.8891	286.3870	303.6424	264.9755	255.6207	228.9398	224.6950	234.2406	237.5467	266.6013	285.6574	320.0442	(64)
Efficiency of water heater	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(216)
Fuel for water heating, kWh/month	361.8873	319.9854	339.2652	296.0620	285.6097	255.7986	251.0558	261.7213	265.4153	297.8786	319.1703	357.5913	(217)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(219)
(221)m	17.8356	16.1096	17.8356	17.2603	17.8356	17.2603	17.8356	17.8356	17.2603	17.8356	17.2603	17.8356	(221)
Pumps and Fa	31.0458	24.9061	22.4251	16.4296	12.6907	10.3684	11.5769	15.0481	19.5460	25.6454	28.9664	31.9086	(231)
Lighting	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
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	(235a)
(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	(235a)
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	(235c)
(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	(235c)
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	(233b)
(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	(233b)
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	(234b)
(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	(234b)
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	(235b)
(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	(235b)
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	(235d)
(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	(235d)
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)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Annual totals kWh/year													
Space heating fuel - main system 1												11870.9275	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												89.5000	
Water heating fuel used												3611.4408	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												165.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												210.0000	(231)
Electricity for lighting (calculated in Appendix L)												250.5571	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												15942.9254	(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	11870.9275	0.2100	2492.8948	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3611.4408	0.2100	758.4026	(264)

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Space and water heating			3251.2973 (265)
Pumps, fans and electric keep-hot	210.0000	0.1387	29.1296 (267)
Energy for lighting	250.5571	0.1443	36.1631 (268)
Total CO ₂ , kg/year			3316.5901 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			33.9600 (273)

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

	Energy kWh/year	Primary energy factor kg CO ₂ /kWh	Primary energy kWh/year
Space heating - main system 1	11870.9275	1.1300	13414.1481 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	3611.4408	1.1300	4080.9281 (278)
Space and water heating			17495.0762 (279)
Pumps, fans and electric keep-hot	210.0000	1.5128	317.6880 (281)
Energy for lighting	250.5571	1.5338	384.3128 (282)
Total Primary energy kWh/year			18197.0770 (286)
Dwelling Primary energy Rate (DPER)			186.3500 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	61.1500 (1b)	x 2.4000 (2b)	= 146.7600 (1b) - (3b)
First floor	36.5000 (1c)	x 2.6000 (2c)	= 94.9000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	97.6500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	241.6600 (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	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) = 0.1241 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3741 (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) =	0.3461 (21)

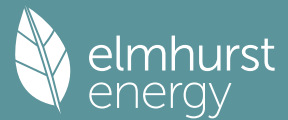
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4413	0.4326	0.4239	0.3807	0.3720	0.3288	0.3288	0.3201	0.3461	0.3720	0.3893	0.4066 (22b)
Effective ac	0.5974	0.5936	0.5899	0.5725	0.5692	0.5540	0.5540	0.5512	0.5599	0.5692	0.5758	0.5827 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.20)			18.1500	1.1450	20.7824		(27)
Ground Floor			61.1500	0.1300	7.9495		(28a)
External Wall	118.8600	20.0400	98.8200	0.1800	17.7876		(29a)
1st Floor	36.5000		36.5000	0.1100	4.0150		(30)
Ground floor	24.6500		24.6500	0.1100	2.7115		(30)
Total net area of external elements Aum(A, m ²)			241.1600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	55.1360		(33)
Party Wall			25.9800	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (User defined value 0.050 * total exposed area)							12.0580 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	67.1940 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	47.6375	47.3360	47.0405	45.6526	45.3929	44.1840	44.1840	43.9602	44.6497	45.3929	45.9182	46.4675 (38)
Heat transfer coeff	114.8316	114.5301	114.2346	112.8466	112.5869	111.3781	111.3781	111.1542	111.8437	112.5869	113.1123	113.6615 (39)
Average = Sum(39)m / 12 =												112.8454

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HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1760	1.1729	1.1698	1.1556	1.1530	1.1406	1.1406	1.1383	1.1454	1.1530	1.1583	1.1640 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	1.1556 31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7167 (42)
Hot water usage for mixer showers	69.7696	68.7211	67.1932	64.2699	62.1126	59.7067	58.3393	59.8556	61.5177	64.1009	67.0870	69.5023 (42a)
Hot water usage for baths	30.1264	29.6790	29.0489	27.8872	27.0173	26.0528	25.5318	26.1574	26.8387	27.8708	29.0564	30.0246 (42b)
Hot water usage for other uses	42.4515	40.9078	39.3641	37.8204	36.2768	34.7331	34.7331	36.2768	37.8204	39.3641	40.9078	42.4515 (42c)
Average daily hot water use (litres/day)												130.8494 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	142.3475	139.3079	135.6063	129.9776	125.4067	120.4926	118.6041	122.2898	126.1768	131.3358	137.0512	141.9784 (44)
Energy content (annual)	225.4437	198.3726	208.4218	177.9328	168.8215	148.1597	143.4414	151.4203	155.5886	178.2214	195.2546	222.3038 (45)
Distribution loss (46)m = 0.15 x (45)m	33.8166	29.7559	31.2633	26.6899	25.3232	22.2240	21.5162	22.7130	23.3383	26.7332	29.2882	33.3456 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	276.4026	244.4000	259.3807	227.2479	219.7804	197.4748	194.4003	202.3792	204.9037	229.1803	244.5696	273.2627 (62)
WWHRS	-31.8957	-28.2089	-29.5387	-24.4592	-22.7951	-19.5059	-18.2837	-19.4429	-20.1816	-23.7919	-26.9533	-31.3051 (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	244.5068	216.1912	229.8420	202.7887	196.9853	177.9688	176.1166	182.9363	184.7221	205.3884	217.6163	241.9576 (64)
12Total per year (kWh/year)												2477.0202 (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	87.6997	77.4657	82.0400	71.4914	68.8729	61.5919	60.4340	63.0870	64.0620	71.9983	77.2509	86.6557 (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	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	129.4273	143.2945	129.4273	133.7416	129.4273	133.7416	129.4273	129.4273	133.7416	129.4273	133.7416	129.4273 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	252.4717	255.0916	248.4896	234.4348	216.6931	200.0184	188.8787	186.2588	192.8608	206.9156	224.6573	241.3320 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672 (71)
Water heating gains (Table 5)	117.8760	115.2764	110.2688	99.2936	92.5711	85.5443	81.2285	84.7943	88.9750	96.7720	107.2929	116.4728 (72)
Total internal gains	566.5252	580.4127	554.9359	534.2202	505.4416	483.0544	463.2846	464.2306	479.3275	499.8651	532.4420	553.9823 (73)

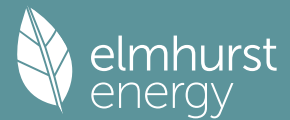
6. Solar gains

[Jan]												
				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d	Gains W	
Southeast				8.6700	36.7938		0.6300	0.7000		0.7700	97.4913 (77)	
Northwest				9.4800	11.2829		0.6300	0.7000		0.7700	32.6891 (81)	
Solar gains	130.1804	232.6033	347.0988	478.4137	579.9872	595.2016	565.7609	487.0153	392.1060	264.8524	157.9034	110.1278 (83)
Total gains	696.7056	813.0160	902.0347	1012.6339	1085.4288	1078.2560	1029.0455	951.2459	871.4335	764.7175	690.3454	664.1101 (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	59.0539	59.2093	59.3625	60.0926	60.2312	60.8850	60.8850	61.0076	60.6315	60.2312	59.9515	59.6618
alpha	4.9369	4.9473	4.9575	5.0062	5.0154	5.0590	5.0590	5.0672	5.0421	5.0154	4.9968	4.9775
util living area	0.9957	0.9902	0.9770	0.9306	0.8184	0.6310	0.4703	0.5266	0.7800	0.9556	0.9908	0.9966 (86)
MIT	19.6627	19.8643	20.1522	20.5360	20.8258	20.9644	20.9933	20.9885	20.8989	20.5171	20.0263	19.6338 (87)
Th 2	19.9393	19.9418	19.9442	19.9557	19.9578	19.9678	19.9678	19.9697	19.9640	19.9578	19.9535	19.9489 (88)
util rest of house	0.9943	0.9870	0.9692	0.9073	0.7633	0.5416	0.3631	0.4142	0.6985	0.9357	0.9871	0.9955 (89)
MIT 2	18.3926	18.6508	19.0157	19.4929	19.8153	19.9483	19.9658	19.9658	19.8974	19.4819	18.8671	18.3627 (90)
Living area fraction	18.5617	18.8123	19.1670	19.6317	19.9498	20.0835	20.1026	20.1019	20.0308	19.6197	19.0214	18.5319 (92)
MIT	18.5617	18.8123	19.1670	19.6317	19.9498	20.0835	20.1026	20.1019	20.0308	19.6197	19.0214	18.5319 (92)
Temperature adjustment												0.0000
adjusted MIT	18.5617	18.8123	19.1670	19.6317	19.9498	20.0835	20.1026	20.1019	20.0308	19.6197	19.0214	18.5319 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9915	0.9821	0.9615	0.8984	0.7628	0.5521	0.3774	0.4290	0.7043	0.9272	0.9825	0.9932	(94)
Useful gains	690.7815	798.4818	867.3270	909.7786	827.9832	595.3223	388.3140	408.1220	613.7762	709.0839	678.2527	659.5682	(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	1637.6940	1593.3803	1447.0083	1211.0411	928.8231	610.7447	390.1101	411.4857	663.3194	1015.5020	1348.4566	1628.9866	(97)
Space heating kWh	704.5029	534.1718	431.2829	216.9090	75.0249	0.0000	0.0000	0.0000	0.0000	227.9751	482.5468	721.2473	(98a)
Space heating requirement - total per year (kWh/year)												3393.6606	
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	704.5029	534.1718	431.2829	216.9090	75.0249	0.0000	0.0000	0.0000	0.0000	227.9751	482.5468	721.2473	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3393.6606	
Space heating per m2											(98c) / (4) =	34.7533	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													92.4000	(206)
Efficiency of main space heating system 2 (in %)													0.0000	(207)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	704.5029	534.1718	431.2829	216.9090	75.0249	0.0000	0.0000	0.0000	0.0000	227.9751	482.5468	721.2473	(98)	
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)	
Space heating fuel (main heating system)	762.4490	578.1080	466.7564	234.7500	81.1957	0.0000	0.0000	0.0000	0.0000	246.7263	522.2368	780.5707	(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	244.5068	216.1912	229.8420	202.7887	196.9853	177.9688	176.1166	182.9363	184.7221	205.3884	217.6163	241.9576	(64)	
Efficiency of water heater	86.5128	86.2390	85.7088	84.5260	82.5013	80.3000	80.3000	80.3000	80.3000	84.6056	86.0361	86.5710	(216)	
Fuel for water heating, kWh/month	282.6250	250.6885	268.1662	239.9128	238.7663	221.6299	219.3233	227.8161	230.0400	242.7599	252.9360	279.4905	(219)	
Space cooling fuel requirement														
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)	
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)	
Lighting	26.8924	21.5741	19.4251	14.2317	10.9929	8.9813	10.0281	13.0349	16.9311	22.2145	25.0913	27.6399	(232)	
Electricity generated by PVs (Appendix M) (negative quantity)	-52.9546	-72.5797	-101.4537	-110.8162	-116.8022	-108.0355	-106.6375	-101.9226	-93.2903	-81.3707	-57.4487	-46.0248	(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)	-36.5811	-76.0787	-149.6521	-222.5754	-292.2513	-292.9453	-289.5465	-246.1298	-181.6758	-108.1134	-48.6072	-28.9989	(233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)	
Annual totals kWh/year														
Space heating fuel - main system 1												3672.7929	(211)	
Space heating fuel - main system 2												0.0000	(213)	
Space heating fuel - secondary												0.0000	(215)	
Efficiency of water heater												80.3000		
Water heating fuel used												2954.1546	(219)	
Space cooling fuel												0.0000	(221)	
Electricity for pumps and fans:														
Total electricity for the above, kWh/year												86.0000	(231)	
Electricity for lighting (calculated in Appendix L)												217.0374	(232)	
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation												-3022.4920	(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												3907.4929	(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	3672.7929	0.2100	771.2865	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2954.1546	0.2100	620.3725	(264)
Space and water heating			1391.6590	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	217.0374	0.1443	31.3252	(268)

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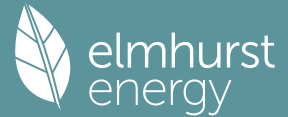


Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1049.3365	0.1352	-141.8724
PV Unit electricity exported	-1973.1554	0.1262	-248.9803
Total			-390.8527 (269)
Total CO2, kg/year			1044.0607 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.6900 (273)

----- 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	3672.7929	1.1300	4150.2560 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2954.1546	1.1300	3338.1947 (278)
Space and water heating			7488.4506 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	217.0374	1.5338	332.8992 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1049.3365	1.4997	-1573.7085
PV Unit electricity exported	-1973.1554	0.4632	-913.9543
Total			-2487.6628 (283)
Total Primary energy kWh/year			5463.7878 (286)
Target Primary Energy Rate (TPER)			55.9500 (287)

Full SAP Calculation Printout



Property Reference	House Type 2 Mid - Refurb				Issued on Date	30/08/2024
Assessment Reference	House Type 2 Mid GLA baseline			Prop Type Ref		
Property	House Type 2, Edmansons Close, Tottenham, N17 6XD					
SAP Rating	73 C	DER	30.95	TER	9.86	
Environmental	72 C	% DER < TER				-213.89
CO ₂ Emissions (t/year)	2.52	DFEE	89.17	TFEE	36.32	
Compliance Check	See BREL	% DFEE < TFEE				-145.53
% DPER < TPER	-230.46	DPER	170.12	TPER	51.48	
Assessor Details	Miss Eleanor Ballinger				Assessor ID	M976-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	61.1500 (1b)	x 2.4000 (2b)	= 146.7600 (1b) - (3b)
First floor	36.5000 (1c)	x 2.6000 (2c)	= 94.9000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	97.6500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 241.6600 (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	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) = 0.1241 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8741 (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) = 0.7430 (21)

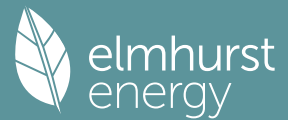
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.9474	0.9288	0.9102	0.8173	0.7987	0.7059	0.7059	0.6873	0.7430	0.7987	0.8359	0.8730 (22b)
Effective ac	0.9487	0.9313	0.9142	0.8340	0.8190	0.7491	0.7491	0.7362	0.7760	0.8190	0.8494	0.8811 (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
Front door			1.8900	3.0000	5.6700		(26)
Window (Uw = 1.60)			18.1500	1.5038	27.2932		(27)
Ground Floor			61.1500	0.2500	15.2875		(28a)
External Wall	93.0000	20.0400	72.9600	0.5500	40.1280		(29a)
1st Floor	36.5000		36.5000	0.1600	5.8400		(30)
Ground floor	24.6500		24.6500	0.1600	3.9440		(30)
Total net area of external elements Aum (A, m ²)			215.3000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	98.1627		(33)
Party Wall			51.9600	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							43.0600 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	141.2227 (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	75.6597	74.2701	72.9080	66.5103	65.3133	59.7411	59.7411	58.7092	61.8874	65.3133	67.7348	70.2663 (38)
Heat transfer coeff												

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Average = Sum(39)m / 12 =	216.8824	215.4928	214.1307	207.7330	206.5360	200.9639	200.9639	199.9320	203.1102	206.5360	208.9575	211.4891 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	2.2210	2.2068	2.1928	2.1273	2.1151	2.0580	2.0580	2.0474	2.0800	2.1151	2.1399	2.1658 (40)
HLP (average)												2.1273
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7167 (42)
Hot water usage for mixer showers												
95.9332	94.4915	92.3907	88.3711	85.4048	82.0968	80.2165	82.3014	84.5869	88.1387	92.2446	95.5656 (42a)	
Hot water usage for baths												
31.7120	31.2411	30.5778	29.3550	28.4393	27.4240	26.8756	27.5341	28.2512	29.3376	30.5857	31.6048 (42b)	
Hot water usage for other uses												
44.6858	43.0609	41.4359	39.8110	38.1861	36.5611	36.5611	38.1861	39.8110	41.4359	43.0609	44.6858 (42c)	
Average daily hot water use (litres/day)												158.4727 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	172.3310	168.7934	164.4044	157.5371	152.0301	146.0819	143.6532	148.0216	152.6491	158.9123	165.8911	171.8562 (44)
Energy content	272.9302	240.3596	252.6835	215.6604	204.6618	179.6247	173.7360	183.2817	188.2316	215.6424	236.3423	269.0853 (45)
Energy content (annual)										Total = Sum(45)m =		2632.2395
Distribution loss (46)m = 0.15 x (45)m												
40.9395	36.0539	37.9025	32.3491	30.6993	26.9437	26.0604	27.4923	28.2347	32.3464	35.4513	40.3628 (46)	
Water storage loss:												
Total storage loss												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)	
If cylinder contains dedicated solar storage												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)	
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month												
323.8891	286.3870	303.6424	264.9755	255.6207	228.9398	224.6950	234.2406	237.5467	266.6013	285.6574	320.0442 (62)	
WWHRS	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 (63b)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)	
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)	
Output from w/h	323.8891	286.3870	303.6424	264.9755	255.6207	228.9398	224.6950	234.2406	237.5467	266.6013	285.6574	320.0442 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		3232.2395 (64)
Electric shower(s)												3232 (64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)	
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month												
103.4890	91.4264	96.7570	84.0358	80.7898	72.0540	70.5070	73.6809	74.9158	84.4408	90.9126	102.2106 (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	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	129.4273	143.2945	129.4273	133.7416	129.4273	133.7416	129.4273	129.4273	133.7416	129.4273	133.7416	129.4273 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	252.4717	255.0916	248.4896	234.4348	216.6931	200.0184	188.8787	186.2588	192.8608	206.9156	224.6573	241.3320 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834 (69)
Pumps, fans	10.0000	10.0000	10.0000	10.0000	10.0000	0.0000	0.0000	0.0000	0.0000	10.0000	10.0000	10.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672 (71)
Water heating gains (Table 5)	139.0981	136.0512	130.0497	116.7165	108.5884	100.0750	94.7674	99.0334	104.0497	113.4957	126.2675	137.3798 (72)
Total internal gains	594.7474	608.1875	581.7168	558.6430	528.4590	497.5851	476.8236	478.4697	494.4022	523.5889	558.4165	581.8894 (73)

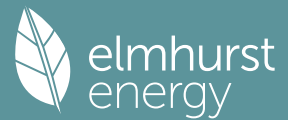
6. Solar gains

[Jan]												
	Area											
	m2											
	Solar flux											
	Table 6a											
	W/m2											
	Specific data											
	or Table 6b											
	Specific data											
	or Table 6c											
	Access											
	factor											
	Table 6d											
	Gains											
	W											
Northeast	9.4800											32.6891 (75)
Southwest	8.6700											97.4913 (79)
Solar gains	130.1804	232.6033	347.0988	478.4137	579.9872	595.2016	565.7609	487.0153	392.1060	264.8524	157.9034	110.1278 (83)
Total gains	724.9278	840.7908	928.8156	1037.0567	1108.4462	1092.7867	1042.5845	965.4851	886.5082	788.4413	716.3200	692.0171 (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	31.2669	31.4686	31.6687	32.6441	32.8333	33.7436	33.7436	33.9178	33.3871	32.8333	32.4528	32.0643
alpha	3.0845	3.0979	3.1112	3.1763	3.1889	3.2496	3.2496	3.2612	3.2258	3.1889	3.1635	3.1376
util living area												
	0.9944	0.9906	0.9835	0.9638	0.9186	0.8228	0.6983	0.7464	0.9020	0.9737	0.9910	0.9952 (86)
MIT	18.3351	18.5729	18.9783	19.5891	20.1573	20.6354	20.8529	20.8122	20.4350	19.7113	18.9588	18.3466 (87)
Th 2	19.8895	19.8966	19.9036	19.9363	19.9425	19.9710	19.9710	19.9763	19.9600	19.9425	19.9301	19.9171 (88)
util rest of house												
	0.9932	0.9885	0.9796	0.9543	0.8935	0.7599	0.5830	0.6406	0.8615	0.9651	0.9887	0.9942 (89)
MIT 2	17.4451	17.6868	18.0952	18.7221	19.2778	19.7365	19.9054	19.8852	19.5596	18.8514	18.0953	17.4752 (90)
Living area fraction												
									fLA = Living area / (4) =			0.1331 (91)
MIT	17.5636	17.8047	18.2127	18.8375	19.3949	19.8562	20.0316	20.0086	19.6761	18.9659	18.2102	17.5912 (92)

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Temperature adjustment												0.0000
adjusted MIT	17.5636	17.8047	18.2127	18.8375	19.3949	19.8562	20.0316	20.0086	19.6761	18.9659	18.2102	17.5912 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9893	0.9827	0.9709	0.9408	0.8769	0.7515	0.5908	0.6446	0.8471	0.9537	0.9831	0.9909	(94)
Useful gains	717.1755	826.2622	901.7636	975.6400	971.9899	821.2713	615.9600	622.3102	750.9718	751.9579	704.2251	685.7145	(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	2876.6336	2780.8753	2508.0560	2064.3517	1589.2685	1056.3032	689.6228	721.4830	1132.5695	1727.8510	2321.5678	2832.0963	(97)
Space heating kWh	1606.6368	1313.5000	1195.0815	783.8724	459.2553	0.0000	0.0000	0.0000	0.0000	726.0644	1164.4867	1596.9080	(98a)
Space heating requirement - total per year (kWh/year)												8845.8052	
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	1606.6368	1313.5000	1195.0815	783.8724	459.2553	0.0000	0.0000	0.0000	0.0000	726.0644	1164.4867	1596.9080	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												8845.8052	
Space heating per m2											(98c) / (4) =	90.5868	(99)

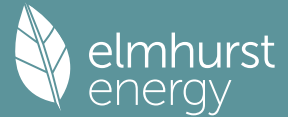
9a. Energy requirements - Individual heating systems, including micro-CHP

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 %)													84.5000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1606.6368	1313.5000	1195.0815	783.8724	459.2553	0.0000	0.0000	0.0000	0.0000	726.0644	1164.4867	1596.9080	(98)
Space heating efficiency (main heating system 1)	84.5000	84.5000	84.5000	84.5000	84.5000	0.0000	0.0000	0.0000	0.0000	84.5000	84.5000	84.5000	(210)
Space heating fuel (main heating system)	1901.3454	1554.4379	1414.2977	927.6596	543.4974	0.0000	0.0000	0.0000	0.0000	859.2479	1378.0908	1889.8320	(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	323.8891	286.3870	303.6424	264.9755	255.6207	228.9398	224.6950	234.2406	237.5467	266.6013	285.6574	320.0442	(64)
Efficiency of water heater	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(216)
Fuel for water heating, kWh/month	361.8873	319.9854	339.2652	296.0620	285.6097	255.7986	251.0558	261.7213	265.4153	297.8786	319.1703	357.5913	(217)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(219)
(221)m	17.8356	16.1096	17.8356	17.2603	17.8356	17.2603	17.8356	17.8356	17.2603	17.8356	17.2603	17.8356	(221)
Pumps and Fa	31.0458	24.9061	22.4251	16.4296	12.6907	10.3684	11.5769	15.0481	19.5460	25.6454	28.9664	31.9086	(231)
Lighting	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
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	(235a)
(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	(235a)
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	(235c)
(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	(235c)
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	(235b)
(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	(235b)
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	(235d)
(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	(235d)
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	(235e)
(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	(235e)
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	(235f)
(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	(235f)
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	(235g)
(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	(235g)
Annual totals kWh/year													
Space heating fuel - main system 1												10468.4086	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												89.5000	
Water heating fuel used												3611.4408	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												165.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												210.0000	(231)
Electricity for lighting (calculated in Appendix L)												250.5571	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												14540.4065	(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	10468.4086	0.2100	2198.3658	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3611.4408	0.2100	758.4026	(264)

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Space and water heating			2956.7684 (265)
Pumps, fans and electric keep-hot	210.0000	0.1387	29.1296 (267)
Energy for lighting	250.5571	0.1443	36.1631 (268)
Total CO ₂ , kg/year			3022.0611 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			30.9500 (273)

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

	Energy kWh/year	Primary energy factor kg CO ₂ /kWh	Primary energy kWh/year
Space heating - main system 1	10468.4086	1.1300	11829.3017 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	3611.4408	1.1300	4080.9281 (278)
Space and water heating			15910.2298 (279)
Pumps, fans and electric keep-hot	210.0000	1.5128	317.6880 (281)
Energy for lighting	250.5571	1.5338	384.3128 (282)
Total Primary energy kWh/year			16612.2306 (286)
Dwelling Primary energy Rate (DPER)			170.1200 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	61.1500 (1b)	x 2.4000 (2b)	= 146.7600 (1b) - (3b)
First floor	36.5000 (1c)	x 2.6000 (2c)	= 94.9000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	97.6500		(4)
Dwelling volume		(3a) + (3b) + (3c) + (3d) + (3e) ... (3n) =	241.6600 (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	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) = 0.1241 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3741 (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) = 0.3180 (21)

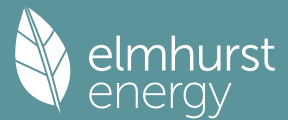
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4055	0.3975	0.3896	0.3498	0.3419	0.3021	0.3021	0.2942	0.3180	0.3419	0.3578	0.3737 (22b)
Effective ac	0.5822	0.5790	0.5759	0.5612	0.5584	0.5456	0.5456	0.5433	0.5506	0.5584	0.5640	0.5698 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.20)			18.1500	1.1450	20.7824		(27)
Ground Floor			61.1500	0.1300	7.9495		(28a)
External Wall	93.0000	20.0400	72.9600	0.1800	13.1328		(29a)
1st Floor	36.5000		36.5000	0.1100	4.0150		(30)
Ground floor	24.6500		24.6500	0.1100	2.7115		(30)
Total net area of external elements Aum(A, m ²)			215.3000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	50.4812		(33)
Party Wall			51.9600	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (User defined value 0.050 * total exposed area)							10.7650 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	61.2462 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	46.4296	46.1750	45.9255	44.7535	44.5342	43.5134	43.5134	43.3244	43.9066	44.5342	44.9778	45.4416 (38)
Heat transfer coeff	107.6758	107.4213	107.1717	105.9997	105.7805	104.7597	104.7597	104.5706	105.1529	105.7805	106.2241	106.6878 (39)
Average = Sum(39)m / 12 =												105.9987

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HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1027	1.1001	1.0975	1.0855	1.0833	1.0728	1.0728	1.0709	1.0768	1.0833	1.0878	1.0926 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	1.0855 31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7167 (42)
Hot water usage for mixer showers	69.7696	68.7211	67.1932	64.2699	62.1126	59.7067	58.3393	59.8556	61.5177	64.1009	67.0870	69.5023 (42a)
Hot water usage for baths	30.1264	29.6790	29.0489	27.8872	27.0173	26.0528	25.5318	26.1574	26.8387	27.8708	29.0564	30.0246 (42b)
Hot water usage for other uses	42.4515	40.9078	39.3641	37.8204	36.2768	34.7331	34.7331	36.2768	37.8204	39.3641	40.9078	42.4515 (42c)
Average daily hot water use (litres/day)												130.8494 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	142.3475	139.3079	135.6063	129.9776	125.4067	120.4926	118.6041	122.2898	126.1768	131.3358	137.0512	141.9784 (44)
Energy content (annual)	225.4437	198.3726	208.4218	177.9328	168.8215	148.1597	143.4414	151.4203	155.5886	178.2214	195.2546	222.3038 (45)
Distribution loss (46)m = 0.15 x (45)m	33.8166	29.7559	31.2633	26.6899	25.3232	22.2240	21.5162	22.7130	23.3383	26.7332	29.2882	33.3456 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	276.4026	244.4000	259.3807	227.2479	219.7804	197.4748	194.4003	202.3792	204.9037	229.1803	244.5696	273.2627 (62)
WWHRS	-31.8957	-28.2089	-29.5387	-24.4592	-22.7951	-19.5059	-18.2837	-19.4429	-20.1816	-23.7919	-26.9533	-31.3051 (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	244.5068	216.1912	229.8420	202.7887	196.9853	177.9688	176.1166	182.9363	184.7221	205.3884	217.6163	241.9576 (64)
12Total per year (kWh/year)												2477.0202 (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	87.6997	77.4657	82.0400	71.4914	68.8729	61.5919	60.4340	63.0870	64.0620	71.9983	77.2509	86.6557 (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	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	129.4273	143.2945	129.4273	133.7416	129.4273	133.7416	129.4273	129.4273	133.7416	129.4273	133.7416	129.4273 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	252.4717	255.0916	248.4896	234.4348	216.6931	200.0184	188.8787	186.2588	192.8608	206.9156	224.6573	241.3320 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672 (71)
Water heating gains (Table 5)	117.8760	115.2764	110.2688	99.2936	92.5711	85.5443	81.2285	84.7943	88.9750	96.7720	107.2929	116.4728 (72)
Total internal gains	566.5252	580.4127	554.9359	534.2202	505.4416	483.0544	463.2846	464.2306	479.3275	499.8651	532.4420	553.9823 (73)

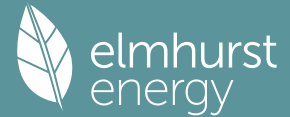
6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d		Gains W
Northeast				9.4800	11.2829		0.6300	0.7000		0.7700		32.6891 (75)
Southwest				8.6700	36.7938		0.6300	0.7000		0.7700		97.4913 (79)
Solar gains	130.1804	232.6033	347.0988	478.4137	579.9872	595.2016	565.7609	487.0153	392.1060	264.8524	157.9034	110.1278 (83)
Total gains	696.7056	813.0160	902.0347	1012.6339	1085.4288	1078.2560	1029.0455	951.2459	871.4335	764.7175	690.3454	664.1101 (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	62.9784	63.1276	63.2746	63.9742	64.1068	64.7315	64.7315	64.8485	64.4894	64.1068	63.8391	63.5616
alpha	5.1986	5.2085	5.2183	5.2649	5.2738	5.3154	5.3154	5.3232	5.2993	5.2738	5.2559	5.2374
util living area	0.9956	0.9895	0.9746	0.9215	0.7966	0.6020	0.4444	0.4990	0.7555	0.9501	0.9901	0.9965 (86)
MIT	19.7769	19.9752	20.2520	20.6118	20.8676	20.9762	20.9960	20.9929	20.9252	20.5849	20.1195	19.7458 (87)
Th 2	19.9987	20.0008	20.0029	20.0127	20.0145	20.0231	20.0231	20.0247	20.0198	20.0145	20.0108	20.0069 (88)
util rest of house	0.9941	0.9862	0.9662	0.8966	0.7411	0.5185	0.3476	0.3967	0.6753	0.9288	0.9863	0.9954 (89)
MIT 2	18.5809	18.8345	19.1843	19.6278	19.9075	20.0101	20.0219	20.0223	19.9713	19.6072	19.0270	18.5473 (90)
Living area fraction	18.7402	18.9864	19.3265	19.7588	20.0353	20.1387	20.1516	20.1515	20.0983	19.7374	19.1724	18.7068 (91)
MIT	18.7402	18.9864	19.3265	19.7588	20.0353	20.1387	20.1516	20.1515	20.0983	19.7374	19.1724	18.7068 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7402	18.9864	19.3265	19.7588	20.0353	20.1387	20.1516	20.1515	20.0983	19.7374	19.1724	18.7068 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9914	0.9814	0.9588	0.8890	0.7424	0.5287	0.3605	0.4102	0.6823	0.9211	0.9818	0.9932	(94)
Useful gains	690.7421	797.8987	864.9148	900.2301	805.8210	570.0886	370.9933	390.2210	594.6053	704.4165	677.7873	659.5754	(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	1554.8560	1513.1791	1374.6332	1151.0317	881.7101	580.2376	372.0598	392.2938	630.7356	966.5564	1282.3813	1547.7028	(97)
Space heating kWh	642.9007	480.6684	379.2305	180.5772	56.4616	0.0000	0.0000	0.0000	0.0000	195.0321	435.3077	660.7668	(98a)
Space heating requirement - total per year (kWh/year)												3030.9448	
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	642.9007	480.6684	379.2305	180.5772	56.4616	0.0000	0.0000	0.0000	0.0000	195.0321	435.3077	660.7668	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3030.9448	
Space heating per m2										(98c) / (4) =		31.0389	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													92.4000	(206)
Efficiency of main space heating system 2 (in %)													0.0000	(207)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	642.9007	480.6684	379.2305	180.5772	56.4616	0.0000	0.0000	0.0000	0.0000	195.0321	435.3077	660.7668	(98)	
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)	
Space heating fuel (main heating system)	695.7800	520.2039	410.4226	195.4299	61.1056	0.0000	0.0000	0.0000	0.0000	211.0737	471.1122	715.1155	(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	244.5068	216.1912	229.8420	202.7887	196.9853	177.9688	176.1166	182.9363	184.7221	205.3884	217.6163	241.9576	(64)	
Efficiency of water heater	86.3519	86.0412	85.4467	84.1337	82.0686	80.3000	80.3000	80.3000	80.3000	84.2707	85.8361	86.4193	(216)	
Fuel for water heating, kWh/month	283.1518	251.2647	268.9889	241.0315	240.0250	221.6299	219.3233	227.8161	230.0400	243.7247	253.5256	279.9811	(219)	
Space cooling fuel requirement														
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)	
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)	
Lighting	26.8924	21.5741	19.4251	14.2317	10.9929	8.9813	10.0281	13.0349	16.9311	22.2145	25.0913	27.6399	(232)	
Electricity generated by PVs (Appendix M) (negative quantity)	-52.9546	-72.5797	-101.4537	-110.8162	-116.8022	-108.0355	-106.6375	-101.9226	-93.2903	-81.3707	-57.4487	-46.0248	(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)	-36.5811	-76.0787	-149.6521	-222.5754	-292.2513	-292.9453	-289.5465	-246.1298	-181.6758	-108.1134	-48.6072	-28.9989	(233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)	
Annual totals kWh/year														
Space heating fuel - main system 1												3280.2433	(211)	
Space heating fuel - main system 2												0.0000	(213)	
Space heating fuel - secondary												0.0000	(215)	
Efficiency of water heater												80.3000		
Water heating fuel used												2960.5025	(219)	
Space cooling fuel												0.0000	(221)	
Electricity for pumps and fans:														
Total electricity for the above, kWh/year												86.0000	(231)	
Electricity for lighting (calculated in Appendix L)												217.0374	(232)	
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation												-3022.4920	(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												3521.2913	(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	3280.2433	0.2100	688.8511	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2960.5025	0.2100	621.7055	(264)
Space and water heating			1310.5566	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	217.0374	0.1443	31.3252	(268)

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Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1049.3365	0.1352	-141.8724
PV Unit electricity exported	-1973.1554	0.1262	-248.9803
Total			-390.8527 (269)
Total CO2, kg/year			962.9584 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.8600 (273)

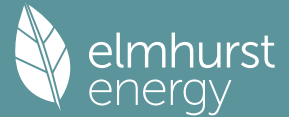
----- 13a. Primary energy - Individual heating systems including micro-CHP -----

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	3280.2433	1.1300	3706.6750 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2960.5025	1.1300	3345.3678 (278)
Space and water heating			7052.0428 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	217.0374	1.5338	332.8992 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1049.3365	1.4997	-1573.7085
PV Unit electricity exported	-1973.1554	0.4632	-913.9543
Total			-2487.6628 (283)
Total Primary energy kWh/year			5027.3800 (286)
Target Primary Energy Rate (TPER)			51.4800 (287)

Appendix C

SAP TER/DER Worksheets – *Refurbishment, Be Lean*

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Property Reference	House Type 1 End - Refurb				Issued on Date	30/08/2024
Assessment Reference	Type 1 End - Improved LEAN			Prop Type Ref		
Property	House Type 1, Edmansons Close, Tottenham, N17 6XD					
SAP Rating	74 C	DER	35.59	TER	15.12	
Environmental	76 C	% DER < TER				-135.38
CO ₂ Emissions (t/year)	1.47	DFEE	108.94	TFEE	42.76	
Compliance Check	See BREL	% DFEE < TFEE				-154.75
% DPER < TPER	-144.56	DPER	194.87	TPER	79.68	
Assessor Details	Miss Eleanor Ballinger				Assessor ID	M976-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	30.0000 (1b)	x 2.4000 (2b)	= 72.0000 (1b) - (3b)
First floor	17.8000 (1c)	x 2.6000 (2c)	= 46.2800 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	47.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 118.2800 (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	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) = 0.2536 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	8.0000 (17)
Infiltration rate	0.6536 (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) = 0.6046 (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	0.7709	0.7558	0.7407	0.6651	0.6500	0.5744	0.5744	0.5593	0.6046	0.6500	0.6802	0.7104 (22b)
Effective ac	0.7971	0.7856	0.7743	0.7212	0.7112	0.6650	0.6650	0.6564	0.6828	0.7112	0.7313	0.7523 (25)

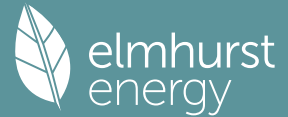
3. Heat losses and heat loss parameter

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
Front door			1.8900	3.0000	5.6700		(26)
Refurb (U _w = 2.70)			4.4500	2.4368	10.8439		(27)
New (U _w = 1.40)			3.6800	1.3258	4.8788		(27)
Ground floor			30.0000	0.4500	13.5000		(28a)
External Wall	71.4800	10.0200	61.4600	0.5500	33.8030		(29a)
1st Floor	17.8000		17.8000	0.1100	1.9580		(30)
Ground floor	12.2000		12.2000	0.1100	1.3420		(30)
Total net area of external elements A _{um} (A, m ²)			131.4800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	71.9957		(33)
Party Wall			26.1100	0.0000	0.0000		(32)
Thermal mass parameter (TMP = C _m / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							26.2960 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	98.2917 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	31.1139	30.6635	30.2221	28.1487	27.7607	25.9549	25.9549	25.6205	26.6505	27.7607	28.5455	29.3660 (38)

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Heat transfer coeff	129.4055	128.9552	128.5137	126.4403	126.0524	124.2465	124.2465	123.9121	124.9421	126.0524	126.8372	127.6576 (39)
Average = Sum(39)m / 12 =												126.4385
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	2.7072	2.6978	2.6886	2.6452	2.6371	2.5993	2.5993	2.5923	2.6139	2.6371	2.6535	2.6707 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.6256 (42)
Hot water usage for mixer showers												
57.9094	57.0391	55.7709	53.3446	51.5540	49.5571	48.4221	49.6807	51.0603	53.2043	55.6828	57.6875 (42a)	
Hot water usage for baths												
22.2592	21.9286	21.4631	20.6047	19.9620	19.2493	18.8644	19.3266	19.8300	20.5925	21.4686	22.1839 (42b)	
Hot water usage for other uses												
31.2775	30.1401	29.0028	27.8654	26.7280	25.5907	25.5907	26.7280	27.8654	29.0028	30.1401	31.2775 (42c)	
Average daily hot water use (litres/day)												102.4623 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
111.4460	109.1078	106.2368	101.8147	98.2440	94.3971	92.8772	95.7353	98.7556	102.7996	107.2915	111.1489 (44)	
Energy content (annual)	176.5033	155.3681	163.2820	139.3792	132.2553	116.0723	112.3269	118.5403	121.7756	139.4981	152.8564	174.0323 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1701.8897
26.4755	23.3052	24.4923	20.9069	19.8383	17.4108	16.8490	17.7811	18.2663	20.9247	22.9285	26.1048 (46)	
Water storage loss:												
Total storage loss												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)	
If cylinder contains dedicated solar storage												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)	
Combi loss	50.9589	46.0274	50.9589	49.3151	50.0641	46.5520	47.3292	48.7857	48.7014	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month												
227.4622	201.3955	214.2409	188.6943	182.3194	162.6243	159.6560	167.3260	170.4770	190.4570	202.1714	224.9912 (62)	
WWHRS	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 (63b)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)	
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)	
Output from w/h												
227.4622	201.3955	214.2409	188.6943	182.3194	162.6243	159.6560	167.3260	170.4770	190.4570	202.1714	224.9912 (64)	
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2291.8151 (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 (64a)	
												0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												
Heat gains from water heating, kWh/month												
71.4271	63.1667	67.0310	58.6724	56.4909	50.2320	49.1810	51.6111	52.6657	59.1228	63.1535	70.6055 (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
81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
73.6144	81.5017	73.6144	76.0682	73.6144	76.0682	73.6144	73.6144	76.0682	73.6144	76.0682	73.6144	73.6144 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
141.5228	142.9913	139.2906	131.4122	121.4671	112.1201	105.8757	104.4072	108.1079	115.9863	125.9314	135.2784	135.2784 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279 (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)												
-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229 (71)
Water heating gains (Table 5)												
96.0041	93.9981	90.0954	81.4894	75.9286	69.7667	66.1035	69.3697	73.1468	79.4662	87.7132	94.8998	94.8998 (72)
Total internal gains	361.5249	368.8747	353.3840	339.3534	321.3938	305.3387	292.9772	294.7749	304.7066	319.4505	340.0965	354.1763 (73)

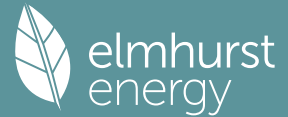
6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
Northeast				1.0600	11.2829		0.8500		0.7000		0.7700		4.9315 (75)
Southwest				3.3900	36.7938		0.8500		0.7000		0.7700		51.4310 (79)
Northeast				3.6800	11.2829		0.6300		0.7000		0.7700		12.6894 (75)
Solar gains	69.0519	123.4739	184.4889	254.6490	309.0129	317.2404	301.4998	259.3424	208.5335	140.6567	83.7742	58.4043	(83)
Total gains	430.5768	492.3486	537.8729	594.0024	630.4067	622.5791	594.4770	554.1173	513.2401	460.1072	423.8706	412.5806	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	25.6515	25.7411	25.8295	26.2531	26.3338	26.7166	26.7166	26.7887	26.5679	26.3338	26.1709	26.0027
alpha	2.7101	2.7161	2.7220	2.7502	2.7556	2.7811	2.7811	2.7859	2.7712	2.7556	2.7447	2.7335
util living area	0.9899	0.9846	0.9756	0.9533	0.9073	0.8179	0.7040	0.7462	0.8880	0.9630	0.9847	0.9911 (86)
MIT	17.9691	18.2160	18.6550	19.3015	19.9407	20.4926	20.7726	20.7220	20.2806	19.4686	18.6310	17.9517 (87)
Th 2	18.9035	18.9087	18.9138	18.9379	18.9424	18.9637	18.9637	18.9677	18.9555	18.9424	18.9333	18.9237 (88)
util rest of house	0.9859	0.9785	0.9650	0.9300	0.8515	0.6828	0.4562	0.5148	0.7929	0.9396	0.9775	0.9876 (89)
MIT 2	15.6187	15.9349	16.4945	17.3168	18.0907	18.6972	18.9126	18.8927	18.5017	17.5402	16.4786	15.6062 (90)

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Living area fraction									fLA = Living area / (4) =		0.3734 (91)	
MIT	16.4964	16.7867	17.3013	18.0579	18.7815	19.3677	19.6072	19.5758	19.1660	18.2603	17.2824	16.4821 (92)
Temperature adjustment												0.0000
adjusted MIT	16.4964	16.7867	17.3013	18.0579	18.7815	19.3677	19.6072	19.5758	19.1660	18.2603	17.2824	16.4821 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9783	0.9685	0.9522	0.9154	0.8455	0.7170	0.5509	0.6010	0.8064	0.9276	0.9679	0.9807	(94)
Useful gains	421.2365	476.8319	512.1706	543.7528	533.0081	446.3725	327.5165	333.0000	413.8786	426.8147	410.2828	404.6198	(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	1578.2768	1532.8565	1388.1164	1157.9287	892.6450	592.3663	373.6290	393.5217	632.9585	965.6015	1291.5058	1567.9014	(97)
Space heating kWh	860.8380	709.6485	651.7036	442.2066	267.5698	0.0000	0.0000	0.0000	0.0000	400.8573	634.4806	865.4815	(98a)
Space heating requirement - total per year (kWh/year)												4832.7861	
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	860.8380	709.6485	651.7036	442.2066	267.5698	0.0000	0.0000	0.0000	0.0000	400.8573	634.4806	865.4815	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4832.7861	
Space heating per m2										(98c) / (4) =		101.1043	(99)

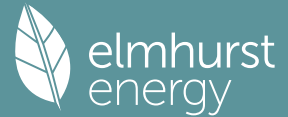
9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													89.5000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	860.8380	709.6485	651.7036	442.2066	267.5698	0.0000	0.0000	0.0000	0.0000	400.8573	634.4806	865.4815	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	961.8301	792.9034	728.1605	494.0856	298.9607	0.0000	0.0000	0.0000	0.0000	447.8853	708.9169	967.0185	(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	227.4622	201.3955	214.2409	188.6943	182.3194	162.6243	159.6560	167.3260	170.4770	190.4570	202.1714	224.9912	(64)
Efficiency of water heater	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(216)
Fuel for water heating, kWh/month	254.1477	225.0229	239.3753	210.8316	203.7088	181.7031	178.3866	186.9564	190.4771	212.8011	225.8899	251.3868	(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	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	15.2956	12.2707	11.0484	8.0945	6.2525	5.1083	5.7037	7.4139	9.6299	12.6350	14.2712	15.7207	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												5399.7610	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												89.5000	
Water heating fuel used												2560.6873	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												123.4445	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												8169.8927	(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	5399.7610	0.2100	1133.9498	(261)

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Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2560.6873	0.2100	537.7443 (264)
Space and water heating			1671.6941 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	123.4445	0.1443	17.8168 (268)
Total CO2, kg/year			1701.4402 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			35.5900 (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	5399.7610	1.1300	6101.7299 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2560.6873	1.1300	2893.5767 (278)
Space and water heating			8995.3065 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	123.4445	1.5338	189.3432 (282)
Total Primary energy kWh/year			9314.7506 (286)
Dwelling Primary energy Rate (DPER)			194.8700 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	30.0000 (1b)	x 2.4000 (2b)	= 72.0000 (1b) - (3b)
First floor	17.8000 (1c)	x 2.6000 (2c)	= 46.2800 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	47.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	118.2800 (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) = 0.1691 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4191 (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) = 0.3877 (21)

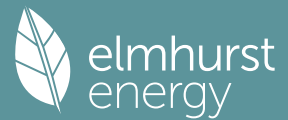
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4943	0.4846	0.4749	0.4264	0.4167	0.3683	0.3683	0.3586	0.3877	0.4167	0.4361	0.4555 (22b)
Effective ac	0.6221	0.6174	0.6128	0.5909	0.5868	0.5678	0.5678	0.5643	0.5751	0.5868	0.5951	0.6037 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.20)			8.1300	1.1450	9.3092		(27)
Ground Floor			30.0000	0.1300	3.9000		(28a)
External Wall	71.4800	10.0200	61.4600	0.1800	11.0628		(29a)
1st Floor	17.8000		17.8000	0.1100	1.9580		(30)
Ground floor	12.2000		12.2000	0.1100	1.3420		(30)
Total net area of external elements Aum(A, m2)			131.4800				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	29.4620	(33)
Party Wall			26.1100	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (User defined value 0.050 * total exposed area)							6.5740 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	36.0360 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	24.2840	24.0988	23.9173	23.0650	22.9055	22.1631	22.1631	22.0256	22.4491	22.9055	23.2281	23.5654 (38)
Heat transfer coeff												

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Average = Sum(39)m / 12 =	60.3199	60.1348	59.9533	59.1009	58.9415	58.1991	58.1991	58.0616	58.4850	58.9415	59.2641	59.6014 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2619	1.2580	1.2543	1.2364	1.2331	1.2176	1.2176	1.2147	1.2235	1.2331	1.2398	1.2469 (40)
HLP (average)												1.2364
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.6256 (42)
Hot water usage for mixer showers												
51.4750	50.7014	49.5742	47.4174	45.8258	44.0508	43.0419	44.1606	45.3869	47.2927	49.4958	51.2778 (42a)	
Hot water usage for baths												
22.2592	21.9286	21.4631	20.6047	19.9620	19.2493	18.8644	19.3266	19.8300	20.5925	21.4686	22.1839 (42b)	
Hot water usage for other uses												
31.2775	30.1401	29.0028	27.8654	26.7280	25.5907	25.5907	26.7280	27.8654	29.0028	30.1401	31.2775 (42c)	
Average daily hot water use (litres/day)												96.5301 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	105.0116	102.7701	100.0400	95.8875	92.5158	88.8908	87.4969	90.2153	93.0823	96.8880	101.1045	104.7392 (44)
Energy conte	166.3128	146.3433	153.7578	131.2652	124.5440	109.3016	105.8199	111.7053	114.7797	131.4761	144.0419	163.9962 (45)
Energy content (annual)										Total = Sum(45)m =		1603.3439
Distribution loss (46)m = 0.15 x (45)m												
24.9469	21.9515	23.0637	19.6898	18.6816	16.3952	15.8730	16.7558	17.2170	19.7214	21.6063	24.5994 (46)	
Water storage loss:												
Total storage loss												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)	
If cylinder contains dedicated solar storage												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)	
Combi loss	50.9589	46.0274	50.9589	47.2870	47.1450	43.8365	44.5875	45.9727	45.9036	49.3731	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month												
217.2717	192.3707	204.7167	178.5522	171.6891	153.1381	150.4074	157.6780	160.6833	180.8492	193.3570	214.9551 (62)	
WWHRS	-23.5322	-20.8121	-21.7932	-18.0456	-16.8179	-14.3912	-13.4894	-14.3447	-14.8897	-17.5533	-19.8857	-23.0964 (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	193.7395	171.5586	182.9234	160.5066	154.8712	138.7469	136.9180	143.3334	145.7936	163.2959	173.4712	191.8587 (64)
12Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				1957.0170 (64)
Electric shower(s)												1957 (64)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)	
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month												
68.0387	60.1660	63.8642	55.4674	53.1972	47.3019	46.3320	48.6352	49.6402	56.0591	60.2227	67.2685 (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	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	73.6144	81.5017	73.6144	76.0682	73.6144	76.0682	73.6144	73.6144	76.0682	73.6144	76.0682	73.6144 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	141.5228	142.9913	139.2906	131.4122	121.4671	112.1201	105.8757	104.4072	108.1079	115.9863	125.9314	135.2784 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279 (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)												
	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229 (71)
Water heating gains (Table 5)												
	91.4499	89.5327	85.8390	77.0381	71.5015	65.6971	62.2742	65.3699	68.9447	75.3482	83.6426	90.4146 (72)
Total internal gains												
	356.9707	364.4094	349.1276	334.9021	316.9667	301.2690	289.1480	290.7751	300.5044	315.3326	336.0259	349.6911 (73)

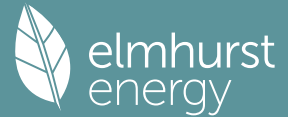
6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
Northeast					4.7400	11.2829	0.6300	0.7000	0.7700		16.3445 (75)	
Southwest					3.3900	36.7938	0.6300	0.7000	0.7700		38.1194 (79)	
Solar gains	54.4640	98.2013	148.7837	208.5209	255.6228	263.4786	249.9830	213.3593	169.2369	112.4215	66.2240	45.9701 (83)
Total gains	411.4347	462.6106	497.9112	543.4231	572.5894	564.7476	539.1309	504.1344	469.7414	427.7540	402.2499	395.6611 (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	55.0307	55.2001	55.3672	56.1657	56.3176	57.0360	57.0360	57.1711	56.7572	56.3176	56.0111	55.6941
alpha	4.6687	4.6800	4.6911	4.7444	4.7545	4.8024	4.8024	4.8114	4.7838	4.7545	4.7341	4.7129
util living area												
	0.9909	0.9833	0.9673	0.9177	0.8077	0.6261	0.4679	0.5178	0.7589	0.9375	0.9825	0.9924 (86)
MIT	19.6821	19.8711	20.1468	20.5222	20.8108	20.9582	20.9915	20.9866	20.8959	20.5317	20.0544	19.6587 (87)
Th 2	19.8708	19.8738	19.8768	19.8910	19.8936	19.9060	19.9060	19.9083	19.9012	19.8936	19.8883	19.8827 (88)
util rest of house												
	0.9880	0.9780	0.9566	0.8907	0.7493	0.5327	0.3552	0.4010	0.6724	0.9109	0.9760	0.9899 (89)
MIT 2	18.3683	18.6094	18.9571	19.4219	19.7409	19.8834	19.9035	19.9038	19.8346	19.4454	18.8540	18.3471 (90)
Living area fraction												
									fLA = Living area / (4) =			0.3734 (91)
MIT	18.8589	19.0806	19.4014	19.8328	20.1404	20.2848	20.3098	20.3082	20.2310	19.8510	19.3022	18.8368 (92)

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Temperature adjustment												0.0000
adjusted MIT	18.8589	19.0806	19.4014	19.8328	20.1404	20.2848	20.3098	20.3082	20.2310	19.8510	19.3022	18.8368 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9844	0.9730	0.9509	0.8890	0.7636	0.5663	0.3975	0.4447	0.7005	0.9097	0.9714	0.9867	(94)
Useful gains	405.0020	450.1293	473.4508	483.1222	437.2066	319.8444	214.3013	224.2084	329.0668	389.1265	390.7417	390.3971	(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	878.1935	852.7453	773.4796	646.1400	497.4907	330.8477	215.9068	226.9144	358.5691	545.2704	723.1550	872.3762	(97)
Space heating kWh	352.0545	270.5580	223.2215	117.3728	44.8514	0.0000	0.0000	0.0000	0.0000	116.1711	239.3376	358.5924	(98a)
Space heating requirement - total per year (kWh/year)												1722.1592	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	352.0545	270.5580	223.2215	117.3728	44.8514	0.0000	0.0000	0.0000	0.0000	116.1711	239.3376	358.5924	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1722.1592	
Space heating per m2											(98c) / (4) =	36.0284	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													92.4000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	352.0545	270.5580	223.2215	117.3728	44.8514	0.0000	0.0000	0.0000	0.0000	116.1711	239.3376	358.5924	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	381.0113	292.8117	241.5817	127.0269	48.5404	0.0000	0.0000	0.0000	0.0000	125.7263	259.0234	388.0870	(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	193.7395	171.5586	182.9234	160.5066	154.8712	138.7469	136.9180	143.3334	145.7936	163.2959	173.4712	191.8587	(64)
Efficiency of water heater	(217)m	85.6441	85.3529	84.8091	83.7209	82.0832	80.3000	80.3000	80.3000	83.6644	85.0714	85.7009	(216)
Fuel for water heating, kWh/month	226.2146	200.9992	215.6884	191.7162	188.6759	172.7857	170.5080	178.4973	181.5612	195.1797	203.9126	223.8702	(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	(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	15.2956	12.2707	11.0484	8.0945	6.2525	5.1083	5.7037	7.4139	9.6299	12.6350	14.2712	15.7207	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	(233a)m	-27.2033	-37.9156	-53.9188	-60.0080	-64.2650	-59.9066	-59.2351	-56.1708	-50.6383	-43.1382	-29.7804	-23.5767 (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	(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	(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	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)	(233b)m	-16.7226	-35.0158	-69.2729	-103.5529	-136.4153	-136.8134	-135.1316	-114.5826	-84.2592	-49.8221	-22.2503	-13.2297 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1863.8086	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2349.6091	(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)												123.4445	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1482.8252	(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												2940.0370	(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	1863.8086	0.2100	391.3998	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2349.6091	0.2100	493.4179	(264)
Space and water heating			884.8177	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)

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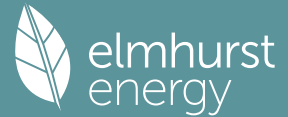


Energy for lighting	123.4445	0.1443	17.8168 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-565.7568	0.1348	-76.2539
PV Unit electricity exported	-917.0683	0.1260	-115.5956
Total			-191.8494 (269)
Total CO2, kg/year			722.7144 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.1200 (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	1863.8086	1.1300	2106.1037 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2349.6091	1.1300	2655.0582 (278)
Space and water heating			4761.1620 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	123.4445	1.5338	189.3432 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-565.7568	1.4981	-847.5841
PV Unit electricity exported	-917.0683	0.4627	-424.3228
Total			-1271.9070 (283)
Total Primary energy kWh/year			3808.6990 (286)
Target Primary Energy Rate (TPER)			79.6800 (287)

Full SAP Calculation Printout



Property Reference	House Type 1 Mid - Refurb				Issued on Date	30/08/2024
Assessment Reference	Type 1 Mid Improved LEAN			Prop Type Ref		
Property	House Type 1, Edmansons Close, Tottenham, N17 6XD					
SAP Rating	77 C	DER	31.07	TER	13.44	
Environmental	79 C	% DER < TER				-131.18
CO ₂ Emissions (t/year)	1.28	DFEE	88.67	TFEE	35.11	
Compliance Check	See BREL	% DFEE < TFEE				-152.54
% DPER < TPER	-141.33	DPER	170.52	TPER	70.66	
Assessor Details	Miss Eleanor Ballinger				Assessor ID	M976-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	30.0000 (1b)	x 2.4000 (2b)	= 72.0000 (1b) - (3b)
First floor	17.8000 (1c)	x 2.6000 (2c)	= 46.2800 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	47.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 118.2800 (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	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) = 0.2536 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	8.0000 (17)
Infiltration rate	0.6536 (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) = 0.5556 (21)

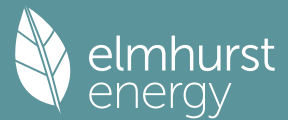
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.7084	0.6945	0.6806	0.6111	0.5973	0.5278	0.5278	0.5139	0.5556	0.5973	0.6250	0.6528 (22b)
Effective ac	0.7509	0.7412	0.7316	0.6868	0.6784	0.6393	0.6393	0.6321	0.6543	0.6784	0.6953	0.7131 (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
Front door			1.8900	3.0000	5.6700		(26)
Refurb (Uw = 2.70)			4.4500	2.4368	10.8439		(27)
New (Uw = 1.40)			3.6800	1.3258	4.8788		(27)
Ground floor			30.0000	0.4500	13.5000		(28a)
External Wall	45.0000	10.0200	34.9800	0.5500	19.2390		(29a)
1st Floor	17.8000		17.8000	0.1100	1.9580		(30)
Ground floor	12.2000		12.2000	0.1100	1.3420		(30)
Total net area of external elements Aum(A, m ²)			105.0000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	57.4317		(33)
Party Wall			52.2200	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							21.0000 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	78.4317 (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
	29.3094	28.9291	28.5564	26.8056	26.4780	24.9531	24.9531	24.6707	25.5405	26.4780	27.1407	27.8335 (38)

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Heat transfer coeff
107.7411 107.3608 106.9880 105.2372 104.9096 103.3848 103.3848 103.1024 103.9721 104.9096 105.5723 106.2651 (39)
Average = Sum(39)m / 12 = 105.2356

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.2540	2.2460	2.2382	2.2016	2.1948	2.1629	2.1629	2.1570	2.1751	2.1948	2.2086	2.2231	(40)
HLP (average)												2.2016	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.6256 (42)
Hot water usage for mixer showers 57.9094 57.0391 55.7709 53.3446 51.5540 49.5571 48.4221 49.6807 51.0603 53.2043 55.6828 57.6875 (42a)
Hot water usage for baths 22.2592 21.9286 21.4631 20.6047 19.9620 19.2493 18.8644 19.3266 19.8300 20.5925 21.4686 22.1839 (42b)
Hot water usage for other uses 31.2775 30.1401 29.0028 27.8654 26.7280 25.5907 25.5907 26.7280 27.8654 29.0028 30.1401 31.2775 (42c)
Average daily hot water use (litres/day) 102.4623 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	111.4460	109.1078	106.2368	101.8147	98.2440	94.3971	92.8772	95.7353	98.7556	102.7996	107.2915	111.1489	(44)
Energy conte	176.5033	155.3681	163.2820	139.3792	132.2553	116.0723	112.3269	118.5403	121.7756	139.4981	152.8564	174.0323	(45)
Energy content (annual)												1701.8897	
Distribution loss (46)m = 0.15 x (45)m	26.4755	23.3052	24.4923	20.9069	19.8383	17.4108	16.8490	17.7811	18.2663	20.9247	22.9285	26.1048	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.0641	46.5520	47.3292	48.7857	48.7014	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	227.4622	201.3955	214.2409	188.6943	182.3194	162.6243	159.6560	167.3260	170.4770	190.4570	202.1714	224.9912	(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	227.4622	201.3955	214.2409	188.6943	182.3194	162.6243	159.6560	167.3260	170.4770	190.4570	202.1714	224.9912	(64)
12Total per year (kWh/year)												2291.8151	(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	71.4271	63.1667	67.0310	58.6724	56.4909	50.2320	49.1810	51.6111	52.6657	59.1228	63.1535	70.6055	(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	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	73.6144	81.5017	73.6144	76.0682	73.6144	76.0682	73.6144	73.6144	76.0682	73.6144	76.0682	73.6144	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	141.5228	142.9913	139.2906	131.4122	121.4671	112.1201	105.8757	104.4072	108.1079	115.9863	125.9314	135.2784	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	(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)	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	(71)
Water heating gains (Table 5)	96.0041	93.9981	90.0954	81.4894	75.9286	69.7667	66.1035	69.3697	73.1468	79.4662	87.7132	94.8998	(72)
Total internal gains	361.5249	368.8747	353.3840	339.3534	321.3938	305.3387	292.9772	294.7749	304.7066	319.4505	340.0965	354.1763	(73)

6. Solar gains

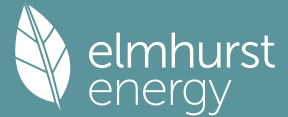
[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W							
Northeast	1.0600	11.2829	0.8500	0.7000	0.7700	4.9315 (75)							
Southwest	3.3900	36.7938	0.8500	0.7000	0.7700	51.4310 (79)							
Northeast	3.6800	11.2829	0.6300	0.7000	0.7700	12.6894 (75)							
Solar gains	69.0519	123.4739	184.4889	254.6490	309.0129	317.2404	301.4998	259.3424	208.5335	140.6567	83.7742	58.4043	(83)
Total gains	430.5768	492.3486	537.8729	594.0024	630.4067	622.5791	594.4770	554.1173	513.2401	460.1072	423.8706	412.5806	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil/m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	30.8095	30.9186	31.0263	31.5425	31.6410	32.1077	32.1077	32.1956	31.9263	31.6410	31.4424	31.2374	
alpha	3.0540	3.0612	3.0684	3.1028	3.1094	3.1405	3.1405	3.1464	3.1284	3.1094	3.0962	3.0825	
util living area	0.9903	0.9846	0.9743	0.9476	0.8909	0.7811	0.6495	0.6969	0.8667	0.9594	0.9847	0.9916	(86)
MIT	18.4366	18.6749	19.0773	19.6628	20.2199	20.6679	20.8697	20.8330	20.4849	19.7760	19.0258	18.4184	(87)
Th 2	19.1694	19.1744	19.1792	19.2023	19.2067	19.2270	19.2270	19.2308	19.2191	19.2067	19.1979	19.1887	(88)
util rest of house	0.9867	0.9788	0.9638	0.9236	0.8333	0.6512	0.4348	0.4910	0.7714	0.9357	0.9778	0.9884	(89)
MIT 2	16.3489	16.6542	17.1664	17.9089	18.5728	19.0498	19.1951	19.1827	18.8885	18.0646	17.1165	16.3363	(90)

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Living area fraction									fLA = Living area / (4) =			0.3734 (91)
MIT	17.1285	17.4088	17.8800	18.5639	19.1879	19.6540	19.8205	19.7990	19.4847	18.7037	17.8295	17.1138 (92)
Temperature adjustment												0.0000
adjusted MIT	17.1285	17.4088	17.8800	18.5639	19.1879	19.6540	19.8205	19.7990	19.4847	18.7037	17.8295	17.1138 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9803	0.9701	0.9528	0.9119	0.8326	0.6885	0.5162	0.5678	0.7896	0.9261	0.9696	0.9827	(94)
Useful gains	422.0862	477.6482	512.4778	541.6593	524.8541	428.6213	306.8616	314.6132	405.2733	426.0892	410.9955	405.4264	(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	1382.1610	1342.9524	1217.5250	1016.9995	785.5499	522.5110	332.9470	350.4438	559.8537	850.1528	1132.7354	1372.2880	(97)
Space heating kWh	714.2956	581.4844	524.5551	342.2450	193.9577	0.0000	0.0000	0.0000	0.0000	315.5033	519.6527	719.3451	(98a)
Space heating requirement - total per year (kWh/year)												3911.0388	
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	714.2956	581.4844	524.5551	342.2450	193.9577	0.0000	0.0000	0.0000	0.0000	315.5033	519.6527	719.3451	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3911.0388	
Space heating per m2										(98c) / (4) =		81.8209	(99)

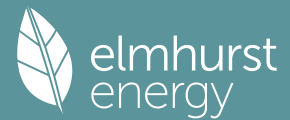
9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													89.5000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	714.2956	581.4844	524.5551	342.2450	193.9577	0.0000	0.0000	0.0000	0.0000	315.5033	519.6527	719.3451	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	798.0957	649.7032	586.0950	382.3966	216.7125	0.0000	0.0000	0.0000	0.0000	352.5177	580.6176	803.7375	(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	227.4622	201.3955	214.2409	188.6943	182.3194	162.6243	159.6560	167.3260	170.4770	190.4570	202.1714	224.9912	(64)
Efficiency of water heater	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(216)
Fuel for water heating, kWh/month	254.1477	225.0229	239.3753	210.8316	203.7088	181.7031	178.3866	186.9564	190.4771	212.8011	225.8899	251.3868	(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	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	15.2956	12.2707	11.0484	8.0945	6.2525	5.1083	5.7037	7.4139	9.6299	12.6350	14.2712	15.7207	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												4369.8758	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												89.5000	
Water heating fuel used												2560.6873	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												123.4445	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												7140.0076	(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	4369.8758	0.2100	917.6739	(261)

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Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2560.6873	0.2100	537.7443 (264)
Space and water heating			1455.4183 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	123.4445	0.1443	17.8168 (268)
Total CO2, kg/year			1485.1644 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			31.0700 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	4369.8758	1.1300	4937.9597 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2560.6873	1.1300	2893.5767 (278)
Space and water heating			7831.5363 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	123.4445	1.5338	189.3432 (282)
Total Primary energy kWh/year			8150.9803 (286)
Dwelling Primary energy Rate (DPER)			170.5200 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	30.0000 (1b)	x 2.4000 (2b)	= 72.0000 (1b) - (3b)
First floor	17.8000 (1c)	x 2.6000 (2c)	= 46.2800 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	47.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	118.2800 (5)

2. Ventilation rate

Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	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) =	0.1691 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.4191	(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) =	0.3562 (21)

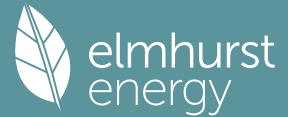
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4542	0.4453	0.4364	0.3918	0.3829	0.3384	0.3384	0.3295	0.3562	0.3829	0.4008	0.4186 (22b)
Effective ac	0.6031	0.5991	0.5952	0.5768	0.5733	0.5573	0.5573	0.5543	0.5634	0.5733	0.5803	0.5876 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.20)			8.1300	1.1450	9.3092		(27)
Ground Floor			30.0000	0.1300	3.9000		(28a)
External Wall	45.0000	10.0200	34.9800	0.1800	6.2964		(29a)
1st Floor	17.8000		17.8000	0.1100	1.9580		(30)
Ground floor	12.2000		12.2000	0.1100	1.3420		(30)
Total net area of external elements Aum(A, m2)			105.0000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.6956		(33)
Party Wall			52.2200	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (User defined value 0.050 * total exposed area)							5.2500 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	29.9456 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 23.5422	Feb 23.3858	Mar 23.2326	Apr 22.5128	May 22.3782	Jun 21.7513	Jul 21.7513	Aug 21.6352	Sep 21.9928	Oct 22.3782	Nov 22.6506	Dec 22.9354 (38)
Heat transfer coeff												

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Average = Sum(39)m / 12 =	53.4877	53.3314	53.1781	52.4584	52.3237	51.6969	51.6969	51.5808	51.9383	52.3237	52.5962	52.8810 (39)
	52.4577											
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1190	1.1157	1.1125	1.0975	1.0946	1.0815	1.0815	1.0791	1.0866	1.0946	1.1003	1.1063 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	1.0974 (40)
	31											

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.6256 (42)											
Hot water usage for mixer showers	51.4750	50.7014	49.5742	47.4174	45.8258	44.0508	43.0419	44.1606	45.3869	47.2927	49.4958	51.2778 (42a)
Hot water usage for baths	22.2592	21.9286	21.4631	20.6047	19.9620	19.2493	18.8644	19.3266	19.8300	20.5925	21.4686	22.1839 (42b)
Hot water usage for other uses	31.2775	30.1401	29.0028	27.8654	26.7280	25.5907	25.5907	26.7280	27.8654	29.0028	30.1401	31.2775 (42c)
Average daily hot water use (litres/day)	96.5301 (43)											
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	105.0116	102.7701	100.0400	95.8875	92.5158	88.8908	87.4969	90.2153	93.0823	96.8880	101.1045	104.7392 (44)
Energy content (annual)	166.3128	146.3433	153.7578	131.2652	124.5440	109.3016	105.8199	111.7053	114.7797	131.4761	144.0419	163.9962 (45)
Distribution loss (46)m = 0.15 x (45)m	24.9469	21.9515	23.0637	19.6898	18.6816	16.3952	15.8730	16.7558	17.2170	19.7214	21.6063	24.5994 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	50.9589	46.0274	50.9589	47.2870	47.1450	43.8365	44.5875	45.9727	45.9036	49.3731	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	217.2717	192.3707	204.7167	178.5522	171.6891	153.1381	150.4074	157.6780	160.6833	180.8492	193.3570	214.9551 (62)
WWHRS	-23.5322	-20.8121	-21.7932	-18.0456	-16.8179	-14.3912	-13.4894	-14.3447	-14.8897	-17.5533	-19.8857	-23.0964 (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	193.7395	171.5586	182.9234	160.5066	154.8712	138.7469	136.9180	143.3334	145.7936	163.2959	173.4712	191.8587 (64)
12Total per year (kWh/year)	1957.0170 (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	68.0387	60.1660	63.8642	55.4674	53.1972	47.3019	46.3320	48.6352	49.6402	56.0591	60.2227	67.2685 (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	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	73.6144	81.5017	73.6144	76.0682	73.6144	76.0682	73.6144	73.6144	76.0682	73.6144	76.0682	73.6144 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	141.5228	142.9913	139.2906	131.4122	121.4671	112.1201	105.8757	104.4072	108.1079	115.9863	125.9314	135.2784 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229 (71)
Water heating gains (Table 5)	91.4499	89.5327	85.8390	77.0381	71.5015	65.6971	62.2742	65.3699	68.9447	75.3482	83.6426	90.4146 (72)
Total internal gains	356.9707	364.4094	349.1276	334.9021	316.9667	301.2690	289.1480	290.7751	300.5044	315.3326	336.0259	349.6911 (73)

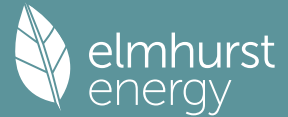
6. Solar gains

[Jan]												Gains
	Area m2				Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		W
Northeast	4.7400				11.2829	0.6300		0.7000		0.7700		16.3445 (75)
Southwest	3.3900				36.7938	0.6300		0.7000		0.7700		38.1194 (79)
Solar gains	54.4640	98.2013	148.7837	208.5209	255.6228	263.4786	249.9830	213.3593	169.2369	112.4215	66.2240	45.9701 (83)
Total gains	411.4347	462.6106	497.9112	543.4231	572.5894	564.7476	539.1309	504.1344	469.7414	427.7540	402.2499	395.6611 (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	62.0599	62.2419	62.4212	63.2777	63.4405	64.2098	64.2098	64.3543	63.9113	63.4405	63.1119	62.7720
alpha	5.1373	5.1495	5.1614	5.2185	5.2294	5.2807	5.2807	5.2903	5.2608	5.2294	5.2075	5.1848
util living area	0.9899	0.9805	0.9603	0.8967	0.7643	0.5709	0.4193	0.4660	0.7095	0.9218	0.9795	0.9916 (86)
MIT	19.9039	20.0859	20.3385	20.6661	20.8890	20.9809	20.9969	20.9947	20.9431	20.6605	20.2371	19.8786 (87)
Th 2	19.9854	19.9880	19.9906	20.0029	20.0052	20.0160	20.0160	20.0179	20.0118	20.0052	20.0006	19.9957 (88)
util rest of house	0.9867	0.9746	0.9481	0.8668	0.7062	0.4895	0.3269	0.3690	0.6277	0.8921	0.9722	0.9890 (89)
MIT 2	18.7322	18.9634	19.2797	19.6793	19.9175	20.0057	20.0150	20.0162	19.9763	19.6839	19.1658	18.7078 (90)
Living area fraction	FLA = Living area / (4) =											0.3734 (91)
MIT	19.1698	19.3826	19.6751	20.0478	20.2803	20.3699	20.3817	20.3816	20.3373	20.0486	19.5658	19.1450 (92)

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Temperature adjustment												0.0000
adjusted MIT	19.1698	19.3826	19.6751	20.0478	20.2803	20.3699	20.3817	20.3816	20.3373	20.0486	19.5658	19.1450 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9834	0.9701	0.9435	0.8683	0.7233	0.5194	0.3615	0.4053	0.6561	0.8936	0.9681	0.9860	(94)
Useful gains	404.5948	448.7731	469.7666	471.8676	414.1339	293.3580	194.9108	204.3159	308.1788	382.2427	389.4217	390.1160	(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	795.3508	772.3775	700.6277	584.7951	448.9536	298.2833	195.4995	205.3718	323.9557	494.3863	655.6553	790.3044	(97)
Space heating kWh	290.7224	217.4621	171.7606	81.3078	25.9059	0.0000	0.0000	0.0000	0.0000	83.4348	191.6882	297.7402	(98a)
Space heating requirement - total per year (kWh/year)												1360.0221	
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	290.7224	217.4621	171.7606	81.3078	25.9059	0.0000	0.0000	0.0000	0.0000	83.4348	191.6882	297.7402	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1360.0221	
Space heating per m2										(98c) / (4) =		28.4523	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													92.4000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	290.7224	217.4621	171.7606	81.3078	25.9059	0.0000	0.0000	0.0000	0.0000	83.4348	191.6882	297.7402	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	314.6347	235.3486	185.8881	87.9955	28.0367	0.0000	0.0000	0.0000	0.0000	90.2975	207.4548	322.2296	(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	193.7395	171.5586	182.9234	160.5066	154.8712	138.7469	136.9180	143.3334	145.7936	163.2959	173.4712	191.8587	(64)
Efficiency of water heater	85.2488	84.8906	84.2467	82.9998	81.4288	80.3000	80.3000	80.3000	80.3000	83.0157	84.5959	85.3193	(216)
Fuel for water heating, kWh/month	227.2634	202.0938	217.1284	193.3820	190.1921	172.7857	170.5080	178.4973	181.5612	196.7048	205.0585	224.8715	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	15.2956	12.2707	11.0484	8.0945	6.2525	5.1083	5.7037	7.4139	9.6299	12.6350	14.2712	15.7207	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-27.2033	-37.9156	-53.9188	-60.0080	-64.2650	-59.9066	-59.2351	-56.1708	-50.6383	-43.1382	-29.7804	-23.5767	(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)	-16.7226	-35.0158	-69.2729	-103.5529	-136.4153	-136.8134	-135.1316	-114.5826	-84.2592	-49.8221	-22.2503	-13.2297	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1													1471.8854 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													80.3000
Water heating fuel used													2360.0469 (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)													123.4445 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-1482.8252 (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													2558.5516 (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	1471.8854	0.2100	309.0959	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2360.0469	0.2100	495.6098	(264)
Space and water heating			804.7058	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)

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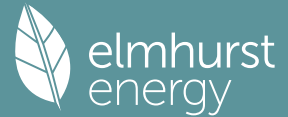


Energy for lighting	123.4445	0.1443	17.8168 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-565.7568	0.1348	-76.2539
PV Unit electricity exported	-917.0683	0.1260	-115.5956
Total			-191.8494 (269)
Total CO2, kg/year			642.6025 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.4400 (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	1471.8854	1.1300	1663.2305 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2360.0469	1.1300	2666.8530 (278)
Space and water heating			4330.0835 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	123.4445	1.5338	189.3432 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-565.7568	1.4981	-847.5841
PV Unit electricity exported	-917.0683	0.4627	-424.3228
Total			-1271.9070 (283)
Total Primary energy kWh/year			3377.6205 (286)
Target Primary Energy Rate (TPER)			70.6600 (287)

Full SAP Calculation Printout



Property Reference	House Type 2 End - Refurb				Issued on Date	30/08/2024
Assessment Reference	Type 2 End Improved LEAN			Prop Type Ref		
Property	House Type 2, Edmansons Close, Tottenham, N17 6XD					
SAP Rating	75 C	DER	28.01	TER	10.69	
Environmental	75 C	% DER < TER				-162.02
CO ₂ Emissions (t/year)	2.33	DFEE	96.75	TFEE	40.09	
Compliance Check	See BREL	% DFEE < TFEE				-141.33
% DPER < TPER	-174.10	DPER	153.36	TPER	55.95	
Assessor Details	Miss Eleanor Ballinger				Assessor ID	M976-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	61.1500 (1b)	x 2.4000 (2b)	= 146.7600 (1b) - (3b)
First floor	36.5000 (1c)	x 2.6000 (2c)	= 94.9000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	97.6500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 241.6600 (5)

2. Ventilation rate

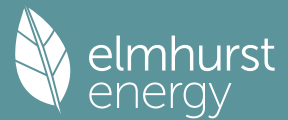
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	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) = 0.1241 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	8.0000 (17)
Infiltration rate	0.5241 (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) = 0.4848 (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	0.6182	0.6060	0.5939	0.5333	0.5212	0.4606	0.4606	0.4485	0.4848	0.5212	0.5454	0.5697 (22b)
Effective ac	0.6911	0.6836	0.6764	0.6422	0.6358	0.6061	0.6061	0.6006	0.6175	0.6358	0.6487	0.6623 (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					
Front door			1.8900	3.0000	5.6700		(26)					
Refurb (Uw = 2.70)			10.7900	2.4368	26.2933		(27)					
New (Uw = 1.40)			7.3600	1.3258	9.7576		(27)					
Ground Floor			61.1500	0.5000	30.5750		(28a)					
External Wall	118.8600	20.0400	98.8200	0.5500	54.3510		(29a)					
1st Floor	36.5000		36.5000	0.1100	4.0150		(30)					
Ground floor	24.6500		24.6500	0.1100	2.7115		(30)					
Total net area of external elements Aum(A, m2)			241.1600				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	133.3734		(33)					
Party Wall			25.9800	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Default value 0.200 * total exposed area)							48.2320 (36)					
Point Thermal bridges						(36a) =	0.0000					
Total fabric heat loss						(33) + (36) + (36a) =	181.6054 (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
	55.1105	54.5189	53.9389	51.2150	50.7053	48.3328	48.3328	47.8935	49.2467	50.7053	51.7363	52.8142 (38)

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Heat transfer coeff
236.7159 236.1243 235.5443 232.8204 232.3107 229.9382 229.9382 229.4989 230.8521 232.3107 233.3417 234.4196 (39)
Average = Sum(39)m / 12 = 232.8179

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.4241	2.4181	2.4121	2.3842	2.3790	2.3547	2.3547	2.3502	2.3641	2.3790	2.3896	2.4006	(40)
HLP (average)												2.3842	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.7167 (42)
Hot water usage for mixer showers 78.4908 77.3112 75.5924 72.3036 69.8766 67.1701 65.6317 67.3375 69.2074 72.1135 75.4728 78.1900 (42a)
Hot water usage for baths 30.1264 29.6790 29.0489 27.8872 27.0173 26.0528 25.5318 26.1574 26.8387 27.8708 29.0564 30.0246 (42b)
Hot water usage for other uses 42.4515 40.9078 39.3641 37.8204 36.2768 34.7331 34.7331 36.2768 37.8204 39.3641 40.9078 42.4515 (42c)
Average daily hot water use (litres/day) 138.8901 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	151.0687	147.8980	144.0054	138.0113	133.1707	127.9559	125.8965	129.7717	133.8665	139.3484	145.4371	150.6661	(44)
Energy conte	239.2559	210.6048	221.3310	188.9306	179.2734	157.3367	152.2609	160.6845	165.0708	189.0944	207.2018	235.9068	(45)
Energy content (annual)										Total = Sum(45)m =		2306.9517	
Distribution loss (46)m = 0.15 x (45)m	35.8884	31.5907	33.1996	28.3396	26.8910	23.6005	22.8391	24.1027	24.7606	28.3642	31.0803	35.3860	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	290.2148	256.6322	272.2899	238.2456	230.2323	206.6518	203.2198	211.6434	214.3859	240.0533	256.5168	286.8657	(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	290.2148	256.6322	272.2899	238.2456	230.2323	206.6518	203.2198	211.6434	214.3859	240.0533	256.5168	286.8657	(64)
12Total per year (kWh/year)												2907	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower (s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month	92.2923	81.5330	86.3323	75.1482	72.3481	64.6432	63.3665	66.1673	67.2148	75.6136	81.2234	91.1787	(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	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	129.4273	143.2945	129.4273	133.7416	129.4273	133.7416	129.4273	129.4273	133.7416	129.4273	133.7416	129.4273	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	252.4717	255.0916	248.4896	234.4348	216.6931	200.0184	188.8787	186.2588	192.8608	206.9156	224.6573	241.3320	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	(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)	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	(71)
Water heating gains (Table 5)	124.0488	121.3288	116.0380	104.3725	97.2421	89.7823	85.1700	88.9346	93.3539	101.6312	112.8102	122.5521	(72)
Total internal gains	572.6981	586.4651	560.7051	539.2990	510.1127	487.2924	467.2262	468.3709	483.7064	504.7243	537.9593	560.0616	(73)

6. Solar gains

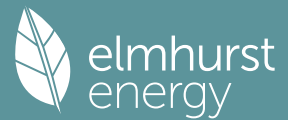
[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W							
Southeast	8.6700	36.7938	0.8500	0.7000	0.7700	131.5359 (77)							
Northwest	2.1200	11.2829	0.8500	0.7000	0.7700	9.8630 (81)							
Northwest	7.3600	11.2829	0.6300	0.7000	0.7700	25.3789 (81)							
Solar gains	166.7777	295.7901	435.8059	592.1013	710.7725	726.5568	691.7706	600.0376	489.4277	335.2946	201.8931	141.3476	(83)
Total gains	739.4758	882.2552	996.5111	1131.4003	1220.8852	1213.8492	1158.9967	1068.4085	973.1342	840.0189	739.8523	701.4091	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	28.6472	28.7190	28.7897	29.1265	29.1904	29.4916	29.4916	29.5481	29.3749	29.1904	29.0615	28.9278	
alpha	2.9098	2.9146	2.9193	2.9418	2.9460	2.9661	2.9661	2.9699	2.9583	2.9460	2.9374	2.9285	
util living area	0.9938	0.9891	0.9804	0.9580	0.9096	0.8147	0.6950	0.7436	0.8944	0.9705	0.9899	0.9947	(86)
MIT	18.1325	18.3880	18.8235	19.4465	20.0581	20.5655	20.8144	20.7647	20.3505	19.5641	18.7512	18.1026	(87)
Th 2	19.0656	19.0692	19.0727	19.0895	19.0926	19.1073	19.1073	19.1101	19.1017	19.0926	19.0863	19.0796	(88)
util rest of house	0.9914	0.9848	0.9720	0.9374	0.8570	0.6861	0.4638	0.5269	0.8073	0.9519	0.9851	0.9927	(89)
MIT 2	15.9076	16.2348	16.7903	17.5808	18.3202	18.8722	19.0623	19.0419	18.6760	17.7422	16.7097	15.8766	(90)

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Living area fraction										FLA = Living area / (4) =	0.1331 (91)
MIT	16.2038	16.5215	17.0610	17.8292	18.5516	19.0976	19.2956	19.2712	18.8989	17.9847	16.1730 (92)
Temperature adjustment											0.0000
adjusted MIT	16.2038	16.5215	17.0610	17.8292	18.5516	19.0976	19.2956	19.2712	18.8989	17.9847	16.1730 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9849	0.9749	0.9573	0.9163	0.8356	0.6852	0.4924	0.5508	0.7936	0.9338	0.9756	0.9870	(94)
Useful gains	728.2946	860.0761	953.9915	1036.6720	1020.2191	831.7604	570.6628	588.4842	772.2567	784.3898	721.8242	692.3030	(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	2817.8174	2744.1119	2487.5730	2078.8982	1591.6968	1034.1700	619.8171	658.9439	1107.8335	1715.5549	2305.7614	2806.6963	(97)
Space heating kWh	1554.6050	1266.0721	1140.9846	750.4029	425.1794	0.0000	0.0000	0.0000	0.0000	692.7869	1140.4347	1573.1087	(98a)
Space heating requirement - total per year (kWh/year)												8543.5742	
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	1554.6050	1266.0721	1140.9846	750.4029	425.1794	0.0000	0.0000	0.0000	0.0000	692.7869	1140.4347	1573.1087	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												8543.5742	
Space heating per m2										(98c) / (4) =		87.4918	(99)

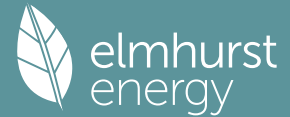
9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													89.5000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1554.6050	1266.0721	1140.9846	750.4029	425.1794	0.0000	0.0000	0.0000	0.0000	692.7869	1140.4347	1573.1087	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	1736.9888	1414.6057	1274.8431	838.4390	475.0607	0.0000	0.0000	0.0000	0.0000	774.0635	1274.2288	1757.6633	(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	290.2148	256.6322	272.2899	238.2456	230.2323	206.6518	203.2198	211.6434	214.3859	240.0533	256.5168	286.8657	(64)
Efficiency of water heater	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(216)
Fuel for water heating, kWh/month	324.2624	286.7399	304.2345	266.1963	257.2428	230.8959	227.0613	236.4730	239.5373	268.2160	286.6110	320.5203	(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	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	31.3594	25.1577	22.6517	16.5956	12.8189	10.4732	11.6939	15.2001	19.7435	25.9045	29.2591	32.2310	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												9545.8929	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												89.5000	
Water heating fuel used												3247.9907	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												253.0887	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												13132.9723	(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	9545.8929	0.2100	2004.6375	(261)

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Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3247.9907	0.2100	682.0780 (264)
Space and water heating			2686.7156 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	253.0887	0.1443	36.5285 (268)
Total CO2, kg/year			2735.1733 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			28.0100 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	9545.8929	1.1300	10786.8590 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3247.9907	1.1300	3670.2295 (278)
Space and water heating			14457.0885 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	253.0887	1.5338	388.1959 (282)
Total Primary energy kWh/year			14975.3851 (286)
Dwelling Primary energy Rate (DPER)			153.3600 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	61.1500 (1b)	x 2.4000 (2b)	= 146.7600 (1b) - (3b)
First floor	36.5000 (1c)	x 2.6000 (2c)	= 94.9000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	97.6500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	241.6600 (5)

2. Ventilation rate

Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	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) =	0.1241 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3741	(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) =	0.3461 (21)

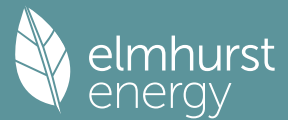
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4413	0.4326	0.4239	0.3807	0.3720	0.3288	0.3288	0.3201	0.3461	0.3720	0.3893	0.4066 (22b)
Effective ac	0.5974	0.5936	0.5899	0.5725	0.5692	0.5540	0.5540	0.5512	0.5599	0.5692	0.5758	0.5827 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.20)			18.1500	1.1450	20.7824		(27)
Ground Floor			61.1500	0.1300	7.9495		(28a)
External Wall	118.8600	20.0400	98.8200	0.1800	17.7876		(29a)
1st Floor	36.5000		36.5000	0.1100	4.0150		(30)
Ground floor	24.6500		24.6500	0.1100	2.7115		(30)
Total net area of external elements Aum(A, m2)			241.1600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		55.1360		(33)
Party Wall			25.9800	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (User defined value 0.050 * total exposed area)							12.0580 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	67.1940 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 47.6375	Feb 47.3360	Mar 47.0405	Apr 45.6526	May 45.3929	Jun 44.1840	Jul 44.1840	Aug 43.9602	Sep 44.6497	Oct 45.3929	Nov 45.9182	Dec 46.4675 (38)
Heat transfer coeff												

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Average = Sum(39)m / 12 =	114.8316	114.5301	114.2346	112.8466	112.5869	111.3781	111.3781	111.1542	111.8437	112.5869	113.1123	113.6615 (39)
	112.8454											
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1760	1.1729	1.1698	1.1556	1.1530	1.1406	1.1406	1.1383	1.1454	1.1530	1.1583	1.1640 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	1.1556 (40)
												31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7167 (42)
Hot water usage for mixer showers												
	69.7696	68.7211	67.1932	64.2699	62.1126	59.7067	58.3393	59.8556	61.5177	64.1009	67.0870	69.5023 (42a)
Hot water usage for baths	30.1264	29.6790	29.0489	27.8872	27.0173	26.0528	25.5318	26.1574	26.8387	27.8708	29.0564	30.0246 (42b)
Hot water usage for other uses	42.4515	40.9078	39.3641	37.8204	36.2768	34.7331	34.7331	36.2768	37.8204	39.3641	40.9078	42.4515 (42c)
Average daily hot water use (litres/day)												130.8494 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	142.3475	139.3079	135.6063	129.9776	125.4067	120.4926	118.6041	122.2898	126.1768	131.3358	137.0512	141.9784 (44)
Energy conte	225.4437	198.3726	208.4218	177.9328	168.8215	148.1597	143.4414	151.4203	155.5886	178.2214	195.2546	222.3038 (45)
Energy content (annual)												Total = Sum(45)m = 2173.3821
Distribution loss (46)m = 0.15 x (45)m	33.8166	29.7559	31.2633	26.6899	25.3232	22.2240	21.5162	22.7130	23.3383	26.7332	29.2882	33.3456 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	276.4026	244.4000	259.3807	227.2479	219.7804	197.4748	194.4003	202.3792	204.9037	229.1803	244.5696	273.2627 (62)
WWHRS	-31.8957	-28.2089	-29.5387	-24.4592	-22.7951	-19.5059	-18.2837	-19.4429	-20.1816	-23.7919	-26.9533	-31.3051 (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	244.5068	216.1912	229.8420	202.7887	196.9853	177.9688	176.1166	182.9363	184.7221	205.3884	217.6163	241.9576 (64)
												Total per year (kWh/year) = Sum(64)m = 2477.0202 (64)
12Total per year (kWh/year)												2477 (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	87.6997	77.4657	82.0400	71.4914	68.8729	61.5919	60.4340	63.0870	64.0620	71.9983	77.2509	86.6557 (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	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	129.4273	143.2945	129.4273	133.7416	129.4273	133.7416	129.4273	129.4273	133.7416	129.4273	133.7416	129.4273 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	252.4717	255.0916	248.4896	234.4348	216.6931	200.0184	188.8787	186.2588	192.8608	206.9156	224.6573	241.3320 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672 (71)
Water heating gains (Table 5)	117.8760	115.2764	110.2688	99.2936	92.5711	85.5443	81.2285	84.7943	88.9750	96.7720	107.2929	116.4728 (72)
Total internal gains	566.5252	580.4127	554.9359	534.2202	505.4416	483.0544	463.2846	464.2306	479.3275	499.8651	532.4420	553.9823 (73)

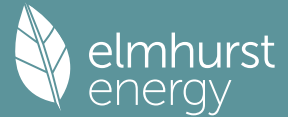
6. Solar gains

[Jan]												Gains
					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		W	
Southeast					8.6700	36.7938	0.6300	0.7000	0.7700		97.4913 (77)	
Northwest					9.4800	11.2829	0.6300	0.7000	0.7700		32.6891 (81)	
Solar gains	130.1804	232.6033	347.0988	478.4137	579.9872	595.2016	565.7609	487.0153	392.1060	264.8524	157.9034	110.1278 (83)
Total gains	696.7056	813.0160	902.0347	1012.6339	1085.4288	1078.2560	1029.0455	951.2459	871.4335	764.7175	690.3454	664.1101 (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	59.0539	59.2093	59.3625	60.0926	60.2312	60.8850	60.8850	61.0076	60.6315	60.2312	59.9515	59.6618
alpha	4.9369	4.9473	4.9575	5.0062	5.0154	5.0590	5.0590	5.0672	5.0421	5.0154	4.9968	4.9775
util living area	0.9957	0.9902	0.9770	0.9306	0.8184	0.6310	0.4703	0.5266	0.7800	0.9556	0.9908	0.9966 (86)
MIT	19.6627	19.8643	20.1522	20.5360	20.8258	20.9644	20.9933	20.9885	20.8989	20.5171	20.0263	19.6338 (87)
Th 2	19.9393	19.9418	19.9442	19.9557	19.9578	19.9678	19.9678	19.9697	19.9640	19.9578	19.9535	19.9489 (88)
util rest of house	0.9943	0.9870	0.9692	0.9073	0.7633	0.5416	0.3631	0.4142	0.6985	0.9357	0.9871	0.9955 (89)
MIT 2	18.3926	18.6508	19.0157	19.4929	19.8153	19.9483	19.9658	19.8974	19.4819	18.8671	18.3627	18.3627 (90)
Living area fraction												FLA = Living area / (4) = 0.1331 (91)
MIT	18.5617	18.8123	19.1670	19.6317	19.9498	20.0835	20.1026	20.1019	20.0308	19.6197	19.0214	18.5319 (92)

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Temperature adjustment												0.0000
adjusted MIT	18.5617	18.8123	19.1670	19.6317	19.9498	20.0835	20.1026	20.1019	20.0308	19.6197	19.0214	18.5319 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9915	0.9821	0.9615	0.8984	0.7628	0.5521	0.3774	0.4290	0.7043	0.9272	0.9825	0.9932	(94)
Useful gains	690.7815	798.4818	867.3270	909.7786	827.9832	595.3223	388.3140	408.1220	613.7762	709.0839	678.2527	659.5682	(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	1637.6940	1593.3803	1447.0083	1211.0411	928.8231	610.7447	390.1101	411.4857	663.3194	1015.5020	1348.4566	1628.9866	(97)
Space heating kWh	704.5029	534.1718	431.2829	216.9090	75.0249	0.0000	0.0000	0.0000	0.0000	227.9751	482.5468	721.2473	(98a)
Space heating requirement - total per year (kWh/year)												3393.6606	
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	704.5029	534.1718	431.2829	216.9090	75.0249	0.0000	0.0000	0.0000	0.0000	227.9751	482.5468	721.2473	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3393.6606	
Space heating per m2											(98c) / (4) =	34.7533	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													92.4000	(206)
Efficiency of main space heating system 2 (in %)													0.0000	(207)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	704.5029	534.1718	431.2829	216.9090	75.0249	0.0000	0.0000	0.0000	0.0000	227.9751	482.5468	721.2473	(98)	
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)	
Space heating fuel (main heating system)	762.4490	578.1080	466.7564	234.7500	81.1957	0.0000	0.0000	0.0000	0.0000	246.7263	522.2368	780.5707	(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	244.5068	216.1912	229.8420	202.7887	196.9853	177.9688	176.1166	182.9363	184.7221	205.3884	217.6163	241.9576	(64)	
Efficiency of water heater													80.3000	(216)
(217)m	86.5128	86.2390	85.7088	84.5260	82.5013	80.3000	80.3000	80.3000	80.3000	84.6056	86.0361	86.5710	(217)	
Fuel for water heating, kWh/month	282.6250	250.6885	268.1662	239.9128	238.7663	221.6299	219.3233	227.8161	230.0400	242.7599	252.9360	279.4905	(219)	
Space cooling fuel requirement														
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)	
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)	
Lighting	26.8924	21.5741	19.4251	14.2317	10.9929	8.9813	10.0281	13.0349	16.9311	22.2145	25.0913	27.6399	(232)	
Electricity generated by PVs (Appendix M) (negative quantity)														
(233a)m	-52.9546	-72.5797	-101.4537	-110.8162	-116.8022	-108.0355	-106.6375	-101.9226	-93.2903	-81.3707	-57.4487	-46.0248	(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	-36.5811	-76.0787	-149.6521	-222.5754	-292.2513	-292.9453	-289.5465	-246.1298	-181.6758	-108.1134	-48.6072	-28.9989	(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													3672.7929	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													80.3000	
Water heating fuel used													2954.1546	(219)
Space cooling fuel													0.0000	(221)
Electricity for pumps and fans:														
Total electricity for the above, kWh/year													86.0000	(231)
Electricity for lighting (calculated in Appendix L)													217.0374	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-3022.4920	(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													3907.4929	(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	3672.7929	0.2100	771.2865	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2954.1546	0.2100	620.3725	(264)
Space and water heating			1391.6590	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)

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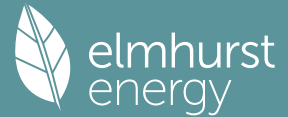


Energy for lighting	217.0374	0.1443	31.3252 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1049.3365	0.1352	-141.8724
PV Unit electricity exported	-1973.1554	0.1262	-248.9803
Total			-390.8527 (269)
Total CO2, kg/year			1044.0607 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.6900 (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	3672.7929	1.1300	4150.2560 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2954.1546	1.1300	3338.1947 (278)
Space and water heating			7488.4506 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	217.0374	1.5338	332.8992 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1049.3365	1.4997	-1573.7085
PV Unit electricity exported	-1973.1554	0.4632	-913.9543
Total			-2487.6628 (283)
Total Primary energy kWh/year			5463.7878 (286)
Target Primary Energy Rate (TPER)			55.9500 (287)

Full SAP Calculation Printout



Property Reference	House Type 2 Mid - Refurb				Issued on Date	30/08/2024
Assessment Reference	Type 2 Mid Improved LEAN			Prop Type Ref		
Property	House Type 2, Edmansons Close, Tottenham, N17 6XD					
SAP Rating	77 C	DER	25.68	TER	9.86	
Environmental	77 C	% DER < TER				-160.45
CO ₂ Emissions (t/year)	2.13	DFEE	85.84	TFEE	36.32	
Compliance Check	See BREL	% DFEE < TFEE				-136.37
% DPER < TPER	-173.52	DPER	140.81	TPER	51.48	
Assessor Details	Miss Eleanor Ballinger				Assessor ID	M976-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	61.1500 (1b)	x 2.4000 (2b)	= 146.7600 (1b) - (3b)
First floor	36.5000 (1c)	x 2.6000 (2c)	= 94.9000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	97.6500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 241.6600 (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	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) = 0.1241 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	8.0000 (17)
Infiltration rate	0.5241 (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) = 0.4455 (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	0.5680	0.5569	0.5458	0.4901	0.4789	0.4232	0.4232	0.4121	0.4455	0.4789	0.5012	0.5235 (22b)
Effective ac	0.6613	0.6551	0.6489	0.6201	0.6147	0.5896	0.5896	0.5849	0.5992	0.6147	0.6256	0.6370 (25)

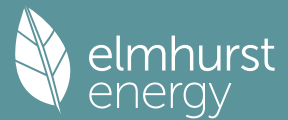
3. Heat losses and heat loss parameter

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
Front door			1.8900	3.0000	5.6700		(26)
Refurb (Uw = 2.70)			10.7900	2.4368	26.2933		(27)
New (Uw = 1.40)			7.3600	1.3258	9.7576		(27)
Ground floor			61.1500	0.4500	27.5175		(28a)
External Wall	93.0000	20.0400	72.9600	0.5500	40.1280		(29a)
1st Floor	36.5000		36.5000	0.1100	4.0150		(30)
Ground floor	24.6500		24.6500	0.1100	2.7115		(30)
Total net area of external elements Aum(A, m ²)			215.3000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	116.0929		(33)
Party Wall			51.9600	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							43.0600 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	159.1529 (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	52.7399	52.2403	51.7506	49.4504	49.0201	47.0167	47.0167	46.6457	47.7884	49.0201	49.8907	50.8009 (38)

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Heat transfer coeff
211.8928 211.3932 210.9035 208.6033 208.1730 206.1696 206.1696 205.7986 206.9413 208.1730 209.0436 209.9538 (39)
Average = Sum(39)m / 12 = 208.6013

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.1699	2.1648	2.1598	2.1362	2.1318	2.1113	2.1113	2.1075	2.1192	2.1318	2.1407	2.1501	(40)
HLP (average)												2.1362	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.7167 (42)
Hot water usage for mixer showers 78.4908 77.3112 75.5924 72.3036 69.8766 67.1701 65.6317 67.3375 69.2074 72.1135 75.4728 78.1900 (42a)
Hot water usage for baths 30.1264 29.6790 29.0489 27.8872 27.0173 26.0528 25.5318 26.1574 26.8387 27.8708 29.0564 30.0246 (42b)
Hot water usage for other uses 42.4515 40.9078 39.3641 37.8204 36.2768 34.7331 34.7331 36.2768 37.8204 39.3641 40.9078 42.4515 (42c)
Average daily hot water use (litres/day) 138.8901 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	151.0687	147.8980	144.0054	138.0113	133.1707	127.9559	125.8965	129.7717	133.8665	139.3484	145.4371	150.6661	(44)
Energy conte	239.2559	210.6048	221.3310	188.9306	179.2734	157.3367	152.2609	160.6845	165.0708	189.0944	207.2018	235.9068	(45)
Energy content (annual)										Total = Sum(45)m =		2306.9517	
Distribution loss (46)m = 0.15 x (45)m	35.8884	31.5907	33.1996	28.3396	26.8910	23.6005	22.8391	24.1027	24.7606	28.3642	31.0803	35.3860	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	290.2148	256.6322	272.2899	238.2456	230.2323	206.6518	203.2198	211.6434	214.3859	240.0533	256.5168	286.8657	(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	290.2148	256.6322	272.2899	238.2456	230.2323	206.6518	203.2198	211.6434	214.3859	240.0533	256.5168	286.8657	(64)
12Total per year (kWh/year)												2907	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower (s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month	92.2923	81.5330	86.3323	75.1482	72.3481	64.6432	63.3665	66.1673	67.2148	75.6136	81.2234	91.1787	(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	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	129.4273	143.2945	129.4273	133.7416	129.4273	133.7416	129.4273	129.4273	133.7416	129.4273	133.7416	129.4273	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	252.4717	255.0916	248.4896	234.4348	216.6931	200.0184	188.8787	186.2588	192.8608	206.9156	224.6573	241.3320	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	(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)	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	(71)
Water heating gains (Table 5)	124.0488	121.3288	116.0380	104.3725	97.2421	89.7823	85.1700	88.9346	93.3539	101.6312	112.8102	122.5521	(72)
Total internal gains	572.6981	586.4651	560.7051	539.2990	510.1127	487.2924	467.2262	468.3709	483.7064	504.7243	537.9593	560.0616	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W							
Northeast	2.1200	11.2829	0.8500	0.7000	0.7700	9.8630	(75)						
Southwest	8.6700	36.7938	0.8500	0.7000	0.7700	131.5359	(79)						
Northeast	7.3600	11.2829	0.6300	0.7000	0.7700	25.3789	(75)						
Solar gains	166.7777	295.7901	435.8059	592.1013	710.7725	726.5568	691.7706	600.0376	489.4277	335.2946	201.8931	141.3476	(83)
Total gains	739.4758	882.2552	996.5111	1131.4003	1220.8852	1213.8492	1158.9967	1068.4085	973.1342	840.0189	739.8523	701.4091	(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	32.0032	32.0788	32.1533	32.5079	32.5751	32.8916	32.8916	32.9509	32.7690	32.5751	32.4394	32.2988	
alpha	3.1335	3.1386	3.1436	3.1672	3.1717	3.1928	3.1928	3.1967	3.1846	3.1717	3.1626	3.1533	
util living area	0.9941	0.9893	0.9799	0.9550	0.8998	0.7922	0.6615	0.7138	0.8825	0.9690	0.9901	0.9951	(86)
MIT	18.4046	18.6553	19.0699	19.6565	20.2201	20.6657	20.8688	20.8280	20.4690	19.7419	18.9791	18.3727	(87)
Th 2	19.2225	19.2257	19.2289	19.2441	19.2469	19.2602	19.2602	19.2626	19.2550	19.2469	19.2412	19.2352	(88)
util rest of house	0.9919	0.9851	0.9716	0.9340	0.8461	0.6663	0.4493	0.5112	0.7947	0.9504	0.9856	0.9932	(89)
MIT 2	16.3375	16.6587	17.1868	17.9292	18.6039	19.0780	19.2269	19.2111	18.9038	18.0499	17.0826	16.3038	(90)

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Living area fraction									fLA = Living area / (4) =		0.1331 (91)	
MIT	16.6127	16.9245	17.4375	18.1591	18.8191	19.2894	19.4455	19.4264	19.1121	18.2752	17.3351	16.5792 (92)
Temperature adjustment												0.0000
adjusted MIT	16.6127	16.9245	17.4375	18.1591	18.8191	19.2894	19.4455	19.4264	19.1121	18.2752	17.3351	16.5792 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9861	0.9761	0.9581	0.9147	0.8282	0.6690	0.4760	0.5346	0.7847	0.9337	0.9770	0.9882	(94)
Useful gains	729.2242	861.1908	954.7701	1034.8683	1011.0897	812.0429	551.6970	571.1860	763.6255	784.3675	722.8086	693.1384	(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	2608.9782	2541.8908	2306.7619	1931.4873	1481.9947	966.8026	586.6609	622.8215	1037.2184	1597.7600	2139.5810	2599.0662	(97)
Space heating kWh	1398.5370	1129.4304	1005.8819	645.5657	350.3533	0.0000	0.0000	0.0000	0.0000	605.1640	1020.0761	1418.0103	(98a)
Space heating requirement - total per year (kWh/year)												7573.0186	
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	1398.5370	1129.4304	1005.8819	645.5657	350.3533	0.0000	0.0000	0.0000	0.0000	605.1640	1020.0761	1418.0103	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												7573.0186	
Space heating per m2										(98c) / (4) =		77.5527	(99)

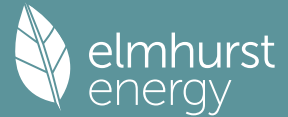
9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													89.5000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1398.5370	1129.4304	1005.8819	645.5657	350.3533	0.0000	0.0000	0.0000	0.0000	605.1640	1020.0761	1418.0103	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	1562.6112	1261.9334	1123.8904	721.3024	391.4562	0.0000	0.0000	0.0000	0.0000	676.1608	1139.7499	1584.3690	(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	290.2148	256.6322	272.2899	238.2456	230.2323	206.6518	203.2198	211.6434	214.3859	240.0533	256.5168	286.8657	(64)
Efficiency of water heater	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(216)
Fuel for water heating, kWh/month	324.2624	286.7399	304.2345	266.1963	257.2428	230.8959	227.0613	236.4730	239.5373	268.2160	286.6110	320.5203	(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	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	31.3594	25.1577	22.6517	16.5956	12.8189	10.4732	11.6939	15.2001	19.7435	25.9045	29.2591	32.2310	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												8461.4733	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												89.5000	
Water heating fuel used												3247.9907	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												253.0887	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												12048.5527	(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	8461.4733	0.2100	1776.9094	(261)

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Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3247.9907	0.2100	682.0780 (264)
Space and water heating			2458.9874 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	253.0887	0.1443	36.5285 (268)
Total CO2, kg/year			2507.4452 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			25.6800 (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	8461.4733	1.1300	9561.4649 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3247.9907	1.1300	3670.2295 (278)
Space and water heating			13231.6943 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	253.0887	1.5338	388.1959 (282)
Total Primary energy kWh/year			13749.9910 (286)
Dwelling Primary energy Rate (DPER)			140.8100 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	61.1500 (1b)	x 2.4000 (2b)	= 146.7600 (1b) - (3b)
First floor	36.5000 (1c)	x 2.6000 (2c)	= 94.9000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	97.6500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	241.6600 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1241 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3741 (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) = 0.3180 (21)

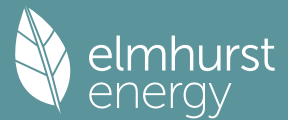
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4055	0.3975	0.3896	0.3498	0.3419	0.3021	0.3021	0.2942	0.3180	0.3419	0.3578	0.3737 (22b)
Effective ac	0.5822	0.5790	0.5759	0.5612	0.5584	0.5456	0.5456	0.5433	0.5506	0.5584	0.5640	0.5698 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.20)			18.1500	1.1450	20.7824		(27)
Ground Floor			61.1500	0.1300	7.9495		(28a)
External Wall	93.0000	20.0400	72.9600	0.1800	13.1328		(29a)
1st Floor	36.5000		36.5000	0.1100	4.0150		(30)
Ground floor	24.6500		24.6500	0.1100	2.7115		(30)
Total net area of external elements Aum(A, m2)			215.3000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	50.4812	(33)
Party Wall			51.9600	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (User defined value 0.050 * total exposed area)							10.7650 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	61.2462 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	46.4296	46.1750	45.9255	44.7535	44.5342	43.5134	43.5134	43.3244	43.9066	44.5342	44.9778	45.4416 (38)
Heat transfer coeff												

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Average = Sum(39)m / 12 =	107.6758	107.4213	107.1717	105.9997	105.7805	104.7597	104.7597	104.5706	105.1529	105.7805	106.2241	106.6878 (39)
	105.9987											
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1027	1.1001	1.0975	1.0855	1.0833	1.0728	1.0728	1.0709	1.0768	1.0833	1.0878	1.0926 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	1.0855 (40)
												31

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.7167 (42)											
Hot water usage for mixer showers	69.7696	68.7211	67.1932	64.2699	62.1126	59.7067	58.3393	59.8556	61.5177	64.1009	67.0870	69.5023 (42a)
Hot water usage for baths	30.1264	29.6790	29.0489	27.8872	27.0173	26.0528	25.5318	26.1574	26.8387	27.8708	29.0564	30.0246 (42b)
Hot water usage for other uses	42.4515	40.9078	39.3641	37.8204	36.2768	34.7331	34.7331	36.2768	37.8204	39.3641	40.9078	42.4515 (42c)
Average daily hot water use (litres/day)	130.8494 (43)											
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	142.3475	139.3079	135.6063	129.9776	125.4067	120.4926	118.6041	122.2898	126.1768	131.3358	137.0512	141.9784 (44)
Energy content (annual)	225.4437	198.3726	208.4218	177.9328	168.8215	148.1597	143.4414	151.4203	155.5886	178.2214	195.2546	222.3038 (45)
Distribution loss (46)m = 0.15 x (45)m	33.8166	29.7559	31.2633	26.6899	25.3232	22.2240	21.5162	22.7130	23.3383	26.7332	29.2882	33.3456 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	276.4026	244.4000	259.3807	227.2479	219.7804	197.4748	194.4003	202.3792	204.9037	229.1803	244.5696	273.2627 (62)
WWHRS	-31.8957	-28.2089	-29.5387	-24.4592	-22.7951	-19.5059	-18.2837	-19.4429	-20.1816	-23.7919	-26.9533	-31.3051 (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	244.5068	216.1912	229.8420	202.7887	196.9853	177.9688	176.1166	182.9363	184.7221	205.3884	217.6163	241.9576 (64)
12Total per year (kWh/year)	2477.0202 (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	87.6997	77.4657	82.0400	71.4914	68.8729	61.5919	60.4340	63.0870	64.0620	71.9983	77.2509	86.6557 (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	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	129.4273	143.2945	129.4273	133.7416	129.4273	133.7416	129.4273	129.4273	133.7416	129.4273	133.7416	129.4273 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	252.4717	255.0916	248.4896	234.4348	216.6931	200.0184	188.8787	186.2588	192.8608	206.9156	224.6573	241.3320 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672 (71)
Water heating gains (Table 5)	117.8760	115.2764	110.2688	99.2936	92.5711	85.5443	81.2285	84.7943	88.9750	96.7720	107.2929	116.4728 (72)
Total internal gains	566.5252	580.4127	554.9359	534.2202	505.4416	483.0544	463.2846	464.2306	479.3275	499.8651	532.4420	553.9823 (73)

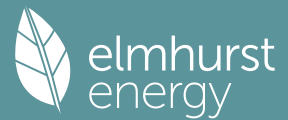
6. Solar gains

[Jan]														
	Area m2				Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W	
Northeast	9.4800				11.2829		0.6300		0.7000		0.7700		32.6891 (75)	
Southwest	8.6700				36.7938		0.6300		0.7000		0.7700		97.4913 (79)	
Solar gains	130.1804	232.6033	347.0988	478.4137	579.9872	595.2016	565.7609	487.0153	392.1060	264.8524	157.9034	110.1278 (83)		
Total gains	696.7056	813.0160	902.0347	1012.6339	1085.4288	1078.2560	1029.0455	951.2459	871.4335	764.7175	690.3454	664.1101 (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	62.9784	63.1276	63.2746	63.9742	64.1068	64.7315	64.7315	64.8485	64.4894	64.1068	63.8391	63.5616
alpha	5.1986	5.2085	5.2183	5.2649	5.2738	5.3154	5.3154	5.3232	5.2993	5.2738	5.2559	5.2374
util living area	0.9956	0.9895	0.9746	0.9215	0.7966	0.6020	0.4444	0.4990	0.7555	0.9501	0.9901	0.9965 (86)
MIT	19.7769	19.9752	20.2520	20.6118	20.8676	20.9762	20.9960	20.9929	20.9252	20.5849	20.1195	19.7458 (87)
Th 2	19.9987	20.0008	20.0029	20.0127	20.0145	20.0231	20.0231	20.0247	20.0198	20.0145	20.0108	20.0069 (88)
util rest of house	0.9941	0.9862	0.9662	0.8966	0.7411	0.5185	0.3476	0.3967	0.6753	0.9288	0.9863	0.9954 (89)
MIT 2	18.5809	18.8345	19.1843	19.6278	19.9075	20.0101	20.0219	20.0223	19.9713	19.6072	19.0270	18.5473 (90)
Living area fraction	FLA = Living area / (4) = 0.1331 (91)											
MIT	18.7402	18.9864	19.3265	19.7588	20.0353	20.1387	20.1516	20.1515	20.0983	19.7374	19.1724	18.7068 (92)

Full SAP Calculation Printout



Temperature adjustment												0.0000
adjusted MIT	18.7402	18.9864	19.3265	19.7588	20.0353	20.1387	20.1516	20.1515	20.0983	19.7374	19.1724	18.7068 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9914	0.9814	0.9588	0.8890	0.7424	0.5287	0.3605	0.4102	0.6823	0.9211	0.9818	0.9932	(94)
Useful gains	690.7421	797.8987	864.9148	900.2301	805.8210	570.0886	370.9933	390.2210	594.6053	704.4165	677.7873	659.5754	(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	1554.8560	1513.1791	1374.6332	1151.0317	881.7101	580.2376	372.0598	392.2938	630.7356	966.5564	1282.3813	1547.7028	(97)
Space heating kWh	642.9007	480.6684	379.2305	180.5772	56.4616	0.0000	0.0000	0.0000	0.0000	195.0321	435.3077	660.7668	(98a)
Space heating requirement - total per year (kWh/year)												3030.9448	
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	642.9007	480.6684	379.2305	180.5772	56.4616	0.0000	0.0000	0.0000	0.0000	195.0321	435.3077	660.7668	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3030.9448	
Space heating per m2											(98c) / (4) =	31.0389	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													92.4000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	642.9007	480.6684	379.2305	180.5772	56.4616	0.0000	0.0000	0.0000	0.0000	195.0321	435.3077	660.7668	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	695.7800	520.2039	410.4226	195.4299	61.1056	0.0000	0.0000	0.0000	0.0000	211.0737	471.1122	715.1155	(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	244.5068	216.1912	229.8420	202.7887	196.9853	177.9688	176.1166	182.9363	184.7221	205.3884	217.6163	241.9576	(64)
Efficiency of water heater													80.3000 (216)
(217)m	86.3519	86.0412	85.4467	84.1337	82.0686	80.3000	80.3000	80.3000	80.3000	84.2707	85.8361	86.4193	(217)
Fuel for water heating, kWh/month	283.1518	251.2647	268.9889	241.0315	240.0250	221.6299	219.3233	227.8161	230.0400	243.7247	253.5256	279.9811	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	26.8924	21.5741	19.4251	14.2317	10.9929	8.9813	10.0281	13.0349	16.9311	22.2145	25.0913	27.6399	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-52.9546	-72.5797	-101.4537	-110.8162	-116.8022	-108.0355	-106.6375	-101.9226	-93.2903	-81.3707	-57.4487	-46.0248	(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	-36.5811	-76.0787	-149.6521	-222.5754	-292.2513	-292.9453	-289.5465	-246.1298	-181.6758	-108.1134	-48.6072	-28.9989	(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													3280.2433 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													80.3000
Water heating fuel used													2960.5025 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year													86.0000 (231)
Electricity for lighting (calculated in Appendix L)													217.0374 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-3022.4920 (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													3521.2913 (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	3280.2433	0.2100	688.8511	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2960.5025	0.2100	621.7055	(264)
Space and water heating			1310.5566	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)

Full SAP Calculation Printout



Energy for lighting	217.0374	0.1443	31.3252 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1049.3365	0.1352	-141.8724
PV Unit electricity exported	-1973.1554	0.1262	-248.9803
Total			-390.8527 (269)
Total CO2, kg/year			962.9584 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.8600 (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	3280.2433	1.1300	3706.6750 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2960.5025	1.1300	3345.3678 (278)
Space and water heating			7052.0428 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	217.0374	1.5338	332.8992 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1049.3365	1.4997	-1573.7085
PV Unit electricity exported	-1973.1554	0.4632	-913.9543
Total			-2487.6628 (283)
Total Primary energy kWh/year			5027.3800 (286)
Target Primary Energy Rate (TPER)			51.4800 (287)

Appendix D

Heat Cost Analysis

Life Cycle Cost Analysis

	Scenario 1a	Scenario 1b	Scenario 2	Scenario 3a	Scenario 3b
Heating	Individual ASHPs - New Build	Individual ASHPs - Refurb	Individual Electric Boilers - Refurb	ASHP Heat Network - New Build	ASHP Heat Network - Refurb
Installed Capital Costs (per dwelling)					
Dwelling Systems: - Sceanrio 1: ASHP + cylinder - Sceanrio 2: Electric boiler + cylinder - Sceanrio 3: HIU	£5,079	£5,079	£2,402	£1,800	£1,800
Primary Pipework (Energy Centre to building entries)	N/A			£1,596	£1,596
Secondary Pipework (within blocks)				£1,000	N/A
Energy Centre Plant: - ASHPs - Pumps, PUs/Expansion, BMS etc				£2,460	£2,460
Total Capex	£5,079	£5,079	£2,402	£6,856	£5,856
Operational Costs (inc. Replacement) - Annual (per dwelling)					
Cost of Heat (£/year)	£380	£1,649	£2,226	£505	£2,577
Heat Network Billing (£/year)	N/A			£90	£90
Heat Network - Supporting Utilities (£/year). Includes: - Gas standing charge - Energy Centre supporting power (to pumps, water quality equipment, parasitic draws on CHP/boilers etc)	N/A			£34	£34
Dwelling Plant Maintenance (£/year): - Sceanrio 1: ASHP + cylinder - Sceanrio 2: Electric boiler + cylinder - Sceanrio 3: HIU	£276	£276	£195	£50	£50
Dwelling Plant Replacement (£/year): - Sceanrio 1: ASHP + cylinder - Sceanrio 2: Electric boiler + cylinder - Sceanrio 3: HIU	£339	£339	£137	£120	£120
Energy Centre Plant Maintenance (£/year): - ASHPs - Pumps, PUs/Expansion, BMS etc	N/A			£471	£471
Energy Centre Plant Replacement (£/year): - ASHPs - Pumps, PUs/Expansion, BMS etc				£164	£164
Total (£/year)	£995	£2,264	£2,558	£1,434	£3,505
Total Operational (30 years)	£29,835	£67,910	£76,734	£43,014	£105,162
Total Lifecycle (Capex + Opex)	£34,914	£72,989	£79,136	£49,870	£111,018

Notes

Present day costs (no inflation accounted for)

Scrapage' value not accounted for - no reliable source available to discern this for options



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Appendix E

Indicative Roof Layout – Solar PV

NOTE: THIS DRAWING MUST NOT BE SCALED.
THE CONTRACTOR IS TO CHECK ALL DIMENSIONS ON SITE

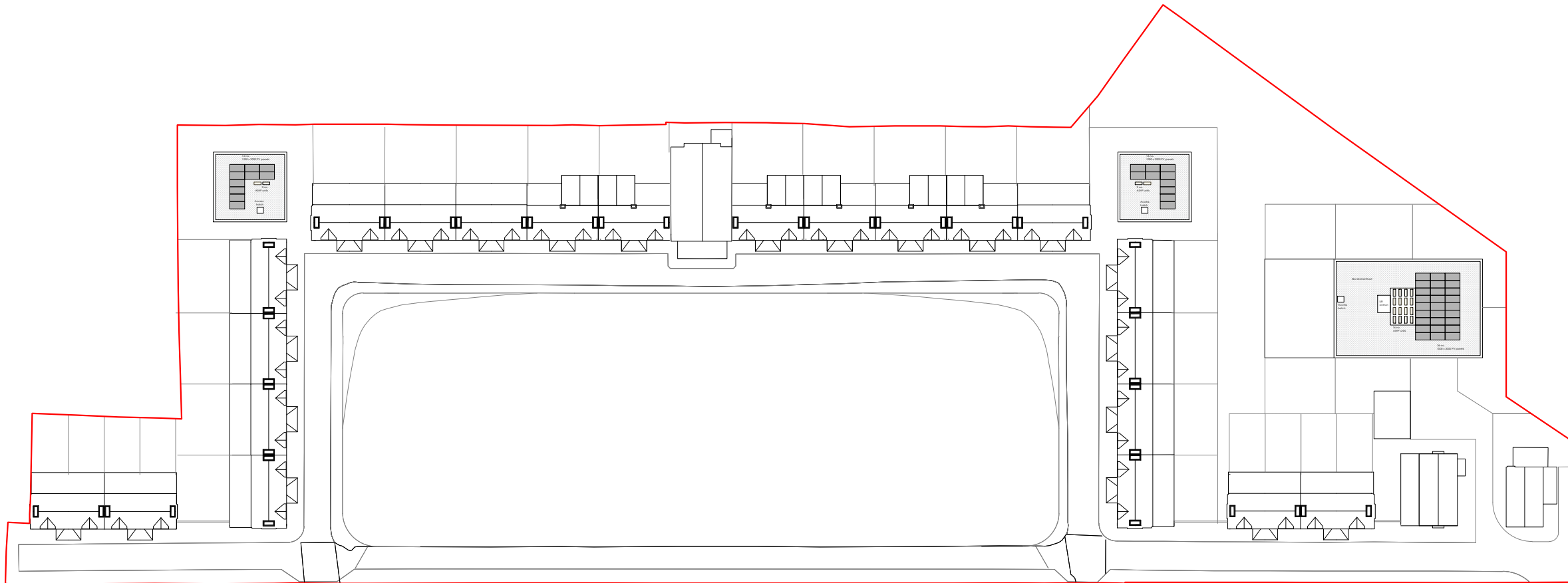
NOTES:

Apartment Building:

27 no. 1m x 2m photovoltaic panels
16 no. ASHP's

Pavilion Buildings (each):

10 no. 1m x 2m photovoltaic panels
2 no. ASHP's



ROOF PLAN - 1:500 @ A2

Note: Indicative layout of ASHPs/PVs subject to engineers design



PROJECT

Edmansons Close
Bruce Grove
Haringey

CLIENT

The Drapers'

DRAWING ORIGINATOR

d+b studios
85 HOLMESDALE ROAD
TEDDINGTON TW11 9LQ

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DRAWING TITLE

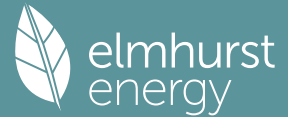
Roof Plan
Proposed

JOB NO db-001		SCALE 1:500 @ A2	DRAWN BY PD		ISSUE DATE SEPT 2022		REVISION 02	
DRAWING STATUS Planning			CHECKED BY PD		PAPER SIZE A2			
PROJECT CODE	COMPANY CODE	DOC. CODE	PACKAGE NO CODE	LEVEL	ZONE / SUBZONE	SUB ZONE	DRAWING NUMBER	
EC	d+b	GA	XXX	00	XX	XXX	035	

Appendix F

SAP TER/DER Worksheets – *New Build, Be Green*

Full SAP Calculation Printout



Property Reference	1B2P End GF - Apt				Issued on Date	30/08/2024	
Assessment Reference	1B2P End GF			Prop Type Ref			
Property	Apartment, 1B2P End GF, Tottenham, N17 6XD						
SAP Rating	82 B	DER	3.56	TER	15.35		
Environmental	98 A	% DER < TER				76.81	
CO ₂ Emissions (t/year)	0.15	DFEE	39.33	TFEE	39.04		
Compliance Check	See BREL	% DFEE < TFEE				-0.75	
% DPER < TPER	54.80	DPER	36.75	TPER	81.30		
Assessor Details	Miss Eleanor Ballinger				Assessor ID	M976-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.2000 (1b)	2.5000 (2b)	125.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	125.5000 (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)

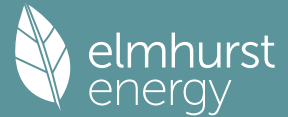
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275 (21)

	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) =												81.0000 (23c)
Effective ac	0.2576	0.2544	0.2512	0.2352	0.2321	0.2161	0.2161	0.2129	0.2225	0.2321	0.2384	0.2448 (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
Door to corridor			1.2000	1.0000	1.2000		(26)
Window (Uw = 0.90)			11.4800	0.8687	9.9730		(27)
Ground Floor			50.2000	0.1300	6.5260	75.0000	3765.0000 (28a)
External Wall	41.7500	11.4800	30.2700	0.1800	5.4486	60.0000	1816.2000 (29a)
Corridor Wall	4.1300	1.2000	2.9300	0.1800	0.5274	60.0000	175.8000 (29a)
Total net area of external elements Aum(A, m ²)			96.0800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	23.6750		(33)
Party Wall 1			30.1300	0.0000	0.0000	45.0000	1355.8500 (32)
Party Ceiling 1			50.2000			30.0000	1506.0000 (32b)
Internal Wall 1			46.7500			9.0000	420.7500 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	9039.6000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							180.0717 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	

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E2 Other lintels (including other steel lintels)	6.3000	0.1500	0.9450
E3 Sill	5.1000	0.0400	0.2040
E4 Jamb	18.1400	0.0500	0.9070
E5 Ground floor (normal)	16.7000	0.1600	2.6720
E5 Ground floor (normal)	1.6500	0.2700	0.4455
E7 Party floor between dwellings (in blocks of flats)	11.5500	0.1000	1.1550
E7 Party floor between dwellings (in blocks of flats)	1.6500	0.1200	0.1980
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.1500	0.2500	1.2875
E16 Corner (normal)	5.0000	0.0900	0.4500
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250
E18 Party wall between dwellings	7.5000	0.0600	0.4500
E25 Staggered party wall between dwellings	2.5000	0.1200	0.3000
P1 Party wall - Ground floor	12.0500	0.1000	1.2050
P2 Party wall - Intermediate floor within a dwelling	12.0500	0.0000	0.0000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			9.9940 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	33.6690 (37)

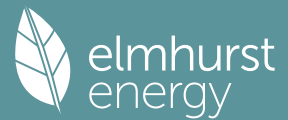
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	10.6670	10.5349	10.4029	9.7429	9.6109	8.9508	8.9508	8.8188	9.2148	9.6109	9.8749	10.1389 (38)
Average = Sum(39)m / 12 =	44.3359	44.2039	44.0719	43.4119	43.2798	42.6198	42.6198	42.4878	42.8838	43.2798	43.5439	43.8079 (39)
												43.3788
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8832	0.8806	0.8779	0.8648	0.8621	0.8490	0.8490	0.8464	0.8543	0.8621	0.8674	0.8727 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												1.6960 (42)
Hot water usage for mixer showers	59.2376	58.3474	57.0502	54.5681	52.7365	50.6938	49.5328	50.8202	52.2314	54.4246	56.9600	59.0107 (42a)
Hot water usage for baths	22.7669	22.4288	21.9526	21.0747	20.4173	19.6884	19.2947	19.7675	20.2823	21.0623	21.9583	22.6899 (42b)
Hot water usage for other uses	31.9986	30.8351	29.6715	28.5079	27.3443	26.1807	26.1807	27.3443	28.5079	29.6715	30.8351	31.9986 (42c)
Average daily hot water use (litres/day)												104.8133 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	114.0032	111.6112	108.6743	104.1507	100.4981	96.5629	95.0081	97.9319	101.0216	105.1584	109.7533	113.6992 (44)
Energy content (annual)	180.5531	158.9329	167.0283	142.5771	135.2897	118.7354	114.9041	121.2602	124.5697	142.6989	156.3637	178.0255 (45)
Distribution loss (46)m = 0.15 x (45)m	27.0830	23.8399	25.0542	21.3866	20.2935	17.8103	17.2356	18.1890	18.6855	21.4048	23.4546	26.7038 (46)
Water storage loss:												170.0000 (47)
Store volume												1.2000 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.6480 (55)
Enter (49) or (54) in (55)												
Total storage loss	20.0880	18.1440	20.0880	19.4400	20.0880	19.4400	20.0880	20.0880	19.4400	20.0880	19.4400	20.0880 (56)
If cylinder contains dedicated solar storage	20.0880	18.1440	20.0880	19.4400	20.0880	19.4400	20.0880	20.0880	19.4400	20.0880	19.4400	20.0880 (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	223.9035	198.0881	210.3787	184.5291	178.6401	160.6874	158.2545	164.6106	166.5217	186.0493	198.3157	221.3759 (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	223.9035	198.0881	210.3787	184.5291	178.6401	160.6874	158.2545	164.6106	166.5217	186.0493	198.3157	221.3759 (64)
12Total per year (kWh/year)												2251.3548 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
												0.0000 (64a)
Heat gains from water heating, kWh/month	94.7142	84.1694	90.2172	80.9685	79.6642	73.0411	72.8859	74.9993	74.9810	82.1277	85.5525	93.8738 (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	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	74.5246	82.5094	74.5246	77.0088	74.5246	77.0088	74.5246	74.5246	77.0088	74.5246	77.0088	74.5246 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	147.7534	149.2866	145.4229	137.1977	126.8147	117.0562	110.5370	109.0038	112.8674	121.0927	131.4756	141.2341 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800 (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)	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396 (71)
Water heating gains (Table 5)	127.3041	125.2520	121.2597	112.4563	107.0755	101.4460	97.9650	100.8056	104.1403	110.3867	118.8229	126.1745 (72)
Total internal gains	398.0219	405.4879	389.6471	375.1025	356.8547	343.9509	331.4664	332.7738	342.4564	354.4439	375.7472	390.3730 (73)

6. Solar gains						
[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	8.1600	11.2829	0.3500	0.8000	0.7700	17.8650 (75)

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Southeast			2.8800		36.7938		0.3500		0.8000		0.7700		20.5617 (77)
Northwest			0.4400		11.2829		0.3500		0.8000		0.7700		0.9633 (81)

Solar gains	39.3900	73.3498	116.9722	172.7781	218.9405	228.5362	215.6811	179.5328	136.0282	85.5461	48.3191	32.9727 (83)
Total gains	437.4120	478.8377	506.6193	547.8806	575.7952	572.4871	547.1475	512.3066	478.4845	439.9900	424.0663	423.3457 (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	56.6358	56.8049	56.9751	57.8413	58.0178	58.9163	58.9163	59.0993	58.5536	58.0178	57.6660	57.3185
alpha	4.7757	4.7870	4.7983	4.8561	4.8679	4.9278	4.9278	4.9400	4.9036	4.8679	4.8444	4.8212
util living area	0.9652	0.9454	0.9081	0.8113	0.6571	0.4699	0.3416	0.3795	0.5947	0.8389	0.9389	0.9692 (86)
Living	20.0695	20.2422	20.4759	20.7627	20.9290	20.9890	20.9981	20.9969	20.9665	20.7619	20.3921	20.0453
Non living	19.1127	19.3286	19.6162	19.9603	20.1388	20.2039	20.2103	20.2119	20.1826	19.9686	19.5262	19.0893
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.5240	20.2422	20.4759	20.7627	20.9290	20.9890	20.9981	20.9969	20.9665	20.7619	20.3921	20.1788 (87)
Th 2	20.1818	20.1841	20.1863	20.1975	20.1998	20.2111	20.2111	20.2133	20.2066	20.1998	20.1953	20.1908 (88)
util rest of house	0.9583	0.9351	0.8911	0.7803	0.6108	0.4144	0.2809	0.3155	0.5340	0.8050	0.9258	0.9631 (89)
MIT 2	19.7556	19.3286	19.6162	19.9603	20.1388	20.2039	20.2103	20.2119	20.1826	19.9686	19.5262	19.2878 (90)
Living area fraction									FLA = Living area / (4) =			0.6096 (91)
MIT	20.2240	19.8855	20.1403	20.4494	20.6205	20.6824	20.6905	20.6904	20.6604	20.4521	20.0540	19.8309 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2240	19.8855	20.1403	20.4494	20.6205	20.6824	20.6905	20.6904	20.6604	20.4521	20.0540	19.8309 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9587	0.9308	0.8900	0.7905	0.6356	0.4478	0.3179	0.3544	0.5692	0.8163	0.9232	0.9600 (94)
Useful gains	419.3622	445.7059	450.9034	433.0992	365.9756	256.3462	173.9129	181.5766	272.3728	359.1668	391.4921	406.4072 (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	706.0041	662.4167	601.1520	501.3820	386.0767	259.2320	174.3371	182.2908	281.3366	426.3983	564.0674	684.7583 (97)
Space heating kWh	213.2616	145.6297	111.7849	49.1637	14.9552	0.0000	0.0000	0.0000	0.0000	50.0202	124.2542	207.0932 (98a)
Space heating requirement - total per year (kWh/year)												916.1627
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	213.2616	145.6297	111.7849	49.1637	14.9552	0.0000	0.0000	0.0000	0.0000	50.0202	124.2542	207.0932 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												916.1627
Space heating per m2										(98c) / (4) =		18.2503 (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 %)												222.4532 (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	213.2616	145.6297	111.7849	49.1637	14.9552	0.0000	0.0000	0.0000	0.0000	50.0202	124.2542	207.0932 (98)
Space heating efficiency (main heating system 1)	222.4532	222.4532	222.4532	222.4532	222.4532	0.0000	0.0000	0.0000	0.0000	222.4532	222.4532	222.4532 (210)
Space heating fuel (main heating system)	95.8681	65.4653	50.2510	22.1007	6.7229	0.0000	0.0000	0.0000	0.0000	22.4857	55.8564	93.0952 (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	223.9035	198.0881	210.3787	184.5291	178.6401	160.6874	158.2545	164.6106	166.5217	186.0493	198.3157	221.3759 (64)
Efficiency of water heater	191.6370	191.6370	191.6370	191.6370	191.6370	191.6370	191.6370	191.6370	191.6370	191.6370	191.6370	191.6370 (216)
Fuel for water heating, kWh/month	116.8373	103.3663	109.7798	96.2910	93.2180	83.8499	82.5803	85.8971	86.8943	97.0842	103.4851	115.5184 (219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.8673	7.1060	7.8673	7.6136	7.8673	7.6136	7.8673	7.8673	7.6136	7.8673	7.6136	7.8673 (231)
Lighting	15.6670	12.5686	11.3167	8.2911	6.4043	5.2323	5.8422	7.5939	9.8637	12.9417	14.6177	16.1024 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-20.3719	-33.7191	-57.0090	-71.4547	-81.3780	-77.0063	-75.6000	-68.6782	-55.9067	-40.9550	-23.5957	-16.8332 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												411.8452 (211)

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Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	191.6370	
Water heating fuel used	1174.8017	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.6050)		
mechanical ventilation fans (SFP = 0.6050)	92.6316	(230a)
Total electricity for the above, kWh/year	92.6316	(231)
Electricity for lighting (calculated in Appendix L)	126.4416	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-622.5078	(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	1183.2122	(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	411.8452	0.1566	64.5040 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1174.8017	0.1409	165.5630 (264)
Space and water heating			230.0670 (265)
Pumps, fans and electric keep-hot	92.6316	0.1387	12.8491 (267)
Energy for lighting	126.4416	0.1443	18.2494 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-622.5078	0.1324	-82.4195
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-82.4195 (269)
Total CO2, kg/year			178.7460 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.5600 (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	411.8452	1.5798	650.6388 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1174.8017	1.5211	1786.9952 (278)
Space and water heating			2437.6340 (279)
Pumps, fans and electric keep-hot	92.6316	1.5128	140.1330 (281)
Energy for lighting	126.4416	1.5338	193.9404 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-622.5078	1.4892	-927.0472
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-927.0472 (283)
Total Primary energy kWh/year			1844.6602 (286)
Dwelling Primary energy Rate (DPER)			36.7500 (287)

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

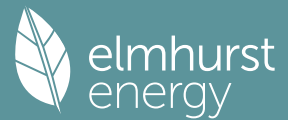
1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.2000 (1b)	x 2.5000 (2b)	= 125.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 125.5000 (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)
Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1594 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4094 (18)
Number of sides sheltered	2 (19)

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Shelter factor
Infiltration rate adjusted to include shelter factor

$$(20) = 1 - [0.075 \times (19)] = 0.8500 \quad (20)$$

$$(21) = (18) \times (20) = 0.3480 \quad (21)$$

	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													
Effective ac	0.4436	0.4349	0.4262	0.3828	0.3741	0.3306	0.3306	0.3219	0.3480	0.3741	0.3915	0.4089	(22b)
	0.5984	0.5946	0.5908	0.5733	0.5700	0.5546	0.5546	0.5518	0.5605	0.5700	0.5766	0.5836	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.2000	1.0000	1.2000			(26)
TER Opening Type (Uw = 1.20)			11.3600	1.1450	13.0076			(27)
Ground Floor			50.2000	0.1300	6.5260			(28a)
External Wall	41.7500	11.3600	30.3900	0.1800	5.4702			(29a)
Corridor Wall	4.1300	1.2000	2.9300	0.1800	0.5274			(29a)
Total net area of external elements Aum(A, m2)			96.0800					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	26.7312		(33)
Party Wall 1			30.1300	0.0000	0.0000			(32)

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

190.0717 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	6.3000	0.0500	0.3150	
E3 Sill	5.1000	0.0500	0.2550	
E4 Jamb	18.1400	0.0500	0.9070	
E5 Ground floor (normal)	16.7000	0.1600	2.6720	
E5 Ground floor (normal)	1.6500	0.1600	0.2640	
E7 Party floor between dwellings (in blocks of flats)	11.5500	0.0700	0.8085	
E7 Party floor between dwellings (in blocks of flats)	1.6500	0.0700	0.1155	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.1500	0.0200	0.1030	
E16 Corner (normal)	5.0000	0.0900	0.4500	
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250	
E18 Party wall between dwellings	7.5000	0.0600	0.4500	
E25 Staggered party wall between dwellings	2.5000	0.0600	0.1500	
P1 Party wall - Ground floor	12.0500	0.0800	0.9640	
P2 Party wall - Intermediate floor within a dwelling	12.0500	0.0000	0.0000	

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

7.2290 (36)

Point Thermal bridges

0.0000

Total fabric heat loss

(33) + (36) + (36a) = 33.9602 (37)

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

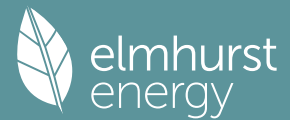
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	24.7832	24.6249	24.4698	23.7412	23.6048	22.9702	22.9702	22.8527	23.2147	23.6048	23.8806	24.1689	(38)
Heat transfer coeff	58.7434	58.5852	58.4300	57.7014	57.5651	56.9304	56.9304	56.8129	57.1749	57.5651	57.8409	58.1292	(39)
Average = Sum(39)m / 12 =												57.7007	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1702	1.1670	1.1639	1.1494	1.1467	1.1341	1.1341	1.1317	1.1389	1.1467	1.1522	1.1580	(40)
HLP (average)												1.1494	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.6960 (42)
Hot water usage for mixer showers													
52.6557	51.8644	50.7113	48.5050	46.8769	45.0612	44.0291	45.1735	46.4279	48.3774	50.6311	52.4539	(42a)	
Hot water usage for baths													
22.7669	22.4288	21.9526	21.0747	20.4173	19.6884	19.2947	19.7675	20.2823	21.0623	21.9583	22.6899	(42b)	
Hot water usage for other uses													
31.9986	30.8351	29.6715	28.5079	27.3443	26.1807	26.1807	27.3443	28.5079	29.6715	30.8351	31.9986	(42c)	
Average daily hot water use (litres/day)												98.7449	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	107.4212	105.1282	102.3354	98.0876	94.6385	90.9303	89.5045	92.2853	95.2181	99.1112	103.4244	107.1425	(44)
Energy content (annual)	170.1289	149.7011	157.2856	134.2770	127.4016	111.8094	108.2479	114.2684	117.4134	134.4929	147.3470	167.7593	(45)
Distribution loss (46)m = 0.15 x (45)m	25.5193	22.4552	23.5928	20.1416	19.1102	16.7714	16.2372	17.1403	17.6120	20.1739	22.1021	25.1639	(46)
Water storage loss:													
Store volume												170.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5003	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8102	(55)
Total storage loss	25.1153	22.6848	25.1153	24.3051	25.1153	24.3051	25.1153	25.1153	24.3051	25.1153	24.3051	25.1153	(56)
If cylinder contains dedicated solar storage	25.1153	22.6848	25.1153	24.3051	25.1153	24.3051	25.1153	25.1153	24.3051	25.1153	24.3051	25.1153	(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	218.5066	193.3971	205.6633	181.0942	175.7793	158.6265	156.6256	162.6461	164.2306	182.8706	194.1642	216.1370	(62)
WWHRS	-24.0720	-21.2895	-22.2931	-18.4596	-17.2036	-14.7213	-13.7989	-14.6737	-15.2312	-17.9559	-20.3419	-23.6262	(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	194.4347	172.1077	183.3702	162.6346	158.5756	143.9052	142.8268	147.9724	148.9994	164.9147	173.8223	192.5108	(64)
12Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				1986.0744	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
												0.0000	(64a)
Heat gains from water heating, kWh/month	95.2700	84.7324	90.9996	82.1008	81.0632	74.6303	74.6946	76.6964	76.4937	83.4211	86.4466	94.4821	(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	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	74.5105	82.4938	74.5105	76.9942	74.5105	76.9942	74.5105	74.5105	76.9942	74.5105	76.9942	74.5105 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	147.7534	149.2866	145.4229	137.1977	126.8147	117.0562	110.5370	109.0038	112.8674	121.0927	131.4756	141.2341 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800 (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)	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396 (71)
Water heating gains (Table 5)	128.0511	126.0899	122.3113	114.0289	108.9559	103.6532	100.3960	103.0866	106.2412	112.1251	120.0647	126.9921 (72)
Total internal gains	401.7549	409.3101	393.6846	379.6606	361.7210	346.1435	333.8833	335.0407	344.5427	359.1681	379.9744	394.1766 (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	8.0700		11.2829		0.6300		0.7000		0.7700		27.8271 (75)	
Southeast	2.8500		36.7938		0.6300		0.7000		0.7700		32.0473 (77)	
Northwest	0.4400		11.2829		0.6300		0.7000		0.7700		1.5172 (81)	
Solar gains	61.3916	114.3196	182.3068	269.2822	341.2276	356.1827	336.1476	279.8095	212.0062	133.3281	75.3080	51.3899 (83)
Total gains	463.1465	523.6297	575.9915	648.9428	702.9486	702.3263	670.0309	614.8502	556.5489	492.4962	455.2824	445.5664 (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	45.1190	45.2409	45.3610	45.9338	46.0426	46.5558	46.5558	46.6521	46.3568	46.0426	45.8231	45.5958
alpha	4.0079	4.0161	4.0241	4.0623	4.0695	4.1037	4.1037	4.1101	4.0905	4.0695	4.0549	4.0397
util living area	0.9733	0.9558	0.9209	0.8307	0.6815	0.5013	0.3697	0.4177	0.6477	0.8725	0.9542	0.9767 (86)
MIT	19.6093	19.8380	20.1679	20.5807	20.8516	20.9675	20.9926	20.9880	20.9102	20.5544	20.0268	19.5762 (87)
Th 2	19.9439	19.9465	19.9490	19.9607	19.9629	19.9731	19.9731	19.9750	19.9692	19.9629	19.9584	19.9538 (88)
util rest of house	0.9671	0.9459	0.9032	0.7957	0.6249	0.4273	0.2854	0.3280	0.5702	0.8372	0.9421	0.9713 (89)
MIT 2	18.3586	18.6458	19.0538	19.5487	19.8397	19.9535	19.9703	19.9701	19.9074	19.5343	18.8947	18.3238 (90)
Living area fraction	fLA = Living area / (4) = 0.6096 (91)											
MIT	19.1210	19.3725	19.7329	20.1778	20.4565	20.5716	20.5935	20.5906	20.5187	20.1561	19.5848	19.0872 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.1210	19.3725	19.7329	20.1778	20.4565	20.5716	20.5935	20.5906	20.5187	20.1561	19.5848	19.0872 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9611	0.9394	0.8990	0.8036	0.6527	0.4710	0.3366	0.3824	0.6129	0.8445	0.9369	0.9656 (94)
Useful gains	445.1096	491.8958	517.8161	521.4702	458.8455	330.8073	225.5642	235.1028	341.1241	415.8949	426.5765	430.2304 (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	870.6348	847.8762	773.1979	650.7420	504.0695	339.9648	227.3514	238.0806	366.9867	550.1001	722.1301	865.3816 (97)
Space heating kWh	316.5908	239.2188	190.0041	93.0757	33.6466	0.0000	0.0000	0.0000	0.0000	99.8487	212.7986	323.7525 (98a)
Space heating requirement - total per year (kWh/year)	1508.9358											
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	316.5908	239.2188	190.0041	93.0757	33.6466	0.0000	0.0000	0.0000	0.0000	99.8487	212.7986	323.7525 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	1508.9358											
Space heating per m ²	(98c) / (4) = 30.0585 (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	316.5908	239.2188	190.0041	93.0757	33.6466	0.0000	0.0000	0.0000	0.0000	99.8487	212.7986	323.7525 (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)	343.0019	259.1753	205.8549	100.8404	36.4535	0.0000	0.0000	0.0000	0.0000	108.1784	230.5510	350.7611 (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

Full SAP Calculation Printout



Efficiency of water heater (217)m	194.4347	172.1077	183.3702	162.6346	158.5756	143.9052	142.8268	147.9724	148.9994	164.9147	173.8223	192.5108 (64)
Fuel for water heating, kWh/month	85.1463	84.7983	84.1396	82.8566	81.2413	79.8000	79.8000	79.8000	79.8000	82.9713	84.5146	79.8000 (216)
Space cooling fuel requirement (221)m	228.3537	202.9611	217.9358	196.2843	195.1910	180.3324	178.9809	185.4291	186.7160	198.7611	205.6713	225.9087 (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	15.4818	12.4201	11.1829	8.1931	6.3286	5.1705	5.7731	7.5041	9.7471	12.7888	14.4449	15.9121 (232)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	-17.2829	-25.2631	-37.6486	-43.9602	-48.8501	-46.1586	-45.6243	-42.3693	-36.8488	-29.6357	-19.3274	-14.8414 (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	-7.2180	-15.4164	-31.0650	-47.2705	-63.0850	-63.5674	-62.7891	-52.8732	-38.3940	-22.2155	-9.6942	-5.6884 (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	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)
Space heating fuel - main system 1												1634.8167 (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												2402.5254 (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)												124.9471 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-827.0869 (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												3421.2022 (238)

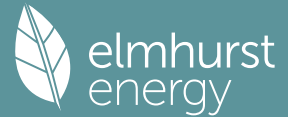
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1634.8167	0.2100	343.3115 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2402.5254	0.2100	504.5303 (264)
Space and water heating			847.8418 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	124.9471	0.1443	18.0337 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-407.8103	0.1338	-54.5662
PV Unit electricity exported	-419.2766	0.1255	-52.6305
Total			-107.1968 (269)
Total CO2, kg/year			770.6081 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.3500 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1634.8167	1.1300	1847.3429 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2402.5254	1.1300	2714.8537 (278)
Space and water heating			4562.1966 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	124.9471	1.5338	191.6480 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-407.8103	1.4945	-609.4598
PV Unit electricity exported	-419.2766	0.4608	-193.1834
Total			-802.6431 (283)
Total Primary energy kWh/year			4081.3022 (286)
Target Primary Energy Rate (TPER)			81.3000 (287)

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Property Reference	1B2P End MF - Apt			Issued on Date	30/08/2024
Assessment Reference	1B2P End MF	Prop Type Ref			
Property	Apartment, 1B2P End MF, Edmansons Close, Tottenham, N17 6XD				
SAP Rating	90 B	DER	3.24	TER	13.34
Environmental	98 A	% DER < TER			75.71
CO ₂ Emissions (t/year)	0.14	DFEE	30.50	TFEE	29.52
Compliance Check	See BREL	% DFEE < TFEE			-3.33
% DPER < TPER	52.37	DPER	33.56	TPER	70.46
Assessor Details	Miss Eleanor Ballinger			Assessor ID	M976-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.2000 (1b)	2.5000 (2b)	125.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	125.5000 (5)

2. Ventilation rate

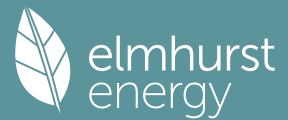
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) =												81.0000 (23c)
Effective ac	0.2576	0.2544	0.2512	0.2352	0.2321	0.2161	0.2161	0.2129	0.2225	0.2321	0.2384	0.2448 (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
Door to corridor			1.2000	1.0000	1.2000		(26)
Window (Uw = 0.90)			11.4800	0.8687	9.9730		(27)
External Wall	41.7500	11.4800	30.2700	0.1800	5.4486	60.0000	1816.2000 (29a)
Corridor Wall	4.1300	1.2000	2.9300	0.1800	0.5274	60.0000	175.8000 (29a)
Total net area of external elements Aum(A, m ²)			45.8800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	17.1490		(33)
Party Wall 1			30.1300	0.0000	0.0000	45.0000	1355.8500 (32)
Party Floor 1			50.2000			40.0000	2008.0000 (32d)
Party Ceiling 1			50.2000			30.0000	1506.0000 (32b)
Internal Wall 1			46.7500			9.0000	420.7500 (32c)
Heat capacity Cm = Sum(A x k)							7282.6000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							145.0717 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	

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E2 Other lintels (including other steel lintels)	6.3000	0.1500	0.9450
E3 Sill	5.1000	0.0400	0.2040
E4 Jamb	18.1400	0.0500	0.9070
E7 Party floor between dwellings (in blocks of flats)	23.1000	0.1000	2.3100
E7 Party floor between dwellings (in blocks of flats)	3.3000	0.1400	0.4620
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	10.3000	0.2500	2.5750
E16 Corner (normal)	5.0000	0.0900	0.4500
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250
E18 Party wall between dwellings	7.5000	0.0600	0.4500
E25 Staggered party wall between dwellings	2.5000	0.1200	0.3000
P2 Party wall - Intermediate floor within a dwelling	24.1000	0.0000	0.0000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.3780 (36)
Point Thermal Bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	25.5270 (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	10.6670	10.5349	10.4029	9.7429	9.6109	8.9508	8.9508	8.8188	9.2148	9.6109	9.8749	10.1389 (38)
Average = Sum(39)m / 12 =	36.1939	36.0619	35.9299	35.2699	35.1378	34.4778	34.4778	34.3458	34.7418	35.1378	35.4019	35.6659 (39)
												35.2368
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7210	0.7184	0.7157	0.7026	0.7000	0.6868	0.6868	0.6842	0.6921	0.7000	0.7052	0.7105 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.6960 (42)											
Hot water usage for mixer showers	59.2376	58.3474	57.0502	54.5681	52.7365	50.6938	49.5328	50.8202	52.2314	54.4246	56.9600	59.0107 (42a)
Hot water usage for baths	22.7669	22.4288	21.9526	21.0747	20.4173	19.6884	19.2947	19.7675	20.2823	21.0623	21.9583	22.6899 (42b)
Hot water usage for other uses	31.9986	30.8351	29.6715	28.5079	27.3443	26.1807	26.1807	27.3443	28.5079	29.6715	30.8351	31.9986 (42c)
Average daily hot water use (litres/day)												104.8133 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	114.0032	111.6112	108.6743	104.1507	100.4981	96.5629	95.0081	97.9319	101.0216	105.1584	109.7533	113.6992 (44)
Energy content (annual)	180.5531	158.9329	167.0283	142.5771	135.2897	118.7354	114.9041	121.2602	124.5697	142.6989	156.3637	178.0255 (45)
Distribution loss (46)m = 0.15 x (45)m	27.0830	23.8399	25.0542	21.3866	20.2935	17.8103	17.2356	18.1890	18.6855	21.4048	23.4546	26.7038 (46)
Water storage loss:												
Store volume												170.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.2000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.6480 (55)
Total storage loss	20.0880	18.1440	20.0880	19.4400	20.0880	19.4400	20.0880	20.0880	19.4400	20.0880	19.4400	20.0880 (56)
If cylinder contains dedicated solar storage	20.0880	18.1440	20.0880	19.4400	20.0880	19.4400	20.0880	20.0880	19.4400	20.0880	19.4400	20.0880 (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	223.9035	198.0881	210.3787	184.5291	178.6401	160.6874	158.2545	164.6106	166.5217	186.0493	198.3157	221.3759 (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	223.9035	198.0881	210.3787	184.5291	178.6401	160.6874	158.2545	164.6106	166.5217	186.0493	198.3157	221.3759 (64)
12Total per year (kWh/year)												2251.3548 (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	94.7142	84.1694	90.2172	80.9685	79.6642	73.0411	72.8859	74.9993	74.9810	82.1277	85.5525	93.8738 (65)

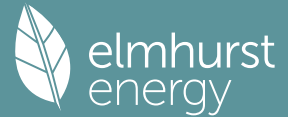
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	74.5246	82.5094	74.5246	77.0088	74.5246	77.0088	74.5246	74.5246	77.0088	74.5246	77.0088	74.5246 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	147.7534	149.2866	145.4229	137.1977	126.8147	117.0562	110.5370	109.0038	112.8674	121.0927	131.4756	141.2341 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800 (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)	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396 (71)
Water heating gains (Table 5)	127.3041	125.2520	121.2597	112.4563	107.0755	101.4460	97.9650	100.8056	104.1403	110.3867	118.8229	126.1745 (72)
Total internal gains	398.0219	405.4879	389.6471	375.1025	356.8547	343.9509	331.4664	332.7738	342.4564	354.4439	375.7472	390.3730 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	8.1600	11.2829	0.3500	0.8000	0.7700	17.8650 (75)
Southeast	2.8800	36.7938	0.3500	0.8000	0.7700	20.5617 (77)
Northwest	0.4400	11.2829	0.3500	0.8000	0.7700	0.9633 (81)

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Solar gains	39.3900	73.3498	116.9722	172.7781	218.9405	228.5362	215.6811	179.5328	136.0282	85.5461	48.3191	32.9727 (83)
Total gains	437.4120	478.8377	506.6193	547.8806	575.7952	572.4871	547.1475	512.3066	478.4845	439.9900	424.0663	423.3457 (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	55.8918	56.0964	56.3025	57.3562	57.5717	58.6738	58.6738	58.8994	58.2280	57.5717	57.1423	56.7193
alpha	4.7261	4.7398	4.7535	4.8237	4.8381	4.9116	4.9116	4.9266	4.8819	4.8381	4.8095	4.7813
util living area	0.9289	0.8949	0.8375	0.7116	0.5511	0.3832	0.2769	0.3077	0.4923	0.7439	0.8832	0.9356 (86)
Living	20.2830	20.4492	20.6496	20.8658	20.9655	20.9954	20.9993	20.9988	20.9848	20.8612	20.5725	20.2626
Non living	19.4963	19.7010	19.9438	20.2021	20.3098	20.3492	20.3521	20.3542	20.3360	20.2038	19.8641	19.4787
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.6332	20.4492	20.6496	20.8658	20.9655	20.9954	20.9993	20.9988	20.9848	20.8612	20.5725	20.3657 (87)
Th 2	20.3223	20.3246	20.3270	20.3385	20.3409	20.3525	20.3525	20.3548	20.3478	20.3409	20.3362	20.3316 (88)
util rest of house	0.9191	0.8814	0.8180	0.6830	0.5158	0.3452	0.2363	0.2649	0.4484	0.7113	0.8664	0.9266 (89)
MIT 2	19.9930	19.7010	19.9438	20.2021	20.3098	20.3492	20.3521	20.3542	20.3360	20.2038	19.8641	19.6324 (90)
Living area fraction												FLA = Living area / (4) = 0.6096 (91)
MIT	20.3833	20.1571	20.3740	20.6066	20.7095	20.7431	20.7466	20.7471	20.7315	20.6045	20.2959	20.0794 (92)
Temperature adjustment												0.0000
adjusted MIT	20.3833	20.1571	20.3740	20.6066	20.7095	20.7431	20.7466	20.7471	20.7315	20.6045	20.2959	20.0794 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9200	0.8778	0.8194	0.6949	0.5357	0.3682	0.2610	0.2910	0.4744	0.7247	0.8653	0.9229 (94)
Useful gains	402.4350	420.3291	415.1467	380.7003	308.4386	210.7871	142.8204	149.0607	226.9726	318.8645	366.9602	390.6889 (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	582.1161	550.1995	498.4918	412.8916	316.5743	211.7998	142.9653	149.3043	230.3895	351.5373	467.1605	566.3531 (97)
Space heating kWh	133.6828	87.2729	62.0088	23.1777	6.0530	0.0000	0.0000	0.0000	0.0000	24.3086	72.1443	130.6942 (98a)
Space heating requirement - total per year (kWh/year)												539.3422
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	133.6828	87.2729	62.0088	23.1777	6.0530	0.0000	0.0000	0.0000	0.0000	24.3086	72.1443	130.6942 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												539.3422
Space heating per m2										(98c) / (4) =		10.7439 (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 %)												210.7826 (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	133.6828	87.2729	62.0088	23.1777	6.0530	0.0000	0.0000	0.0000	0.0000	24.3086	72.1443	130.6942 (98)
Space heating efficiency (main heating system 1)	210.7826	210.7826	210.7826	210.7826	210.7826	0.0000	0.0000	0.0000	0.0000	210.7826	210.7826	210.7826 (210)
Space heating fuel (main heating system)	63.4221	41.4042	29.4183	10.9960	2.8717	0.0000	0.0000	0.0000	0.0000	11.5325	34.2269	62.0042 (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	223.9035	198.0881	210.3787	184.5291	178.6401	160.6874	158.2545	164.6106	166.5217	186.0493	198.3157	221.3759 (64)
Efficiency of water heater (217)m	184.5000	184.5000	184.5000	184.5000	184.5000	184.5000	184.5000	184.5000	184.5000	184.5000	184.5000	184.5000 (216)
Fuel for water heating, kWh/month	121.3569	107.3648	114.0264	100.0158	96.8239	87.0934	85.7748	89.2198	90.2557	100.8397	107.4882	119.9870 (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	8.0104	7.2352	8.0104	7.7520	8.0104	7.7520	8.0104	8.0104	7.7520	8.0104	7.7520	8.0104 (231)
Lighting	16.7457	13.4340	12.0958	8.8619	6.8452	5.5926	6.2444	8.1168	10.5429	13.8328	15.6241	17.2111 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-20.1972	-33.3566	-56.3153	-70.8609	-81.4229	-77.5762	-76.1628	-69.1632	-56.2473	-40.7376	-23.4081	-16.7053 (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												255.8760 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												184.5000

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Water heating fuel used	1220.2465 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.6160)	
mechanical ventilation fans (SFP = 0.6160)	94.3158 (230a)
Total electricity for the above, kWh/year	94.3158 (231)
Electricity for lighting (calculated in Appendix L)	135.1474 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-622.1536 (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	1083.4321 (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	255.8760	0.1573	40.2584 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1220.2465	0.1409	171.9674 (264)
Space and water heating			212.2258 (265)
Pumps, fans and electric keep-hot	94.3158	0.1387	13.0828 (267)
Energy for lighting	135.1474	0.1443	19.5059 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-622.1536	0.1323	-82.2960
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-82.2960 (269)
Total CO2, kg/year			162.5185 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.2400 (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	255.8760	1.5824	404.9064 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1220.2465	1.5211	1856.1215 (278)
Space and water heating			2261.0280 (279)
Pumps, fans and electric keep-hot	94.3158	1.5128	142.6809 (281)
Energy for lighting	135.1474	1.5338	207.2936 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-622.1536	1.4887	-926.2299
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-926.2299 (283)
Total Primary energy kWh/year			1684.7725 (286)
Dwelling Primary energy Rate (DPER)			33.5600 (287)

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

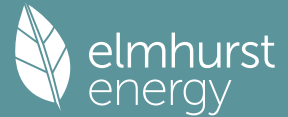
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	50.2000 (1b)	x 2.5000 (2b)	= 125.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 125.5000 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1594 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4094 (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) = 0.3480 (21)

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Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
Effective ac	0.4436	0.4349	0.4262	0.3828	0.3741	0.3306	0.3306	0.3219	0.3480	0.3741	0.3915	0.4089	(22b)
	0.5984	0.5946	0.5908	0.5733	0.5700	0.5546	0.5546	0.5518	0.5605	0.5700	0.5766	0.5836	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opaque door			1.2000	1.0000	1.2000		(26)
TER Opening Type (Uw = 1.20)			11.3600	1.1450	13.0076		(27)
External Wall	41.7500	11.3600	30.3900	0.1800	5.4702		(29a)
Corridor Wall	4.1300	1.2000	2.9300	0.1800	0.5274		(29a)
Total net area of external elements Aum(A, m2)			45.8800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		20.2052		(33)
Party Wall 1			30.1300	0.0000	0.0000		(32)

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

155.0717 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.3000	0.0500	0.3150
E3 Sill	5.1000	0.0500	0.2550
E4 Jamb	18.1400	0.0500	0.9070
E7 Party floor between dwellings (in blocks of flats)	23.1000	0.0700	1.6170
E7 Party floor between dwellings (in blocks of flats)	3.3000	0.0700	0.2310
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	10.3000	0.0200	0.2060
E16 Corner (normal)	5.0000	0.0900	0.4500
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250
E18 Party wall between dwellings	7.5000	0.0600	0.4500
E25 Staggered party wall between dwellings	2.5000	0.0600	0.1500
P2 Party wall - Intermediate floor within a dwelling	24.1000	0.0000	0.0000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			4.3560 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 24.5612 (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	24.7832	24.6249	24.4698	23.7412	23.6048	22.9702	22.9702	22.8527	23.2147	23.6048	23.8806	24.1689	(38)
Average = Sum(39)m / 12 =	49.3444	49.1862	49.0310	48.3024	48.1661	47.5314	47.5314	47.4139	47.7759	48.1661	48.4419	48.7302	(39)
												48.3017	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.9830	0.9798	0.9767	0.9622	0.9595	0.9468	0.9468	0.9445	0.9517	0.9595	0.9650	0.9707	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

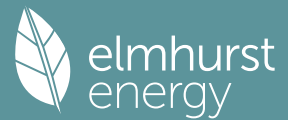
4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.6960 (42)
Hot water usage for mixer showers													
Hot water usage for baths	52.6557	51.8644	50.7113	48.5050	46.8769	45.0612	44.0291	45.1735	46.4279	48.3774	50.6311	52.4539	(42a)
Hot water usage for other uses	22.7669	22.4288	21.9526	21.0747	20.4173	19.6884	19.2947	19.7675	20.2823	21.0623	21.9583	22.6899	(42b)
Average daily hot water use (litres/day)	31.9986	30.8351	29.6715	28.5079	27.3443	26.1807	26.1807	27.3443	28.5079	29.6715	30.8351	31.9986	(42c)
												98.7449	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	107.4212	105.1282	102.3354	98.0876	94.6385	90.9303	89.5045	92.2853	95.2181	99.1112	103.4244	107.1425	(44)
Energy content (annual)	170.1289	149.7011	157.2856	134.2770	127.4016	111.8094	108.2479	114.2684	117.4134	134.4929	147.3470	167.7593	(45)
Distribution loss (46)m = 0.15 x (45)m													
Water storage loss:	25.5193	22.4552	23.5928	20.1416	19.1102	16.7714	16.2372	17.1403	17.6120	20.1739	22.1021	25.1639	(46)
Store volume													170.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.5003 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8102 (55)
Total storage loss	25.1153	22.6848	25.1153	24.3051	25.1153	24.3051	25.1153	25.1153	24.3051	25.1153	24.3051	25.1153	(56)
If cylinder contains dedicated solar storage	25.1153	22.6848	25.1153	24.3051	25.1153	24.3051	25.1153	25.1153	24.3051	25.1153	24.3051	25.1153	(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	218.5066	193.3971	205.6633	181.0942	175.7793	158.6265	156.6256	162.6461	164.2306	182.8706	194.1642	216.1370	(62)
WWHRS	-24.0720	-21.2895	-22.2931	-18.4596	-17.2036	-14.7213	-13.7989	-14.6737	-15.2312	-17.9559	-20.3419	-23.6262	(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	194.4347	172.1077	183.3702	162.6346	158.5756	143.9052	142.8268	147.9724	148.9994	164.9147	173.8223	192.5108	(64)
12Total per year (kWh/year)													1986.0744 (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	95.2700	84.7324	90.9996	82.1008	81.0632	74.6303	74.6946	76.6964	76.4937	83.4211	86.4466	94.4821	(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	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	(66)

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Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	74.5105	82.4938	74.5105	76.9942	74.5105	76.9942	74.5105	76.9942	74.5105	76.9942	74.5105	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	147.7534	149.2866	145.4229	137.1977	126.8147	117.0562	110.5370	109.0038	112.8674	121.0927	131.4756	141.2341 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	(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)	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	(71)
Water heating gains (Table 5)	128.0511	126.0899	122.3113	114.0289	108.9559	103.6532	100.3960	103.0866	106.2412	112.1251	120.0647	126.9921 (72)
Total internal gains	401.7549	409.3101	393.6846	379.6606	361.7210	346.1435	333.8833	335.0407	344.5427	359.1681	379.9744	394.1766 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W	
Northeast					8.0700	11.2829	0.6300	0.7000			0.7700	27.8271 (75)	
Southeast					2.8500	36.7938	0.6300	0.7000			0.7700	32.0473 (77)	
Northwest					0.4400	11.2829	0.6300	0.7000			0.7700	1.5172 (81)	
Solar gains	61.3916	114.3196	182.3068	269.2822	341.2276	356.1827	336.1476	279.8095	212.0062	133.3281	75.3080	51.3899 (83)	
Total gains	463.1465	523.6297	575.9915	648.9428	702.9486	702.3263	670.0309	614.8502	556.5489	492.4962	455.2824	445.5664 (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	43.8223	43.9634	44.1024	44.7677	44.8944	45.4939	45.4939	45.6066	45.2611	44.8944	44.6389	44.3747
alpha	3.9215	3.9309	3.9402	3.9845	3.9930	4.0329	4.0329	4.0404	4.0174	3.9930	3.9759	3.9583
util living area	0.9514	0.9234	0.8719	0.7555	0.5945	0.4246	0.3102	0.3512	0.5606	0.8064	0.9203	0.9569 (86)
MIT	19.7769	20.0154	20.3330	20.6979	20.9035	20.9807	20.9958	20.9931	20.9432	20.6669	20.1846	19.7443 (87)
Th 2	20.0976	20.1002	20.1028	20.1150	20.1172	20.1279	20.1279	20.1298	20.1238	20.1172	20.1126	20.1078 (88)
util rest of house	0.9429	0.9107	0.8515	0.7216	0.5478	0.3696	0.2496	0.2863	0.4988	0.7701	0.9050	0.9492 (89)
MIT 2	18.6943	18.9908	19.3791	19.8127	20.0333	20.1149	20.1259	20.1264	20.0817	19.7911	19.2145	18.6611 (90)
Living area fraction	fLA = Living area / (4) = 0.6096 (91)											
MIT	19.3542	19.6154	19.9605	20.3523	20.5638	20.6426	20.6561	20.6547	20.6068	20.3250	19.8059	19.3214 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.3542	19.6154	19.9605	20.3523	20.5638	20.6426	20.6561	20.6547	20.6068	20.3250	19.8059	19.3214 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9346	0.9028	0.8480	0.7311	0.5718	0.4023	0.2864	0.3256	0.5335	0.7792	0.8990	0.9412 (94)
Ext temp.	432.8364	472.7546	488.4140	474.4424	401.9736	282.5537	191.8888	200.2254	296.8929	383.7467	409.2838	419.3556 (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	742.8421	723.7931	659.9834	553.1726	426.9331	287.2157	192.7940	201.7324	310.8681	468.4133	615.4963	736.8685 (97)
Space heating requirement - total per year (kWh/year)	230.6443	168.6979	127.6476	56.6857	18.5699	0.0000	0.0000	0.0000	0.0000	62.9920	148.4730	236.2296 (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)
Space heating contribution - total per year (kWh/year)	230.6443	168.6979	127.6476	56.6857	18.5699	0.0000	0.0000	0.0000	0.0000	62.9920	148.4730	236.2296 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	1049.9399											
Space heating per m2	(98c) / (4) = 20.9151 (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
Space heating efficiency (main heating system 1)	230.6443	168.6979	127.6476	56.6857	18.5699	0.0000	0.0000	0.0000	0.0000	62.9920	148.4730	236.2296 (98)
Space heating fuel (main heating system)	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 efficiency (main heating system 2)	249.8854	182.7713	138.2965	61.4147	20.1190	0.0000	0.0000	0.0000	0.0000	68.2470	160.8592	255.9367 (211)
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 (212)
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 (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	194.4347	172.1077	183.3702	162.6346	158.5756	143.9052	142.8268	147.9724	148.9994	164.9147	173.8223	192.5108 (64)
Efficiency of water heater (217)m	84.4438	84.0149	83.2635	81.9466	80.6569	79.8000	79.8000	79.8000	79.8000	82.0999	83.7083	79.8000 (216)
Fuel for water heating, kWh/month	230.2534	204.8537	220.2289	198.4641	196.6051	180.3324	178.9809	185.4291	186.7160	200.8709	207.6523	84.5198 (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)

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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	15.4818	12.4201	11.1829	8.1931	6.3286	5.1705	5.7731	7.5041	9.7471	12.7888	14.4449	15.9121	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-17.2829	-25.2631	-37.6486	-43.9602	-48.8501	-46.1586	-45.6243	-42.3693	-36.8488	-29.6357	-19.3274	-14.8414	(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	-7.2180	-15.4164	-31.0650	-47.2705	-63.0850	-63.5674	-62.7891	-52.8732	-38.3940	-22.2155	-9.6942	-5.6884	(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												1137.5297	(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												2418.1567	(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)												124.9471	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-827.0869	(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												2939.5466	(238)

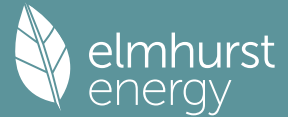
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1137.5297	0.2100	238.8812	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2418.1567	0.2100	507.8129	(264)
Space and water heating			746.6941	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	124.9471	0.1443	18.0337	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-407.8103	0.1338	-54.5662	
PV Unit electricity exported	-419.2766	0.1255	-52.6305	
Total			-107.1968	(269)
Total CO2, kg/year			669.4604	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.3400	(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	1137.5297	1.1300	1285.4086	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2418.1567	1.1300	2732.5171	(278)
Space and water heating			4017.9256	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	124.9471	1.5338	191.6480	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-407.8103	1.4945	-609.4598	
PV Unit electricity exported	-419.2766	0.4608	-193.1834	
Total			-802.6431	(283)
Total Primary energy kWh/year			3537.0313	(286)
Target Primary Energy Rate (TPER)			70.4600	(287)

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Property Reference	1B2P End TF - Apt			Issued on Date	30/08/2024
Assessment Reference	1B2P End TF	Prop Type Ref			
Property	Apartment, 1B2P End TF, Edmansons Close, Tottenham, N17 6XD				
SAP Rating	82 B	DER	3.61	TER	16.75
Environmental	98 A	% DER < TER			78.45
CO ₂ Emissions (t/year)	0.15	DFEE	39.96	TFEE	45.43
Compliance Check	See BREL	% DFEE < TFEE			12.05
% DPER < TPER	58.12	DPER	37.20	TPER	88.84
Assessor Details	Miss Eleanor Ballinger			Assessor ID	M976-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.2000 (1b)	2.5000 (2b)	125.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	125.5000 (5)

2. Ventilation rate

											m3 per hour		
Number of open chimneys											0 * 80 =	0.0000 (6a)	
Number of open flues											0 * 20 =	0.0000 (6b)	
Number of chimneys / flues attached to closed fire											0 * 10 =	0.0000 (6c)	
Number of flues attached to solid fuel boiler											0 * 20 =	0.0000 (6d)	
Number of flues attached to other heater											0 * 35 =	0.0000 (6e)	
Number of blocked chimneys											0 * 20 =	0.0000 (6f)	
Number of intermittent extract fans											0 * 10 =	0.0000 (7a)	
Number of passive vents											0 * 10 =	0.0000 (7b)	
Number of flueless gas fires											0 * 40 =	0.0000 (7c)	
											Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											0.0000 / (5) =	0.0000 (8)	
Pressure test											Yes		
Pressure Test Method											Blower Door		
Measured/design AP50											3.0000 (17)		
Infiltration rate											0.1500 (18)		
Number of sides sheltered											2 (19)		
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.8500 (20)	
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.1275 (21)	
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)	
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) =													81.0000 (23c)
Effective ac	0.2576	0.2544	0.2512	0.2352	0.2321	0.2161	0.2161	0.2129	0.2225	0.2321	0.2384	0.2448 (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
Door to corridor			1.2000	1.0000	1.2000		(26)
Window (Uw = 0.90)			11.4800	0.8687	9.9730		(27)
External Wall	41.7500	11.4800	30.2700	0.1800	5.4486	60.0000	1816.2000 (29a)
Corridor Wall	4.1300	1.2000	2.9300	0.1800	0.5274	60.0000	175.8000 (29a)
External Roof 1	50.2000		50.2000	0.1000	5.0200	80.0000	4016.0000 (30)
Total net area of external elements Aum(A, m ²)			96.0800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	22.1690		(33)
Party Wall 1			30.1300	0.0000	0.0000	45.0000	1355.8500 (32)
Party Floor 1			50.2000			2008.0000	(32d)
Internal Wall 1			46.7500			9.0000	420.7500 (32c)
Heat capacity Cm = Sum(A x k)							9792.6000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							195.0717 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	

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E2 Other lintels (including other steel lintels)	6.3000	0.1500	0.9450
E3 Sill	5.1000	0.0400	0.2040
E4 Jamb	18.1400	0.0500	0.9070
E7 Party floor between dwellings (in blocks of flats)	11.5500	0.1000	1.1550
E7 Party floor between dwellings (in blocks of flats)	1.6500	0.1400	0.2310
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.1500	0.2500	1.2875
E14 Flat roof	1.6500	0.0800	0.1320
E15 Flat roof with parapet	16.7000	0.3000	5.0100
E16 Corner (normal)	5.0000	0.0900	0.4500
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250
E18 Party wall between dwellings	7.5000	0.0600	0.4500
E25 Staggered party wall between dwellings	2.5000	0.1200	0.3000
P2 Party wall - Intermediate floor within a dwelling	12.0500	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	12.0500	0.1000	1.2050
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			12.0515 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	34.2205 (37)

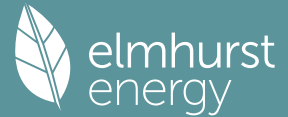
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	10.6670	10.5349	10.4029	9.7429	9.6109	8.9508	8.9508	8.8188	9.2148	9.6109	9.8749	10.1389
Average = Sum(39)m / 12 =	44.8874	44.7554	44.6234	43.9634	43.8313	43.1713	43.1713	43.0393	43.4353	43.8313	44.0954	44.3594
												43.9303
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8942	0.8915	0.8889	0.8758	0.8731	0.8600	0.8600	0.8574	0.8652	0.8731	0.8784	0.8837
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												1.6960 (42)
Hot water usage for mixer showers	59.2376	58.3474	57.0502	54.5681	52.7365	50.6938	49.5328	50.8202	52.2314	54.4246	56.9600	59.0107
Hot water usage for baths	22.7669	22.4288	21.9526	21.0747	20.4173	19.6884	19.2947	19.7675	20.2823	21.0623	21.9583	22.6899
Hot water usage for other uses	31.9986	30.8351	29.6715	28.5079	27.3443	26.1807	26.1807	27.3443	28.5079	29.6715	30.8351	31.9986
Average daily hot water use (litres/day)												104.8133
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	114.0032	111.6112	108.6743	104.1507	100.4981	96.5629	95.0081	97.9319	101.0216	105.1584	109.7533	113.6992
Energy content (annual)	180.5531	158.9329	167.0283	142.5771	135.2897	118.7354	114.9041	121.2602	124.5697	142.6989	156.3637	178.0255
Distribution loss (46)m = 0.15 x (45)m	27.0830	23.8399	25.0542	21.3866	20.2935	17.8103	17.2356	18.1890	18.6855	21.4048	23.4546	26.7038
Water storage loss:												170.0000
Store volume												1.2000
a) If manufacturer declared loss factor is known (kWh/day):												0.5400
Temperature factor from Table 2b												0.6480
Enter (49) or (54) in (55)												0.6480
Total storage loss	20.0880	18.1440	20.0880	19.4400	20.0880	19.4400	20.0880	20.0880	19.4400	20.0880	19.4400	20.0880
If cylinder contains dedicated solar storage	20.0880	18.1440	20.0880	19.4400	20.0880	19.4400	20.0880	20.0880	19.4400	20.0880	19.4400	20.0880
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total heat required for water heating calculated for each month	223.9035	198.0881	210.3787	184.5291	178.6401	160.6874	158.2545	164.6106	166.5217	186.0493	198.3157	221.3759
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
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Output from w/h	223.9035	198.0881	210.3787	184.5291	178.6401	160.6874	158.2545	164.6106	166.5217	186.0493	198.3157	221.3759
12Total per year (kWh/year)												2251.3548
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
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000
Heat gains from water heating, kWh/month	94.7142	84.1694	90.2172	80.9685	79.6642	73.0411	72.8859	74.9993	74.9810	82.1277	85.5525	93.8738

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	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	74.5246	82.5094	74.5246	77.0088	74.5246	77.0088	74.5246	74.5246	77.0088	74.5246	77.0088	74.5246
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	147.7534	149.2866	145.4229	137.1977	126.8147	117.0562	110.5370	109.0038	112.8674	121.0927	131.4756	141.2341
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800
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
Losses e.g. evaporation (negative values) (Table 5)	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396
Water heating gains (Table 5)	127.3041	125.2520	121.2597	112.4563	107.0755	101.4460	97.9650	100.8056	104.1403	110.3867	118.8229	126.1745
Total internal gains	398.0219	405.4879	389.6471	375.1025	356.8547	343.9509	331.4664	332.7738	342.4564	354.4439	375.7472	390.3730

6. Solar gains												
[Jan]	Area	Solar flux	g	FF	Access	Gains						
	m2	Table 6a	W/m2	Specific data	factor	W						
				or Table 6b	or Table 6c							
Northeast	8.1600	11.2829	0.3500	0.8000	0.7700	17.8650	(75)					

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Southeast			2.8800		36.7938		0.3500		0.8000		0.7700	20.5617 (77)
Northwest			0.4400		11.2829		0.3500		0.8000		0.7700	0.9633 (81)

Solar gains	39.3900	73.3498	116.9722	172.7781	218.9405	228.5362	215.6811	179.5328	136.0282	85.5461	48.3191	32.9727 (83)
Total gains	437.4120	478.8377	506.6193	547.8806	575.7952	572.4871	547.1475	512.3066	478.4845	439.9900	424.0663	423.3457 (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	60.5997	60.7785	60.9583	61.8735	62.0599	63.0087	63.0087	63.2020	62.6257	62.0599	61.6883	61.3211
alpha	5.0400	5.0519	5.0639	5.1249	5.1373	5.2006	5.2006	5.2135	5.1750	5.1373	5.1126	5.0881
util living area	0.9713	0.9535	0.9187	0.8241	0.6681	0.4769	0.3462	0.3848	0.6043	0.8515	0.9476	0.9749 (86)
Living	20.1106	20.2766	20.5020	20.7788	20.9369	20.9910	20.9986	20.9976	20.9710	20.7765	20.4198	20.0871
Non living	19.1522	19.3601	19.6378	19.9695	20.1374	20.1960	20.2011	20.2029	20.1770	19.9759	19.5495	19.1298
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.5450	20.2766	20.5020	20.7788	20.9369	20.9910	20.9986	20.9976	20.9710	20.7765	20.4198	20.2148 (87)
Th 2	20.1725	20.1747	20.1769	20.1881	20.1904	20.2016	20.2016	20.2039	20.1971	20.1904	20.1859	20.1814 (88)
util rest of house	0.9651	0.9439	0.9022	0.7927	0.6202	0.4196	0.2839	0.3190	0.5416	0.8174	0.9353	0.9694 (89)
MIT 2	19.7657	19.3601	19.6378	19.9695	20.1374	20.1960	20.2011	20.2029	20.1770	19.9759	19.5495	19.3193 (90)
Living area fraction									FLA =	Living area /	(4) =	0.6096 (91)
MIT	20.2408	19.9188	20.1646	20.4628	20.6247	20.6806	20.6872	20.6873	20.6610	20.4640	20.0800	19.8651 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2408	19.9188	20.1646	20.4628	20.6247	20.6806	20.6872	20.6873	20.6610	20.4640	20.0800	19.8651 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9657	0.9405	0.9019	0.8039	0.6464	0.4542	0.3219	0.3591	0.5784	0.8296	0.9334	0.9670 (94)
Useful gains	422.4134	450.3536	456.9398	440.4206	372.1982	260.0231	176.1178	183.9469	276.7549	365.0353	395.8344	409.3711 (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	715.5394	672.1714	609.7594	508.3400	391.1819	262.5070	176.4505	184.5234	284.9780	432.3507	572.3583	694.8958 (97)
Space heating kWh	218.0857	149.0616	113.6977	48.9020	14.1239	0.0000	0.0000	0.0000	0.0000	50.0827	127.0972	212.4304 (98a)
Space heating requirement - total per year (kWh/year)												933.4812
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	218.0857	149.0616	113.6977	48.9020	14.1239	0.0000	0.0000	0.0000	0.0000	50.0827	127.0972	212.4304 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												933.4812
Space heating per m2										(98c) / (4) =		18.5952 (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 %)												223.1041 (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	218.0857	149.0616	113.6977	48.9020	14.1239	0.0000	0.0000	0.0000	0.0000	50.0827	127.0972	212.4304 (98)
Space heating efficiency (main heating system 1)	223.1041	223.1041	223.1041	223.1041	223.1041	0.0000	0.0000	0.0000	0.0000	223.1041	223.1041	223.1041 (210)
Space heating fuel (main heating system)	97.7507	66.8126	50.9617	21.9189	6.3306	0.0000	0.0000	0.0000	0.0000	22.4481	56.9677	95.2158 (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	223.9035	198.0881	210.3787	184.5291	178.6401	160.6874	158.2545	164.6106	166.5217	186.0493	198.3157	221.3759 (64)
Efficiency of water heater (217)m	191.9313	191.9313	191.9313	191.9313	191.9313	191.9313	191.9313	191.9313	191.9313	191.9313	191.9313	191.9313 (216)
Fuel for water heating, kWh/month	116.6582	103.2078	109.6114	96.1433	93.0750	83.7213	82.4537	85.7654	86.7611	96.9353	103.3264	115.3412 (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	8.0104	7.2352	8.0104	7.7520	8.0104	7.7520	8.0104	8.0104	7.7520	8.0104	7.7520	8.0104 (231)
Lighting	16.7457	13.4340	12.0958	8.8619	6.8452	5.5926	6.2444	8.1168	10.5429	13.8328	15.6241	17.2111 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-20.3901	-33.7590	-57.0719	-71.4881	-81.3844	-77.0631	-75.6635	-68.7437	-55.9629	-40.9844	-23.6187	-16.8485 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												418.4061 (211)

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Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	191.9313	
Water heating fuel used	1173.0002	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.6160)		
mechanical ventilation fans (SFP = 0.6160)	94.3158	(230a)
Total electricity for the above, kWh/year	94.3158	(231)
Electricity for lighting (calculated in Appendix L)	135.1474	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-622.9783	(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	1197.8912	(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	418.4061	0.1567	65.5658 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1173.0002	0.1409	165.3091 (264)
Space and water heating			230.8749 (265)
Pumps, fans and electric keep-hot	94.3158	0.1387	13.0828 (267)
Energy for lighting	135.1474	0.1443	19.5059 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-622.9783	0.1324	-82.4822
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-82.4822 (269)
Total CO2, kg/year			180.9814 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.6100 (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	418.4061	1.5801	661.1304 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1173.0002	1.5211	1784.2550 (278)
Space and water heating			2445.3853 (279)
Pumps, fans and electric keep-hot	94.3158	1.5128	142.6809 (281)
Energy for lighting	135.1474	1.5338	207.2936 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-622.9783	1.4892	-927.7492
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-927.7492 (283)
Total Primary energy kWh/year			1867.6107 (286)
Dwelling Primary energy Rate (DPER)			37.2000 (287)

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

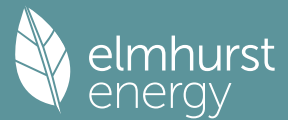
1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.2000 (1b)	x 2.5000 (2b)	= 125.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 125.5000 (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)
Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1594 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4094 (18)
Number of sides sheltered	2 (19)

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Shelter factor
Infiltration rate adjusted to include shelter factor

$$(20) = 1 - [0.075 \times (19)] = 0.8500 \quad (20)$$

$$(21) = (18) \times (20) = 0.3480 \quad (21)$$

	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													
Effective ac	0.4436	0.4349	0.4262	0.3828	0.3741	0.3306	0.3306	0.3219	0.3480	0.3741	0.3915	0.4089	(22b)
	0.5984	0.5946	0.5908	0.5733	0.5700	0.5546	0.5546	0.5518	0.5605	0.5700	0.5766	0.5836	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.2000	1.0000	1.2000			(26)
TER Opening Type (Uw = 1.20)			11.3600	1.1450	13.0076			(27)
External Wall	41.7500	11.3600	30.3900	0.1800	5.4702			(29a)
Corridor Wall	4.1300	1.2000	2.9300	0.1800	0.5274			(29a)
External Roof 1	50.2000		50.2000	0.1100	5.5220			(30)
Total net area of external elements Aum(A, m2)			96.0800					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	25.7272		(33)
Party Wall 1			30.1300	0.0000	0.0000			(32)

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

195.0717 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element	6.3000	0.0500	0.3150	
E2 Other lintels (including other steel lintels)	5.1000	0.0500	0.2550	
E3 Sill	18.1400	0.0500	0.9070	
E4 Jamb	11.5500	0.0700	0.8085	
E7 Party floor between dwellings (in blocks of flats)	1.6500	0.0700	0.1155	
E7 Party floor between dwellings (in blocks of flats)	5.1500	0.0200	0.1030	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	1.6500	0.0800	0.1320	
E14 Flat roof	16.7000	0.5600	9.3520	
E15 Flat roof with parapet	5.0000	0.0900	0.4500	
E16 Corner (normal)	2.5000	-0.0900	-0.2250	
E17 Corner (inverted - internal area greater than external area)	7.5000	0.0600	0.4500	
E18 Party wall between dwellings	2.5000	0.0600	0.1500	
E25 Staggered party wall between dwellings	12.0500	0.0000	0.0000	
P2 Party wall - Intermediate floor within a dwelling	12.0500	0.1200	1.4460	
P4 Party wall - Roof (insulation at ceiling level)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				14.2590 (36)
Point Thermal bridges				0.0000
Total fabric heat loss				(33) + (36) + (36a) = 39.9862 (37)

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

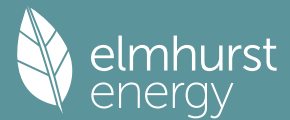
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	24.7832	24.6249	24.4698	23.7412	23.6048	22.9702	22.9702	22.8527	23.2147	23.6048	23.8806	24.1689	(38)
Heat transfer coeff	64.7694	64.6112	64.4560	63.7274	63.5911	62.9564	62.9564	62.8389	63.2009	63.5911	63.8669	64.1552	(39)
Average = Sum(39)m / 12 =												63.7267	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2902	1.2871	1.2840	1.2695	1.2668	1.2541	1.2541	1.2518	1.2590	1.2668	1.2722	1.2780	(40)
HLP (average)												1.2695	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.6960 (42)
Hot water usage for mixer showers	52.6557	51.8644	50.7113	48.5050	46.8769	45.0612	44.0291	45.1735	46.4279	48.3774	50.6311	52.4539 (42a)	
Hot water usage for baths	22.7669	22.4288	21.9526	21.0747	20.4173	19.6884	19.2947	19.7675	20.2823	21.0623	21.9583	22.6899 (42b)	
Hot water usage for other uses	31.9986	30.8351	29.6715	28.5079	27.3443	26.1807	26.1807	27.3443	28.5079	29.6715	30.8351	31.9986 (42c)	
Average daily hot water use (litres/day)												98.7449 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	107.4212	105.1282	102.3354	98.0876	94.6385	90.9303	89.5045	92.2853	95.2181	99.1112	103.4244	107.1425 (44)	
Energy content (annual)	170.1289	149.7011	157.2856	134.2770	127.4016	111.8094	108.2479	114.2684	117.4134	134.4929	147.3470	167.7593 (45)	
Distribution loss (46)m = 0.15 x (45)m	25.5193	22.4552	23.5928	20.1416	19.1102	16.7714	16.2372	17.1403	17.6120	20.1739	22.1021	25.1639 (46)	
Water storage loss:													
Store volume												170.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):												1.5003 (48)	
Temperature factor from Table 2b												0.5400 (49)	
Enter (49) or (54) in (55)												0.8102 (55)	
Total storage loss	25.1153	22.6848	25.1153	24.3051	25.1153	24.3051	25.1153	25.1153	24.3051	25.1153	24.3051	25.1153 (56)	
If cylinder contains dedicated solar storage	25.1153	22.6848	25.1153	24.3051	25.1153	24.3051	25.1153	25.1153	24.3051	25.1153	24.3051	25.1153 (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	218.5066	193.3971	205.6633	181.0942	175.7793	158.6265	156.6256	162.6461	164.2306	182.8706	194.1642	216.1370 (62)	
WWHRS	-24.0720	-21.2895	-22.2931	-18.4596	-17.2036	-14.7213	-13.7989	-14.6737	-15.2312	-17.9559	-20.3419	-23.6262 (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	194.4347	172.1077	183.3702	162.6346	158.5756	143.9052	142.8268	147.9724	148.9994	164.9147	173.8223	192.5108 (64)	
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		1986.0744 (64)	
Electric shower(s)												1986 (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)	
Total Energy used by instantaneous electric shower (s) (kWh/year) = Sum(64a)m =													
Heat gains from water heating, kWh/month	95.2700	84.7324	90.9996	82.1008	81.0632	74.6303	74.6946	76.6964	76.4937	83.4211	86.4466	94.4821 (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	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	84.7995	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	74.5105	82.4938	74.5105	76.9942	74.5105	76.9942	74.5105	74.5105	76.9942	74.5105	76.9942	74.5105	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	147.7534	149.2866	145.4229	137.1977	126.8147	117.0562	110.5370	109.0038	112.8674	121.0927	131.4756	141.2341	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	31.4800	(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)	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	-67.8396	(71)
Water heating gains (Table 5)	128.0511	126.0899	122.3113	114.0289	108.9559	103.6532	100.3960	103.0866	106.2412	112.1251	120.0647	126.9921	(72)
Total internal gains	401.7549	409.3101	393.6846	379.6606	361.7210	346.1435	333.8833	335.0407	344.5427	359.1681	379.9744	394.1766	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
Northeast				8.0700	11.2829		0.6300	0.7000	0.7700		27.8271 (75)	
Southeast				2.8500	36.7938		0.6300	0.7000	0.7700		32.0473 (77)	
Northwest				0.4400	11.2829		0.6300	0.7000	0.7700		1.5172 (81)	
Solar gains	61.3916	114.3196	182.3068	269.2822	341.2276	356.1827	336.1476	279.8095	212.0062	133.3281	75.3080	51.3899 (83)
Total gains	463.1465	523.6297	575.9915	648.9428	702.9486	702.3263	670.0309	614.8502	556.5489	492.4962	455.2824	445.5664 (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	41.9977	42.1006	42.2019	42.6844	42.7759	43.2071	43.2071	43.2879	43.0400	42.7759	42.5912	42.3998	
alpha	3.7998	3.8067	3.8135	3.8456	3.8517	3.8805	3.8805	3.8859	3.8693	3.8517	3.8394	3.8267	
util living area	0.9768	0.9622	0.9329	0.8559	0.7204	0.5434	0.4054	0.4565	0.6886	0.8922	0.9609	0.9797	(86)
MIT	19.4226	19.6544	20.0028	20.4570	20.7859	20.9462	20.9865	20.9789	20.8666	20.4408	19.8670	19.3883	(87)
Th 2	19.8485	19.8510	19.8534	19.8648	19.8670	19.8770	19.8770	19.8788	19.8731	19.8670	19.8626	19.8581	(88)
util rest of house	0.9711	0.9530	0.9164	0.8219	0.6607	0.4590	0.3057	0.3514	0.6050	0.8584	0.9498	0.9747	(89)
MIT 2	18.0558	18.3479	18.7812	19.3304	19.6894	19.8451	19.8721	19.8705	19.7820	19.3286	18.6270	18.0190	(90)
Living area fraction	18.8890	19.1443	19.5258	20.0171	20.3578	20.5163	20.5514	20.5461	20.4432	20.0066	19.3828	18.8537	(91)
MIT	18.8890	19.1443	19.5258	20.0171	20.3578	20.5163	20.5514	20.5461	20.4432	20.0066	19.3828	18.8537	(92)
Temperature adjustment	18.8890	19.1443	19.5258	20.0171	20.3578	20.5163	20.5514	20.5461	20.4432	20.0066	19.3828	18.8537	(93)
adjusted MIT	18.8890	19.1443	19.5258	20.0171	20.3578	20.5163	20.5514	20.5461	20.4432	20.0066	19.3828	18.8537	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9649	0.9460	0.9109	0.8269	0.6878	0.5081	0.3662	0.4149	0.6493	0.8632	0.9440	0.9689	(94)
Useful gains	446.8966	495.3762	524.6463	536.6261	483.4968	356.8317	245.3943	255.1175	361.3901	425.1022	429.7962	431.7284	(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	944.9197	920.3413	839.5944	708.4664	550.5580	372.4671	248.7667	260.5382	400.8933	598.1735	784.4653	940.1076	(97)
Space heating kWh	370.5292	285.5766	234.3214	123.7250	49.8935	0.0000	0.0000	0.0000	0.0000	128.7651	255.3617	378.2341	(98a)
Space heating requirement - total per year (kWh/year)												1826.4065	
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	370.5292	285.5766	234.3214	123.7250	49.8935	0.0000	0.0000	0.0000	0.0000	128.7651	255.3617	378.2341	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1826.4065	
Space heating per m2												36.3826	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)

0.0000 (201)

Fraction of space heat from main system(s)

1.0000 (202)

Efficiency of main space heating system 1 (in %)

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	370.5292	285.5766	234.3214	123.7250	49.8935	0.0000	0.0000	0.0000	0.0000	128.7651	255.3617	378.2341	(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)	401.4401	309.4004	253.8693	134.0466	54.0558	0.0000	0.0000	0.0000	0.0000	139.5071	276.6649	409.7878	(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	194.4347	172.1077	183.3702	162.6346	158.5756	143.9052	142.8268	147.9724	148.9994	164.9147	173.8223	192.5108 (64)
Fuel for water heating, kWh/month	85.4821	85.1872	84.6107	83.4545	81.7838	79.8000	79.8000	79.8000	79.8000	83.5111	84.9210	79.8000 (216)
Space cooling fuel requirement (221)m	227.4567	202.0347	216.7222	194.8782	193.8961	180.3324	178.9809	185.4291	186.7160	197.4765	204.6870	85.5457 (217)
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	225.0384 (219)
Lighting	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	0.0000 (221)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	15.4818	12.4201	11.1829	8.1931	6.3286	5.1705	5.7731	7.5041	9.7471	12.7888	14.4449	7.3041 (231)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	-17.2829	-25.2631	-37.6486	-43.9602	-48.8501	-46.1586	-45.6243	-42.3693	-36.8488	-29.6357	-19.3274	15.9121 (232)
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 (233a)
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 (234a)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	-7.2180	-15.4164	-31.0650	-47.2705	-63.0850	-63.5674	-62.7891	-52.8732	-38.3940	-22.2155	-9.6942	0.0000 (235a)
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 (235a)
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 (235c)
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 (235c)
Annual totals kWh/year												
Space heating fuel - main system 1												1978.7720 (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												2393.6482 (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)												124.9471 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-827.0869 (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												3756.2804 (238)

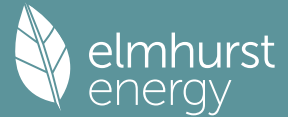
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1978.7720	0.2100	415.5421 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2393.6482	0.2100	502.6661 (264)
Space and water heating			918.2082 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	124.9471	0.1443	18.0337 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-407.8103	0.1338	-54.5662
PV Unit electricity exported	-419.2766	0.1255	-52.6305
Total			-107.1968 (269)
Total CO2, kg/year			840.9745 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.7500 (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	1978.7720	1.1300	2236.0123 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2393.6482	1.1300	2704.8225 (278)
Space and water heating			4940.8349 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	124.9471	1.5338	191.6480 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-407.8103	1.4945	-609.4598
PV Unit electricity exported	-419.2766	0.4608	-193.1834
Total			-802.6431 (283)
Total Primary energy kWh/year			4459.9406 (286)
Target Primary Energy Rate (TPER)			88.8400 (287)

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Property Reference	2B3P GF - Corner				Issued on Date	30/08/2024	
Assessment Reference	2B3P - GF - Corner			Prop Type Ref			
Property	Corner Pavillion, 2B3P GF, Edmansons Close, Tottenham, N17 6XD						
SAP Rating	80 C	DER	4.09	TER	14.53		
Environmental	97 A	% DER < TER				71.85	
CO ₂ Emissions (t/year)	0.21	DFEE	49.55	TFEE	45.26		
Compliance Check	See BREL	% DFEE < TFEE				-9.49	
% DPER < TPER	44.77	DPER	42.15	TPER	76.31		
Assessor Details	Miss Eleanor Ballinger				Assessor ID	M976-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	60.8500 (1b)	2.5000 (2b)	152.1250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.8500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	152.1250 (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)

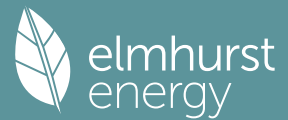
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275 (21)

	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) =												81.0000 (23c)
Effective ac	0.2576	0.2544	0.2512	0.2352	0.2321	0.2161	0.2161	0.2129	0.2225	0.2321	0.2384	0.2448 (25)

3. Heat losses and heat loss parameter

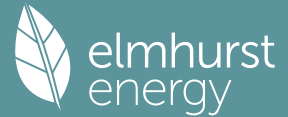
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door to corridor			1.2000	1.0000	1.2000		(26)
Window (Uw = 0.90)			19.5800	0.8687	17.0097		(27)
Ground Floor			60.8500	0.1300	7.9105	75.0000	4563.7500 (28a)
External Wall	69.7500	19.5800	50.1700	0.1800	9.0306	60.0000	3010.2000 (29a)
Corridor Wall	19.3800	1.2000	18.1800	0.1800	3.2724	60.0000	1090.7999 (29a)
Total net area of external elements Aum(A, m ²)			149.9800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	38.4232		(33)
Party Ceilings 1			60.8500			30.0000	1825.5000 (32b)
Internal Wall 1			100.0000			9.0000	900.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	11390.2499 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							187.1857 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				9.3600	0.1500	1.4040	

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E3 Sill						8.1600		0.0400		0.3264				
E4 Jamb						35.6000		0.0500		1.7800				
E5 Ground floor (normal)						27.9000		0.1600		4.4640				
E5 Ground floor (normal)						7.7500		0.3200		2.4800				
E7 Party floor between dwellings (in blocks of flats)						22.4000		0.1000		2.2400				
E7 Party floor between dwellings (in blocks of flats)						7.7500		0.1400		1.0850				
E23 Balcony within or between dwellings, balcony support penetrates wall insulation						11.0000		0.2500		2.7500				
E16 Corner (normal)						15.0000		0.0900		1.3500				
E17 Corner (inverted - internal area greater than external area)						2.5000		-0.0900		-0.2250				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)											17.6544	(36)		
Point Thermal bridges											0.0000			
Total fabric heat loss									(33) + (36) + (36a) =		56.0776	(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	12.9300	12.7699	12.6099	11.8098	11.6498	10.8497	10.8497	10.6897	11.1698	11.6498	11.9699	12.2899	(38)	
Average = Sum(39)m / 12 =	69.0075	68.8475	68.6875	67.8874	67.7274	66.9273	66.9273	66.7673	67.2473	67.7274	68.0474	68.3674	(39)	
												67.8474		
HLP (average)	1.1341	1.1314	1.1288	1.1157	1.1130	1.0999	1.0999	1.0972	1.1051	1.1130	1.1183	1.1235	(40)	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31		
4. Water heating energy requirements (kWh/year)														
Assumed occupancy												2.0056	(42)	
Hot water usage for mixer showers	65.0771	64.0991	62.6740	59.9473	57.9350	55.6910	54.4155	55.8298	57.3802	59.7896	62.5749	64.8277	(42a)	
Hot water usage for baths	24.9990	24.6277	24.1049	23.1409	22.4191	21.6187	21.1864	21.7055	22.2708	23.1273	24.1111	24.9145	(42b)	
Hot water usage for other uses	35.1690	33.8901	32.6112	31.3324	30.0535	28.7746	28.7746	30.0535	31.3324	32.6112	33.8901	35.1690	(42c)	
Average daily hot water use (litres/day)												115.1487	(43)	
Daily hot water use	125.2450	122.6169	119.3901	114.4205	110.4076	106.0843	104.3765	107.5888	110.9834	115.5281	120.5761	124.9112	(44)	
Energy conte	198.3575	174.6048	183.4981	156.6360	148.6299	130.4430	126.2343	133.2175	136.8536	156.7705	171.7827	195.5807	(45)	
Energy content (annual)										Total = Sum(45)m =		1912.6087		
Distribution loss (46)m = 0.15 x (45)m	29.7536	26.1907	27.5247	23.4954	22.2945	19.5665	18.9351	19.9826	20.5280	23.5156	25.7674	29.3371	(46)	
Water storage loss:														
Store volume												170.0000	(47)	
a) If manufacturer declared loss factor is known (kWh/day):												1.2000	(48)	
Temperature factor from Table 2b												0.5400	(49)	
Enter (49) or (54) in (55)												0.6480	(55)	
Total storage loss	20.0880	18.1440	20.0880	19.4400	20.0880	19.4400	20.0880	20.0880	19.4400	20.0880	19.4400	20.0880	(56)	
If cylinder contains dedicated solar storage	20.0880	18.1440	20.0880	19.4400	20.0880	19.4400	20.0880	20.0880	19.4400	20.0880	19.4400	20.0880	(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	241.7079	213.7600	226.8485	198.5880	191.9803	172.3950	169.5847	176.5679	178.8056	200.1209	213.7347	238.9311	(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	241.7079	213.7600	226.8485	198.5880	191.9803	172.3950	169.5847	176.5679	178.8056	200.1209	213.7347	238.9311	(64)	
									Total per year (kWh/year) = Sum(64)m =			2423.0247	(64)	
12Total per year (kWh/year)												2423	(64)	
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)	
												0.0000	(64a)	
Heat gains from water heating, kWh/month	100.6342	89.3803	95.6935	85.6431	84.0997	76.9339	76.6532	78.9751	79.0654	86.8065	90.6794	99.7109	(65)	
5. Internal gains (see Table 5 and 5a)														
Metabolic gains (Table 5), Watts														
(66)m	100.2781	100.2781	100.2781	100.2781	100.2781	100.2781	100.2781	100.2781	100.2781	100.2781	100.2781	100.2781	(66)	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	88.3105	97.7723	88.3105	91.2542	88.3105	91.2542	88.3105	88.3105	91.2542	88.3105	91.2542	88.3105	(67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	175.0855	176.9023	172.3239	162.5771	150.2735	138.7098	130.9846	129.1678	133.7461	143.4929	155.7966	167.3602	(68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.0278	33.0278	33.0278	33.0278	33.0278	33.0278	33.0278	33.0278	33.0278	33.0278	33.0278	33.0278	(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)	-80.2225	-80.2225	-80.2225	-80.2225	-80.2225	-80.2225	-80.2225	-80.2225	-80.2225	-80.2225	-80.2225	-80.2225	(71)	
Water heating gains (Table 5)	135.2610	133.0064	128.6202	118.9487	113.0373	106.8527	103.0285	106.1494	109.8131	116.6754	125.9435	134.0200	(72)	
Total internal gains	451.7404	460.7644	442.3381	425.8634	404.7047	389.9001	375.4071	376.7111	387.8968	401.5623	426.0777	442.7742	(73)	
6. Solar gains														
[Jan]			Area		Solar flux		g		FF		Access		Gains	
			m2		Table 6a		Specific data		Specific data		factor		W	
					W/m2		or Table 6b		or Table 6c		Table 6d			
Northeast			8.2800		11.2829		0.3500		0.8000		0.7700		18.1278	(75)
Southeast			1.2000		36.7938		0.3500		0.8000		0.7700		8.5674	(77)
Southwest			5.4000		36.7938		0.3500		0.8000		0.7700		38.5532	(79)
Northwest			4.7000		11.2829		0.3500		0.8000		0.7700		10.2899	(81)

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Solar gains	75.5382	138.1087	214.0385	307.2290	382.4804	396.5870	375.3306	316.6102	245.9037	159.3996	92.1963	63.5327 (83)
Total gains	527.2786	598.8731	656.3766	733.0924	787.1851	786.4871	750.7377	693.3212	633.8005	560.9619	518.2740	506.3069 (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	45.8495	45.9560	46.0631	46.6060	46.7161	47.2746	47.2746	47.3879	47.0496	46.7161	46.4964	46.2787
alpha	4.0566	4.0637	4.0709	4.1071	4.1144	4.1516	4.1516	4.1592	4.1366	4.1144	4.0998	4.0852
util living area	0.9768	0.9606	0.9290	0.8471	0.7062	0.5238	0.3873	0.4345	0.6645	0.8840	0.9598	0.9800 (86)
Living	19.5938	19.8230	20.1469	20.5559	20.8361	20.9636	20.9918	20.9869	20.9048	20.5378	20.0070	19.5572
Non living	18.3613	18.6497	19.0521	19.5460	19.8515	19.9784	19.9977	19.9976	19.9298	19.5397	18.8922	18.3211
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.2806	19.8230	20.1469	20.5559	20.8361	20.9636	20.9918	20.9869	20.9048	20.5378	20.0070	19.7590 (87)
Th 2	19.9731	19.9752	19.9774	19.9881	19.9902	20.0009	20.0009	20.0031	19.9966	19.9902	19.9859	19.9817 (88)
util rest of house	0.9715	0.9517	0.9130	0.8147	0.6513	0.4496	0.3017	0.3442	0.5887	0.8514	0.9492	0.9753 (89)
MIT 2	19.3305	18.6497	19.0521	19.5460	19.8515	19.9784	19.9977	19.9976	19.9298	19.5397	18.8922	18.6203 (90)
Living area fraction	19.7131	19.1221	19.4929	19.9526	20.2479	20.3751	20.3980	20.3959	FLA = Living area / (4) =	19.9416	19.3411	0.4026 (91)
MIT	19.7131	19.1221	19.4929	19.9526	20.2479	20.3751	20.3980	20.3959	20.3224	19.9416	19.3411	19.0788 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7131	19.1221	19.4929	19.9526	20.2479	20.3751	20.3980	20.3959	20.3224	19.9416	19.3411	19.0788 (93)

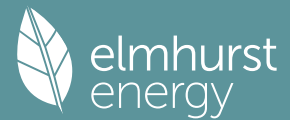
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9699	0.9426	0.9041	0.8134	0.6661	0.4780	0.3361	0.3803	0.6145	0.8496	0.9407	0.9701 (94)
Useful gains	511.3882	564.4763	593.4082	596.3153	524.3296	375.9447	252.3053	263.6824	389.4852	476.6134	487.5533	491.1647 (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	1063.6172	979.1565	892.4484	750.3310	578.9299	386.5110	254.1872	266.7963	418.4395	632.6814	832.9735	1017.2254 (97)
Space heating kWh	410.8583	278.6651	222.4859	110.8913	40.6226	0.0000	0.0000	0.0000	0.0000	116.1146	248.7025	391.3892 (98a)
Space heating requirement - total per year (kWh/year)												1819.7296
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	410.8583	278.6651	222.4859	110.8913	40.6226	0.0000	0.0000	0.0000	0.0000	116.1146	248.7025	391.3892 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1819.7296
Space heating per m2										(98c) / (4) =		29.9052 (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 %)												239.7071 (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	410.8583	278.6651	222.4859	110.8913	40.6226	0.0000	0.0000	0.0000	0.0000	116.1146	248.7025	391.3892 (98)
Space heating efficiency (main heating system 1)	239.7071	239.7071	239.7071	239.7071	239.7071	0.0000	0.0000	0.0000	0.0000	239.7071	239.7071	239.7071 (210)
Space heating fuel (main heating system)	171.4002	116.2523	92.8158	46.2612	16.9468	0.0000	0.0000	0.0000	0.0000	48.4402	103.7527	163.2781 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	241.7079	213.7600	226.8485	198.5880	191.9803	172.3950	169.5847	176.5679	178.8056	200.1209	213.7347	238.9311 (64)
Efficiency of water heater (217)m	191.0660	191.0660	191.0660	191.0660	191.0660	191.0660	191.0660	191.0660	191.0660	191.0660	191.0660	191.0660 (216)
Fuel for water heating, kWh/month	126.5049	111.8776	118.7278	103.9368	100.4785	90.2280	88.7571	92.4120	93.5831	104.7391	111.8643	125.0516 (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	10.0566	9.0834	10.0566	9.7322	10.0566	9.7322	10.0566	10.0566	9.7322	10.0566	9.7322	10.0566 (231)
Lighting	21.1974	17.0054	15.3115	11.2178	8.6650	7.0794	7.9045	10.2745	13.3456	17.5102	19.7777	21.7866 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-21.6778	-36.2224	-61.9289	-78.3297	-89.1010	-83.5105	-81.9594	-74.1418	-59.9765	-44.1454	-25.1842	-17.8557 (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												759.1472 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												191.0660
Water heating fuel used												1268.1609 (219)

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Space cooling fuel	0.0000 (221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.6380)	
mechanical ventilation fans (SFP = 0.6380)	118.4080 (230a)
Total electricity for the above, kWh/year	118.4080 (231)
Electricity for lighting (calculated in Appendix L)	171.0755 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-674.0333 (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	1642.7583 (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	759.1472	0.1560	118.4606 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1268.1609	0.1410	178.7783 (264)
Space and water heating			297.2389 (265)
Pumps, fans and electric keep-hot	118.4080	0.1387	16.4247 (267)
Energy for lighting	171.0755	0.1443	24.6915 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-674.0333	0.1324	-89.2235
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-89.2235 (269)
Total CO2, kg/year			249.1315 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.0900 (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	759.1472	1.5777	1197.6865 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1268.1609	1.5213	1929.2231 (278)
Space and water heating			3126.9096 (279)
Pumps, fans and electric keep-hot	118.4080	1.5128	179.1276 (281)
Energy for lighting	171.0755	1.5338	262.4013 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-674.0333	1.4891	-1003.7142
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-1003.7142 (283)
Total Primary energy kWh/year			2564.7243 (286)
Dwelling Primary energy Rate (DPER)			42.1500 (287)

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

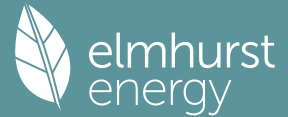
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	60.8500 (1b)	2.5000 (2b)	152.1250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.8500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	152.1250 (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) = 0.1315 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3815 (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) = 0.3243 (21)

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Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Effective ac	0.4134	0.4053	0.3972	0.3567	0.3486	0.3080	0.3080	0.2999	0.3243	0.3486	0.3648	0.3810	(22b)
	0.5855	0.5821	0.5789	0.5636	0.5608	0.5474	0.5474	0.5450	0.5526	0.5608	0.5665	0.5726	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.2000	1.0000	1.2000			(26)
TER Opening Type (Uw = 1.20)			14.0300	1.1450	16.0649			(27)
Ground Floor			60.8500	0.1300	7.9105			(28a)
External Wall	69.7500	14.0300	55.7200	0.1800	10.0296			(29a)
Corridor Wall	19.3800	1.2000	18.1800	0.1800	3.2724			(29a)
Total net area of external elements Aum(A, m2)			149.9800					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 38.4774			(33)

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

197.1857 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	9.3600	0.0500	0.4680	
E3 Sill	8.1600	0.0500	0.4080	
E4 Jamb	35.6000	0.0500	1.7800	
E5 Ground floor (normal)	27.9000	0.1600	4.4640	
E5 Ground floor (normal)	7.7500	0.1600	1.2400	
E7 Party floor between dwellings (in blocks of flats)	22.4000	0.0700	1.5680	
E7 Party floor between dwellings (in blocks of flats)	7.7500	0.0700	0.5425	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	11.0000	0.0200	0.2200	
E16 Corner (normal)	15.0000	0.0900	1.3500	
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250	

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

11.8155 (36)

Point Thermal bridges

(33a) = 0.0000
(33) + (36) + (36a) = 50.2929 (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	29.3907	29.2241	29.0608	28.2939	28.1504	27.4824	27.4824	27.3586	27.7397	28.1504	28.4407	28.7441	(38)
Average = Sum(39)m / 12 =	79.6836	79.5170	79.3537	78.5867	78.4432	77.7752	77.7752	77.6515	78.0325	78.4432	78.7335	79.0370	(39)
												78.5861	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.3095	1.3068	1.3041	1.2915	1.2891	1.2781	1.2781	1.2761	1.2824	1.2891	1.2939	1.2989	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.0056 (42)
Hot water usage for mixer showers													
Hot water usage for baths	57.8463	56.9770	55.7102	53.2865	51.4978	49.5031	48.3693	49.6265	51.0046	53.1463	55.6221	57.6246	(42a)
Hot water usage for other uses	24.9990	24.6277	24.1049	23.1409	22.4191	21.6187	21.1864	21.7055	22.2708	23.1273	24.1111	24.9145	(42b)
Average daily hot water use (litres/day)	35.1690	33.8901	32.6112	31.3324	30.0535	28.7746	28.7746	30.0535	31.3324	32.6112	33.8901	35.1690	(42c)
												108.4821	(43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	118.0143	115.4948	112.4263	107.7597	103.9704	99.8964	98.3303	101.3855	104.6078	108.8848	113.6233	117.7081	(44)
Energy content (annual)	186.9057	164.4630	172.7951	147.5177	139.9641	122.8343	118.9220	125.5365	128.9919	147.7556	161.8772	184.3024	(45)
Distribution loss (46)m = 0.15 x (45)m													
Water storage loss:	28.0359	24.6695	25.9193	22.1277	20.9946	18.4251	17.8383	18.8305	19.3488	22.1633	24.2816	27.6454	(46)

Store volume 170.0000 (47)

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

Temperature factor from Table 2b 1.5003 (48)

Enter (49) or (54) in (55) 0.5400 (49)

Total storage loss 0.8102 (55)

If cylinder contains dedicated solar storage 25.1153 (56)

Primary loss 25.1153 (57)

Combi loss 23.2624 (59)

Total heat required for water heating calculated for each month 0.0000 (61)

WWHRS 235.2834 (62)

PV diverter -26.4449 (63a)

Solar input -0.0000 (63b)

FGHRS 0.0000 (63c)

Output from w/h 0.0000 (63d)

208.8385 184.7709 196.6821 174.0556 169.4423 153.4790 152.1406 157.7940 159.0764 176.4074 186.3473 206.7250 (64)

12Total per year (kWh/year) Total per year (kWh/year) = Sum(64)m = 2125.7591 (64)

Electric shower(s) 0.0000 (64a)

Heat gains from water heating, kWh/month 100.8483 89.6408 96.1565 86.5033 85.2402 78.2961 78.2437 80.4430 80.3435 87.8309 91.2779 99.9827 (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	100.2781	100.2781	100.2781	100.2781	100.2781	100.2781	100.2781	100.2781	100.2781	100.2781	100.2781	100.2781	(66)
	88.3105	97.7723	88.3105	91.2542	88.3105	91.2542	88.3105	88.3105	91.2542	88.3105	91.2542	88.3105	(67)

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Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	175.0855	176.9023	172.3239	162.5771	150.2735	138.7098	130.9846	129.1678	133.7461	143.4929	155.7966	167.3602 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.0278	33.0278	33.0278	33.0278	33.0278	33.0278	33.0278	33.0278	33.0278	33.0278	33.0278	33.0278 (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)	-80.2225	-80.2225	-80.2225	-80.2225	-80.2225	-80.2225	-80.2225	-80.2225	-80.2225	-80.2225	-80.2225	-80.2225 (71)
Water heating gains (Table 5)	135.5488	133.3940	129.2426	120.1435	114.5702	108.7446	105.1663	108.1224	111.5882	118.0523	126.7748	134.3854 (72)
Total internal gains	455.0282	464.1521	445.9605	430.0582	409.2376	391.7921	377.5448	378.6841	389.6719	405.9392	429.9090	446.1395 (73)

6. Solar gains

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

Northeast					5.9400	11.2829	0.6300	0.7000				0.7700	20.4824 (75)			
Southeast					0.8600	36.7938	0.6300	0.7000				0.7700	9.6704 (77)			
Southwest					3.8600	36.7938	0.6300	0.7000				0.7700	43.4044 (79)			
Northwest					3.3700	11.2829	0.6300	0.7000				0.7700	11.6205 (81)			

Solar gains					85.1777	155.7524	241.4309	346.6192	431.5750	447.5147	423.5198	357.2249	277.3982	179.7764	103.9652	71.6378 (83)
Total gains					540.2059	619.9045	687.3914	776.6774	840.8126	839.3067	801.0646	735.9089	667.0701	585.7156	533.8742	517.7774 (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	41.8278	41.9154	42.0016	42.4116	42.4891	42.8541	42.8541	42.9223	42.7128	42.4891	42.3325	42.1699
alpha	3.7885	3.7944	3.8001	3.8274	3.8326	3.8569	3.8569	3.8615	3.8475	3.8326	3.8222	3.8113
util living area	0.9802	0.9660	0.9379	0.8646	0.7334	0.5581	0.4178	0.4696	0.7015	0.9008	0.9660	0.9830 (86)
MIT	19.3627	19.6068	19.9649	20.4268	20.7683	20.9397	20.9846	20.9761	20.8551	20.4085	19.8135	19.3228 (87)
Th 2	19.8334	19.8355	19.8376	19.8475	19.8494	19.8580	19.8580	19.8596	19.8547	19.8494	19.8456	19.8417 (88)
util rest of house	0.9752	0.9576	0.9222	0.8313	0.6734	0.4711	0.3138	0.3603	0.6169	0.8684	0.9560	0.9786 (89)
MIT 2	17.9690	18.2769	18.7233	19.2825	19.6570	19.8223	19.8526	19.8503	19.7557	19.2781	18.5482	17.9242 (90)
Living area fraction	18.5302	18.8123	19.2232	19.7432	20.1045	20.2722	20.3084	20.3036	20.1984	19.7332	19.0576	18.4873 (93)
MIT	18.5302	18.8123	19.2232	19.7432	20.1045	20.2722	20.3084	20.3036	20.1984	19.7332	19.0576	18.4873 (93)
Temperature adjustment	18.5302	18.8123	19.2232	19.7432	20.1045	20.2722	20.3084	20.3036	20.1984	19.7332	19.0576	18.4873 (93)
adjusted MIT	18.5302	18.8123	19.2232	19.7432	20.1045	20.2722	20.3084	20.3036	20.1984	19.7332	19.0576	18.4873 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	522.6580	587.6258	626.9367	643.0176	578.2140	422.8381	284.8031	297.2385	429.6984	506.3634	505.6037	503.0754 (94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1133.9099	1106.2675	1009.6339	852.1334	659.2747	441.1573	288.4181	303.1194	475.8709	716.4387	941.4659	1129.2296 (97)
Space heating kWh	454.7714	348.5272	284.7267	150.5634	60.3091	0.0000	0.0000	0.0000	0.0000	156.2961	313.8208	465.8588 (98a)
Space heating requirement - total per year (kWh/year)	2234.8736											
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	454.7714	348.5272	284.7267	150.5634	60.3091	0.0000	0.0000	0.0000	0.0000	156.2961	313.8208	465.8588 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2234.8736											
Space heating per m2	(98c) / (4) = 36.7276 (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	454.7714	348.5272	284.7267	150.5634	60.3091	0.0000	0.0000	0.0000	0.0000	156.2961	313.8208	465.8588 (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)	492.7101	377.6026	308.4796	163.1239	65.3404	0.0000	0.0000	0.0000	0.0000	169.3349	340.0009	504.7224 (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	208.8385	184.7709	196.6821	174.0556	169.4423	153.4790	152.1406	157.7940	159.0764	176.4074	186.3473	206.7250 (64)
Water heating requirement	85.7563	85.4606	84.8885	83.7363	81.9811	79.8000	79.8000	79.8000	79.8000	83.7894	85.2192	79.8000 (216)
Efficiency of water heater (217)m	243.5256	216.2060	231.6946	207.8616	206.6847	192.3296	190.6524	197.7368	199.3438	210.5366	218.6683	240.8683 (219)
Fuel for water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Space cooling fuel requirement (221)m	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)
Pumps and Fa												

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Lighting	18.3492	14.7204	13.2541	9.7105	7.5007	6.1281	6.8424	8.8940	11.5524	15.1574	17.1202	18.8592	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-28.7586	-40.6992	-58.7409	-66.3529	-71.8440	-67.2009	-66.3979	-62.5478	-55.7820	-46.6998	-31.6817	-24.8477	(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	-15.7896	-33.2654	-66.1961	-99.5251	-131.6793	-132.3059	-130.7223	-110.6247	-81.0266	-47.5774	-21.0861	-12.4802	(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												2421.3148	(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												2556.1082	(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)												148.0884	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1503.8318	(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												3707.6795	(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	2421.3148	0.2100	508.4761 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2556.1082	0.2100	536.7827 (264)
Space and water heating			1045.2588 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	148.0884	0.1443	21.3737 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-621.5532	0.1345	-83.5890
PV Unit electricity exported	-882.2786	0.1259	-111.0532
Total			-194.6422 (269)
Total CO2, kg/year			883.9196 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.5300 (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	2421.3148	1.1300	2736.0857 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2556.1082	1.1300	2888.4022 (278)
Space and water heating			5624.4879 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	148.0884	1.5338	227.1429 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-621.5532	1.4970	-930.4805
PV Unit electricity exported	-882.2786	0.4620	-407.6411
Total			-1338.1216 (283)
Total Primary energy kWh/year			4643.6101 (286)
Target Primary Energy Rate (TPER)			76.3100 (287)

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Property Reference	2B3P TF - Corner			Issued on Date	30/08/2024	
Assessment Reference	2B3P - TF - Corner		Prop Type Ref			
Property	Corner Pavillion, 2B3P TF, Edmansons Close, Tottenham, N17 6XD					
SAP Rating	86 B	DER	3.91	TER	15.75	
Environmental	97 A	% DER < TER				75.17
CO ₂ Emissions (t/year)	0.2	DFEE	46.64	TFEE	50.83	
Compliance Check	See BREL	% DFEE < TFEE				8.26
% DPER < TPER	51.39	DPER	40.29	TPER	82.88	
Assessor Details	Miss Eleanor Ballinger			Assessor ID	M976-0001	
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	60.8500 (1b)	2.5000 (2b)	152.1250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.8500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	152.1250 (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) =												81.0000 (23c)
Effective ac	0.2576	0.2544	0.2512	0.2352	0.2321	0.2161	0.2161	0.2129	0.2225	0.2321	0.2384	0.2448 (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
Door to corridor			1.2000	1.0000	1.2000		(26)
Window (Uw = 0.90)			19.5800	0.8687	17.0097		(27)
External Wall	69.7500	19.5800	50.1700	0.1800	9.0306	60.0000	3010.2000 (29a)
Corridor Wall		1.2000	18.1800	0.1800	3.2724	60.0000	1090.7999 (29a)
Main Roof	60.8500		60.8500	0.1000	6.0850	80.0000	4868.0000 (30)
Total net area of external elements Aum(A, m ²)			149.9800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.5977		(33)
Party Floor 1			60.8500			40.0000	2434.0000 (32d)
Internal Wall 1			100.0000			900.0000	(32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	12302.9999 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							202.1857 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				9.3600	0.1500	1.4040	

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E3 Sill	8.1600	0.0400	0.3264
E4 Jamb	35.6000	0.0500	1.7800
E7 Party floor between dwellings (in blocks of flats)	22.4000	0.1000	2.2400
E7 Party floor between dwellings (in blocks of flats)	7.7500	0.1400	1.0850
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.5000	0.2500	1.3750
E14 Flat roof	7.7500	0.0800	0.6200
E15 Flat roof with parapet	27.9000	0.3000	8.3700
E16 Corner (normal)	15.0000	0.0900	1.3500
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250

Thermal bridges (Sum(L x Psi) calculated using Appendix K)
 Point Thermal Bridges (36a) = 18.3254 (36)
 Total fabric heat loss (33) + (36) + (36a) = 54.9231 (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	12.9300	12.7699	12.6099	11.8098	11.6498	10.8497	10.8497	10.6897	11.1698	11.6498	11.9699	12.2899
Average = Sum(39)m / 12 =	67.8530	67.6930	67.5330	66.7329	66.5729	65.7728	65.7728	65.6128	66.0928	66.5729	66.8929	67.2129

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1151	1.1125	1.1098	1.0967	1.0940	1.0809	1.0809	1.0783	1.0862	1.0940	1.0993	1.1046
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.0056 (42)											
Hot water usage for mixer showers	65.0771	64.0991	62.6740	59.9473	57.9350	55.6910	54.4155	55.8298	57.3802	59.7896	62.5749	64.8277
Hot water usage for baths	24.9990	24.6277	24.1049	23.1409	22.4191	21.6187	21.1864	21.7055	22.2708	23.1273	24.1111	24.9145
Hot water usage for other uses	35.1690	33.8901	32.6112	31.3324	30.0535	28.7746	28.7746	30.0535	31.3324	32.6112	33.8901	35.1690
Average daily hot water use (litres/day)												115.1487
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	125.2450	122.6169	119.3901	114.4205	110.4076	106.0843	104.3765	107.5888	110.9834	115.5281	120.5761	124.9112
Energy content (annual)	198.3575	174.6048	183.4981	156.6360	148.6299	130.4430	126.2343	133.2175	136.8536	156.7705	171.7827	195.5807
Distribution loss (46)m = 0.15 x (45)m												1912.6087
Water storage loss:	29.7536	26.1907	27.5247	23.4954	22.2945	19.5665	18.9351	19.9826	20.5280	23.5156	25.7674	29.3371
Store volume												170.0000
a) If manufacturer declared loss factor is known (kWh/day):												1.2000
Temperature factor from Table 2b												0.5400
Enter (49) or (54) in (55)												0.6480
Total storage loss	20.0880	18.1440	20.0880	19.4400	20.0880	19.4400	20.0880	20.0880	19.4400	20.0880	19.4400	20.0880
If cylinder contains dedicated solar storage	20.0880	18.1440	20.0880	19.4400	20.0880	19.4400	20.0880	20.0880	19.4400	20.0880	19.4400	20.0880
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total heat required for water heating calculated for each month	241.7079	213.7600	226.8485	198.5880	191.9803	172.3950	169.5847	176.5679	178.8056	200.1209	213.7347	238.9311
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
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Output from w/h	241.7079	213.7600	226.8485	198.5880	191.9803	172.3950	169.5847	176.5679	178.8056	200.1209	213.7347	238.9311
12Total per year (kWh/year)												2423.0247
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
Heat gains from water heating, kWh/month	100.6342	89.3803	95.6935	85.6431	84.0997	76.9339	76.6532	78.9751	79.0654	86.8065	90.6794	99.7109

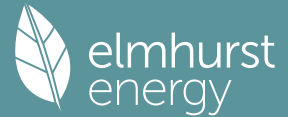
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	100.2781	100.2781	100.2781	100.2781	100.2781	100.2781	100.2781	100.2781	100.2781	100.2781	100.2781	100.2781
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	88.3105	97.7723	88.3105	91.2542	88.3105	91.2542	88.3105	88.3105	91.2542	88.3105	91.2542	88.3105
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	175.0855	176.9023	172.3239	162.5771	150.2735	138.7098	130.9846	129.1678	133.7461	143.4929	155.7966	167.3602
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.0278	33.0278	33.0278	33.0278	33.0278	33.0278	33.0278	33.0278	33.0278	33.0278	33.0278	33.0278
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
Losses e.g. evaporation (negative values) (Table 5)	-80.2225	-80.2225	-80.2225	-80.2225	-80.2225	-80.2225	-80.2225	-80.2225	-80.2225	-80.2225	-80.2225	-80.2225
Water heating gains (Table 5)	135.2610	133.0064	128.6202	118.9487	113.0373	106.8527	103.0285	106.1494	109.8131	116.6754	125.9435	134.0200
Total internal gains	451.7404	460.7644	442.3381	425.8634	404.7047	389.9001	375.4071	376.7111	387.8968	401.5623	426.0777	442.7742

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	2.7600	11.2829	0.3500	0.8000	0.7700	6.0426 (75)
Southeast	1.2000	36.7938	0.3500	0.8000	0.7700	8.5674 (77)
Southwest	10.9200	36.7938	0.3500	0.8000	0.7700	77.9631 (79)
Northwest	4.7000	11.2829	0.3500	0.8000	0.7700	10.2899 (81)

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Solar gains	102.8629	180.6386	261.5674	348.2476	412.1121	418.8290	399.7604	350.6321	291.3519	203.5294	124.1940	87.3900 (83)
Total gains	554.6033	641.4030	703.9055	774.1111	816.8168	808.7292	775.1674	727.3432	679.2487	605.0917	550.2718	530.1642 (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	50.3662	50.4853	50.6049	51.2116	51.3347	51.9592	51.9592	52.0859	51.7076	51.3347	51.0891	50.8459	
alpha	4.3577	4.3657	4.3737	4.4141	4.4223	4.4639	4.4639	4.4724	4.4472	4.4223	4.4059	4.3897	
util living area	0.9768	0.9568	0.9201	0.8321	0.6887	0.5066	0.3704	0.4102	0.6290	0.8660	0.9570	0.9805 (86)	
Living	19.7633	20.0038	20.3058	20.6570	20.8811	20.9763	20.9953	20.9927	20.9395	20.6463	20.1540	19.7228	
Non living	18.5774	18.8785	19.2505	19.6695	19.9082	20.0024	20.0147	20.0157	19.9718	19.6704	19.0783	18.5327	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.3673	20.0038	20.3058	20.6570	20.8811	20.9763	20.9953	20.9927	20.9395	20.6463	20.1540	19.9015 (87)	
Th 2	19.9885	19.9907	19.9928	20.0035	20.0057	20.0165	20.0165	20.0186	20.0122	20.0057	20.0014	19.9971 (88)	
util rest of house	0.9712	0.9468	0.9019	0.7970	0.6327	0.4341	0.2891	0.3250	0.5533	0.8293	0.9453	0.9757 (89)	
MIT 2	19.4260	18.8785	19.2505	19.6695	19.9082	20.0024	20.0147	20.0157	19.9718	19.6704	19.0783	18.7966 (90)	
Living area fraction									fLA = Living area / (4) =				0.4026 (91)
MIT	19.8050	19.3316	19.6754	20.0671	20.2999	20.3945	20.4095	20.4091	20.3614	20.0633	19.5114	19.2415 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.8050	19.3316	19.6754	20.0671	20.2999	20.3945	20.4095	20.4091	20.3614	20.0633	19.5114	19.2415 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9700	0.9389	0.8953	0.7995	0.6500	0.4624	0.3218	0.3592	0.5811	0.8316	0.9382	0.9711 (94)
Useful gains	537.9583	602.2071	630.2216	618.8727	530.8908	373.9949	249.4654	261.2623	394.6967	503.2186	516.2919	514.8650 (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	1052.0602	976.9172	889.7742	745.2154	572.5213	381.1225	250.5639	263.0457	413.8361	630.0019	830.2349	1010.9806 (97)
Space heating kWh	382.4918	251.8052	193.1071	90.9667	30.9731	0.0000	0.0000	0.0000	0.0000	94.3267	226.0389	369.1100 (98a)
Space heating requirement - total per year (kWh/year)												1638.8195
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	382.4918	251.8052	193.1071	90.9667	30.9731	0.0000	0.0000	0.0000	0.0000	94.3267	226.0389	369.1100 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1638.8195
Space heating per m2										(98c) / (4) =		26.9321 (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 %)												239.2162 (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	382.4918	251.8052	193.1071	90.9667	30.9731	0.0000	0.0000	0.0000	0.0000	94.3267	226.0389	369.1100 (98)
Space heating efficiency (main heating system 1)	239.2162	239.2162	239.2162	239.2162	239.2162	0.0000	0.0000	0.0000	0.0000	239.2162	239.2162	239.2162 (210)
Space heating fuel (main heating system)	159.8938	105.2626	80.7249	38.0270	12.9477	0.0000	0.0000	0.0000	0.0000	39.4316	94.4915	154.2998 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	241.7079	213.7600	226.8485	198.5880	191.9803	172.3950	169.5847	176.5679	178.8056	200.1209	213.7347	238.9311 (64)
Efficiency of water heater (217)m	191.1028	191.1028	191.1028	191.1028	191.1028	191.1028	191.1028	191.1028	191.1028	191.1028	191.1028	191.1028 (216)
Fuel for water heating, kWh/month	126.4806	111.8561	118.7050	103.9169	100.4592	90.2106	88.7401	92.3942	93.5651	104.7190	111.8428	125.0275 (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	10.0566	9.0834	10.0566	9.7322	10.0566	9.7322	10.0566	10.0566	9.7322	10.0566	9.7322	10.0566 (231)
Lighting	21.1974	17.0054	15.3115	11.2178	8.6650	7.0794	7.9045	10.2745	13.3456	17.5102	19.7777	21.7866 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-21.6243	-36.0654	-61.5087	-77.7210	-88.6348	-83.5081	-81.9571	-74.1398	-59.9752	-43.8882	-25.1055	-17.8234 (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												685.0789 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												191.1028
Water heating fuel used												1267.9170 (219)

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Space cooling fuel	0.0000 (221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.6380)	
mechanical ventilation fans (SFP = 0.6380)	118.4080 (230a)
Total electricity for the above, kWh/year	118.4080 (231)
Electricity for lighting (calculated in Appendix L)	171.0755 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-671.9516 (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	1570.5279 (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	685.0789	0.1565	107.1844 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1267.9170	0.1410	178.7439 (264)
Space and water heating			285.9283 (265)
Pumps, fans and electric keep-hot	118.4080	0.1387	16.4247 (267)
Energy for lighting	171.0755	0.1443	24.6915 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-671.9516	0.1323	-88.9237
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-88.9237 (269)
Total CO2, kg/year			238.1207 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.9100 (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	685.0789	1.5792	1081.8641 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1267.9170	1.5213	1928.8521 (278)
Space and water heating			3010.7163 (279)
Pumps, fans and electric keep-hot	118.4080	1.5128	179.1276 (281)
Energy for lighting	171.0755	1.5338	262.4013 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-671.9516	1.4890	-1000.5224
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-1000.5224 (283)
Total Primary energy kWh/year			2451.7229 (286)
Dwelling Primary energy Rate (DPER)			40.2900 (287)

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

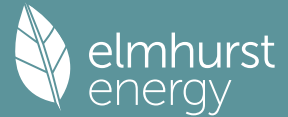
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	60.8500 (1b)	2.5000 (2b)	152.1250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.8500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	152.1250 (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) = 0.1315 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3815 (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) = 0.3243 (21)

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Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Effective ac	0.4134	0.4053	0.3972	0.3567	0.3486	0.3080	0.3080	0.2999	0.3243	0.3486	0.3648	0.3810	(22b)
	0.5855	0.5821	0.5789	0.5636	0.5608	0.5474	0.5474	0.5450	0.5526	0.5608	0.5665	0.5726	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.2000	1.0000	1.2000			(26)
TER Opening Type (Uw = 1.20)			14.0300	1.1450	16.0649			(27)
External Wall	69.7500	14.0300	55.7200	0.1800	10.0296			(29a)
Corridor Wall	19.3800	1.2000	18.1800	0.1800	3.2724			(29a)
Main Roof	60.8500		60.8500	0.1100	6.6935			(30)
Total net area of external elements Aum (A, m2)			149.9800					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	37.2604		(33)

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

202.1857 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	9.3600	0.0500	0.4680	
E3 Sill	8.1600	0.0500	0.4080	
E4 Jamb	35.6000	0.0500	1.7800	
E7 Party floor between dwellings (in blocks of flats)	22.4000	0.0700	1.5680	
E7 Party floor between dwellings (in blocks of flats)	7.7500	0.0700	0.5425	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.5000	0.0200	0.1100	
E14 Flat roof	7.7500	0.0800	0.6200	
E15 Flat roof with parapet	27.9000	0.5600	15.6240	
E16 Corner (normal)	15.0000	0.0900	1.3500	
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			22.2455	(36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	59.5059 (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	29.3907	29.2241	29.0608	28.2939	28.1504	27.4824	27.4824	27.3586	27.7397	28.1504	28.4407	28.7441	(38)
Average = Sum(39)m / 12 =	88.9966	88.7300	88.5667	87.7997	87.6562	86.9882	86.9882	86.8645	87.2455	87.6562	87.9465	88.2500	(39)
												87.7991	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.4609	1.4582	1.4555	1.4429	1.4405	1.4296	1.4296	1.4275	1.4338	1.4405	1.4453	1.4503	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

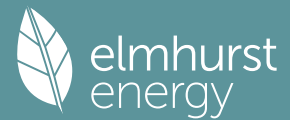
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.0056 (42)
Hot water usage for mixer showers													
Hot water usage for baths	57.8463	56.9770	55.7102	53.2865	51.4978	49.5031	48.3693	49.6265	51.0046	53.1463	55.6221	57.6246	(42a)
Hot water usage for other uses	24.9990	24.6277	24.1049	23.1409	22.4191	21.6187	21.1864	21.7055	22.2708	23.1273	24.1111	24.9145	(42b)
Average daily hot water use (litres/day)	35.1690	33.8901	32.6112	31.3324	30.0535	28.7746	28.7746	30.0535	31.3324	32.6112	33.8901	35.1690	(42c)
												108.4821	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	118.0143	115.4948	112.4263	107.7597	103.9704	99.8964	98.3303	101.3855	104.6078	108.8848	113.6233	117.7081	(44)
Energy content (annual)	186.9057	164.4630	172.7951	147.5177	139.9641	122.8343	118.9220	125.5365	128.9919	147.7556	161.8772	184.3024	(45)
Distribution loss (46)m = 0.15 x (45)m													
Water storage loss:	28.0359	24.6695	25.9193	22.1277	20.9946	18.4251	17.8383	18.8305	19.3488	22.1633	24.2816	27.6454	(46)
Store volume												170.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5003	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8102	(55)
Total storage loss	25.1153	22.6848	25.1153	24.3051	25.1153	24.3051	25.1153	25.1153	24.3051	25.1153	24.3051	25.1153	(56)
If cylinder contains dedicated solar storage	25.1153	22.6848	25.1153	24.3051	25.1153	24.3051	25.1153	25.1153	24.3051	25.1153	24.3051	25.1153	(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	22.5120	(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	235.2834	208.1590	221.1728	194.3348	188.3418	169.6514	167.2997	173.9142	175.8090	196.1333	208.6944	232.6801	(62)
WWHRS	-26.4449	-23.3881	-24.4907	-20.2792	-18.8995	-16.1724	-15.1591	-16.1202	-16.7326	-19.7259	-22.3471	-25.9552	(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	208.8385	184.7709	196.6821	174.0556	169.4423	153.4790	152.1406	157.7940	159.0764	176.4074	186.3473	206.7250	(64)
12Total per year (kWh/year)												2125.7591	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Heat gains from water heating, kWh/month	100.8483	89.6408	96.1565	86.5033	85.2402	78.2961	78.2437	80.4430	80.3435	87.8309	91.2779	99.9827	(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	100.2781	100.2781	100.2781	100.2781	100.2781	100.2781	100.2781	100.2781	100.2781	100.2781	100.2781	100.2781	(66)
	88.3105	97.7723	88.3105	91.2542	88.3105	91.2542	88.3105	88.3105	91.2542	88.3105	91.2542	88.3105	(67)

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Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	175.0855	176.9023	172.3239	162.5771	150.2735	138.7098	130.9846	129.1678	133.7461	143.4929	155.7966	167.3602 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.0278	33.0278	33.0278	33.0278	33.0278	33.0278	33.0278	33.0278	33.0278	33.0278	33.0278	33.0278 (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)	-80.2225	-80.2225	-80.2225	-80.2225	-80.2225	-80.2225	-80.2225	-80.2225	-80.2225	-80.2225	-80.2225	-80.2225 (71)
Water heating gains (Table 5)	135.5488	133.3940	129.2426	120.1435	114.5702	108.7446	105.1663	108.1224	111.5882	118.0523	126.7748	134.3854 (72)
Total internal gains	455.0282	464.1521	445.9605	430.0582	409.2376	391.7921	377.5448	378.6841	389.6719	405.9392	429.9090	446.1395 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d		Gains W	
Northeast				1.9800	11.2829	0.6300	0.7000		0.7700		6.8275 (75)	
Southeast				0.8600	36.7938	0.6300	0.7000		0.7700		9.6704 (77)	
Southwest				7.8200	36.7938	0.6300	0.7000		0.7700		87.9333 (79)	
Northwest				3.3700	11.2829	0.6300	0.7000		0.7700		11.6205 (81)	
Solar gains	116.0517	203.8066	295.1333	392.9658	465.0556	472.6458	451.1227	395.6660	328.7497	229.6382	140.1191	98.5940 (83)
Total gains	571.0799	667.9587	741.0938	823.0241	874.2932	864.4378	828.6676	774.3500	718.4216	635.5774	570.0281	544.7335 (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	38.4435	38.5157	38.5867	38.9238	38.9875	39.2869	39.2869	39.3429	39.1711	38.9875	38.8588	38.7252
alpha	3.5629	3.5677	3.5724	3.5949	3.5992	3.6191	3.6191	3.6229	3.6114	3.5992	3.5906	3.5817
util living area	0.9793	0.9635	0.9354	0.8697	0.7544	0.5904	0.4463	0.4922	0.7093	0.8979	0.9644	0.9823 (86)
MIT	19.1996	19.4719	19.8489	20.3232	20.6959	20.9092	20.9747	20.9638	20.8192	20.3339	19.6870	19.1525 (87)
Th 2	19.7169	19.7190	19.7210	19.7306	19.7324	19.7407	19.7407	19.7423	19.7375	19.7324	19.7288	19.7250 (88)
util rest of house	0.9737	0.9540	0.9183	0.8350	0.6913	0.4932	0.3257	0.3682	0.6181	0.8627	0.9534	0.9775 (89)
MIT 2	17.6836	18.0262	18.4953	19.0699	19.4824	19.6883	19.7324	19.7291	19.6175	19.1001	18.3083	17.6294 (90)
Living area fraction	18.2940	18.6083	19.0403	19.5745	19.9710	20.1799	20.2326	20.2262	20.1013	19.5969	18.8634	18.2426 (92)
MIT	18.2940	18.6083	19.0403	19.5745	19.9710	20.1799	20.2326	20.2262	20.1013	19.5969	18.8634	18.2426 (93)
Temperature adjustment												0.0000
adjusted MIT	18.2940	18.6083	19.0403	19.5745	19.9710	20.1799	20.2326	20.2262	20.1013	19.5969	18.8634	18.2426 (93)

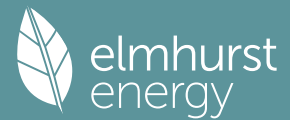
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	551.2306	630.0149	672.1364	683.2004	615.7044	457.0549	309.9531	323.3259	464.5653	545.4152	537.8315	528.2786 (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	1244.0187	1216.3367	1110.6558	937.2194	725.0056	485.3834	315.9909	332.3649	523.5907	788.6315	1034.5523	1239.2624 (97)
Space heating kWh	515.4343	394.0083	326.2584	182.8937	81.3201	0.0000	0.0000	0.0000	0.0000	180.9529	357.6389	528.9719 (98a)
Space heating requirement - total per year (kWh/year)												2567.4786
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	515.4343	394.0083	326.2584	182.8937	81.3201	0.0000	0.0000	0.0000	0.0000	180.9529	357.6389	528.9719 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2567.4786
Space heating per m2										(98c) / (4) =		42.1936 (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
515.4343	394.0083	326.2584	182.8937	81.3201	0.0000	0.0000	0.0000	0.0000	0.0000	180.9529	357.6389	528.9719 (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)	558.4337	426.8779	353.4760	198.1513	88.1041	0.0000	0.0000	0.0000	0.0000	196.0487	387.4745	573.1007 (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	208.8385	184.7709	196.6821	174.0556	169.4423	153.4790	152.1406	157.7940	159.0764	176.4074	186.3473	206.7250 (64)
Water heating requirement	86.0032	85.7139	85.1865	84.1710	82.5120	79.8000	79.8000	79.8000	79.8000	84.1169	85.4969	79.8000 (216)
Efficiency of water heater (217)m	242.8265	215.5671	230.8840	206.7880	205.3549	192.3296	190.6524	197.7368	199.3438	209.7170	217.9580	240.1760 (219)
Fuel for water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Space cooling fuel requirement (221)m	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)
Pumps and Fa												

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Lighting	18.3492	14.7204	13.2541	9.7105	7.5007	6.1281	6.8424	8.8940	11.5524	15.1574	17.1202	18.8592 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-28.7586	-40.6992	-58.7409	-66.3529	-71.8440	-67.2009	-66.3979	-62.5478	-55.7820	-46.6998	-31.6817	-24.8477 (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	(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	(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	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-15.7896	-33.2654	-66.1961	-99.5251	-131.6793	-132.3059	-130.7223	-110.6247	-81.0266	-47.5774	-21.0861	-12.4802 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year												
Space heating fuel - main system 1												2781.6669 (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												2549.3340 (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)												148.0884 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-1503.8318 (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												4061.2575 (238)

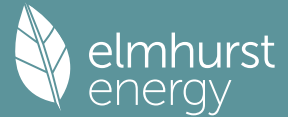
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2781.6669	0.2100	584.1501 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2549.3340	0.2100	535.3601 (264)
Space and water heating			1119.5102 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	148.0884	0.1443	21.3737 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-621.5532	0.1345	-83.5890
PV Unit electricity exported	-882.2786	0.1259	-111.0532
Total			-194.6422 (269)
Total CO2, kg/year			958.1709 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.7500 (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	2781.6669	1.1300	3143.2836 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2549.3340	1.1300	2880.7474 (278)
Space and water heating			6024.0310 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	148.0884	1.5338	227.1429 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-621.5532	1.4970	-930.4805
PV Unit electricity exported	-882.2786	0.4620	-407.6411
Total			-1338.1216 (283)
Total Primary energy kWh/year			5043.1532 (286)
Target Primary Energy Rate (TPER)			82.8800 (287)

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Property Reference	House Type 5 - NEW				Issued on Date	30/08/2024	
Assessment Reference	House Type 5 Det Baseline			Prop Type Ref			
Property	House Type 5, Edmansons Close, Tottenham, N17 6XD						
SAP Rating	80 C	DER	4.38	TER	11.24		
Environmental	96 A	% DER < TER				61.03	
CO ₂ Emissions (t/year)	0.41	DFEE	44.54	TFEE	44.88		
Compliance Check	See BREL	% DFEE < TFEE				0.75	
% DPER < TPER	21.62	DPER	46.12	TPER	58.84		
Assessor Details	Miss Eleanor Ballinger				Assessor ID	M976-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	62.0500 (1b)	x 2.4000 (2b)	= 148.9200 (1b) - (3b)
First floor	42.7500 (1c)	x 2.6000 (2c)	= 111.1500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	104.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 260.0700 (5)

2. Ventilation rate

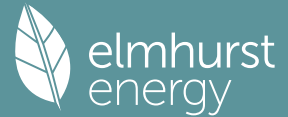
	m ³ per hour											
Number of open chimneys	0 * 80 = 0.0000 (6a)											
Number of open flues	0 * 20 = 0.0000 (6b)											
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)											
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)											
Number 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)											
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	0.1769	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) =												81.0000 (23c)
Effective ac	0.2719	0.2684	0.2650	0.2476	0.2442	0.2268	0.2268	0.2233	0.2337	0.2442	0.2511	0.2580 (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
Front door			1.8900	1.0000	1.8900		(26)
Window (Uw = 0.90)			25.0400	0.8687	21.7529		(27)
Ground Floor			62.0500	0.1300	8.0665	75.0000	4653.7500 (28a)
External Wall	148.9600	26.9300	122.0300	0.1800	21.9654	60.0000	7321.8004 (29a)
1st Floor	42.7500		42.7500	0.1000	4.2750	9.0000	384.7500 (30)
Ground floor	19.3000		19.3000	0.1000	1.9300	9.0000	173.7000 (30)
Total net area of external elements Aum(A, m ²)			273.0600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	59.8798		(33)
Party Ceilings 1			60.8500			90.0000	5476.5000 (32b)
Internal Wall 1			100.0000			9.0000	900.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	18910.5004 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							180.4437 (35)
List of Thermal Bridges							

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Solar gains	122.7370	217.2985	319.1830	432.1335	517.4782	528.4508	503.3594	437.4388	357.9439	246.0567	148.5097	104.0672 (83)
Total gains	739.5432	848.3410	923.6952	1014.5507	1069.6786	1060.0875	1014.2354	949.3983	885.7259	792.4941	729.2740	707.7117 (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	51.7419	51.8941	52.0472	52.8263	52.9849	53.7926	53.7926	53.9571	53.4666	52.9849	52.6686	52.3561
alpha	4.4495	4.4596	4.4698	4.5218	4.5323	4.5862	4.5862	4.5971	4.5644	4.5323	4.5112	4.4904
util living area	0.9858	0.9732	0.9487	0.8811	0.7537	0.5669	0.4188	0.4637	0.6969	0.9085	0.9731	0.9881 (86)
Living	19.6768	19.8982	20.1950	20.5745	20.8405	20.9669	20.9933	20.9895	20.9164	20.5716	20.0696	19.6458
Non living	18.5662	18.8473	19.2200	19.6881	19.9870	20.1186	20.1377	20.1381	20.0735	19.6960	19.0752	18.5337
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.3231	19.8982	20.1950	20.5745	20.8405	20.9669	20.9933	20.9895	20.9164	20.5716	20.0696	19.8352 (87)
Th 2	20.1095	20.1119	20.1143	20.1262	20.1286	20.1406	20.1406	20.1430	20.1358	20.1286	20.1238	20.1190 (88)
util rest of house	0.9826	0.9673	0.9373	0.8557	0.7063	0.4987	0.3393	0.3809	0.6298	0.8831	0.9662	0.9854 (89)
MIT 2	19.4943	18.8473	19.2200	19.6881	19.9870	20.1186	20.1377	20.1381	20.0735	19.6960	19.0752	18.8194 (90)
Living area fraction	19.8161	19.2554	19.5987	20.0323	20.3185	20.4480	20.4699	20.4687	FLA = Living area / (4) =	19.4614	19.4614	0.3884 (91)
MIT	19.8161	19.2554	19.5987	20.0323	20.3185	20.4480	20.4699	20.4687	20.4008	20.0361	19.4614	19.2139 (92)
Temperature adjustment												0.0000
adjusted MIT	19.8161	19.2554	19.5987	20.0323	20.3185	20.4480	20.4699	20.4687	20.4008	20.0361	19.4614	19.2139 (93)

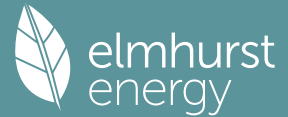
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9813	0.9601	0.9294	0.8527	0.7172	0.5237	0.3701	0.4128	0.6514	0.8800	0.9595	0.9819 (94)
Useful gains	725.7500	814.5223	858.4699	865.0838	767.1445	555.1253	375.3330	391.9238	576.9758	697.3929	699.7539	694.8876 (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	1575.2209	1453.1108	1321.9962	1106.9725	854.4324	571.0658	377.9054	396.1054	619.0362	935.4926	1232.8649	1506.3564 (97)
Space heating kWh	632.0063	429.1314	344.8636	174.1598	64.9422	0.0000	0.0000	0.0000	0.0000	177.1462	383.8399	603.7327 (98a)
Space heating requirement - total per year (kWh/year)												2809.8222
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	632.0063	429.1314	344.8636	174.1598	64.9422	0.0000	0.0000	0.0000	0.0000	177.1462	383.8399	603.7327 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2809.8222
Space heating per m2										(98c) / (4) =		26.8113 (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 %)												245.5878 (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	632.0063	429.1314	344.8636	174.1598	64.9422	0.0000	0.0000	0.0000	0.0000	177.1462	383.8399	603.7327 (98)
Space heating efficiency (main heating system 1)	245.5878	245.5878	245.5878	245.5878	245.5878	0.0000	0.0000	0.0000	0.0000	245.5878	245.5878	245.5878 (210)
Space heating fuel (main heating system)	257.3444	174.7365	140.4238	70.9155	26.4436	0.0000	0.0000	0.0000	0.0000	72.1315	156.2944	245.8318 (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	286.2331	252.9524	268.0363	233.7464	225.3412	201.6736	197.9193	206.4706	209.5250	235.3112	252.2946	282.8331 (64)
Efficiency of water heater (217)m	189.1869	189.1869	189.1869	189.1869	189.1869	189.1869	189.1869	189.1869	189.1869	189.1869	189.1869	189.1869 (216)
Fuel for water heating, kWh/month	151.2965	133.7050	141.6780	123.5531	119.1104	106.6002	104.6157	109.1358	110.7503	124.3803	133.3573	149.4993 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	17.1925	15.5287	17.1925	16.6379	17.1925	16.6379	17.1925	17.1925	16.6379	17.1925	16.6379	17.1925 (231)
Lighting	34.5831	27.7439	24.9803	18.3016	14.1367	11.5498	12.8960	16.7627	21.7731	28.5674	32.2668	35.5443 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												1144.1215 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)

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Efficiency of water heater	189.1869	
Water heating fuel used	1507.6820 (219)	
Space cooling fuel	0.0000 (221)	
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.6380)		
mechanical ventilation fans (SFP = 0.6380)	202.4281 (230a)	
Total electricity for the above, kWh/year	202.4281 (231)	
Electricity for lighting (calculated in Appendix L)	279.1058 (232)	
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000 (233)	
Wind generation	0.0000 (234)	
Hydro-electric generation (Appendix N)	0.0000 (235a)	
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)	
Appendix Q - special features		
Energy saved or generated	-0.0000 (236)	
Energy used	0.0000 (237)	
Total delivered energy for all uses	3133.3373 (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	1144.1215	0.1560	178.5022 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1507.6820	0.1411	212.6817 (264)
Space and water heating			391.1839 (265)
Pumps, fans and electric keep-hot	202.4281	0.1387	28.0793 (267)
Energy for lighting	279.1058	0.1443	40.2836 (268)
Total CO2, kg/year			459.5468 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.3800 (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	1144.1215	1.5776	1804.9344 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1507.6820	1.5216	2294.1144 (278)
Space and water heating			4099.0488 (279)
Pumps, fans and electric keep-hot	202.4281	1.5128	306.2332 (281)
Energy for lighting	279.1058	1.5338	428.1017 (282)
Total Primary energy kWh/year			4833.3838 (286)
Dwelling Primary energy Rate (DPER)			46.1200 (287)

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

1. Overall dwelling characteristics

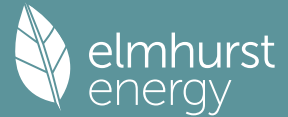
	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	62.0500 (1b)	x 2.4000 (2b)	= 148.9200 (1b) - (3b)
First floor	42.7500 (1c)	x 2.6000 (2c)	= 111.1500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	104.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	260.0700 (5)

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) = 0.1538 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4038 (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) = 0.3735 (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	0.4762	0.4669	0.4576	0.4109	0.4015	0.3548	0.3548	0.3455	0.3735	0.4015	0.4202	0.4389 (22b)
Effective ac	0.6134	0.6090	0.6047	0.5844	0.5806	0.5630	0.5630	0.5597	0.5698	0.5806	0.5883	0.5963 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type (Uw = 1.20)			24.3200	1.1450	27.8473			(27)
Ground Floor			62.0500	0.1300	8.0665			(28a)
External Wall	148.9600	26.2100	122.7500	0.1800	22.0950			(29a)
1st Floor	42.7500		42.7500	0.1100	4.7025			(30)
Ground floor	19.3000		19.3000	0.1100	2.1230			(30)
Total net area of external elements Aum(A, m2)			273.0600					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	66.7243		(33)

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

165.3473 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E5 Ground floor (normal)	31.9500	0.1600	5.1120	
E6 Intermediate floor within a dwelling	18.5000	0.0000	0.0000	
E10 Eaves (insulation at ceiling level)	18.6000	0.0600	1.1160	
E10 Eaves (insulation at ceiling level)	9.3000	0.0600	0.5580	
E24 Eaves (insulation at ceiling level - inverted)	9.3000	0.2400	2.2320	
E12 Gable (insulation at ceiling level)	9.2000	0.0600	0.5520	
E12 Gable (insulation at ceiling level)	4.2000	0.0600	0.2520	
E16 Corner (normal)	20.0000	0.0900	1.8000	
E1 Steel lintel with perforated steel base plate	12.3200	0.0500	0.6160	
E3 Sill	11.4200	0.0500	0.5710	
E4 Jamb	43.2000	0.0500	2.1600	

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

14.9690 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 81.6933 (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	52.6440	52.2660	51.8956	50.1557	49.8301	48.3147	48.3147	48.0341	48.8984	49.8301	50.4887	51.1772	(38)
Heat transfer coeff	134.3373	133.9594	133.5889	131.8490	131.5235	130.0080	130.0080	129.7274	130.5918	131.5235	132.1820	132.8705	(39)
Average = Sum(39)m / 12 =												131.8474	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2818	1.2782	1.2747	1.2581	1.2550	1.2405	1.2405	1.2379	1.2461	1.2550	1.2613	1.2678	(40)
HLP (average)												1.2581	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	(40)

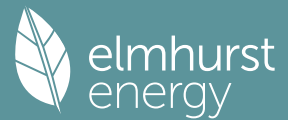
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.7797 (42)
Hot water usage for mixer showers													
70.8269	69.7625	68.2115	65.2439	63.0539	60.6116	59.2234	60.7626	62.4500	65.0723	68.1036	70.5555	(42a)	
Hot water usage for baths													
30.5811	30.1269	29.4874	28.3081	27.4251	26.4460	25.9171	26.5522	27.2437	28.2914	29.4949	30.4777	(42b)	
Hot water usage for other uses													
43.0973	41.5301	39.9630	38.3958	36.8286	35.2614	35.2614	36.8286	38.3958	39.9630	41.5301	43.0973	(42c)	
Average daily hot water use (litres/day)													132.8329 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	144.5053	141.4196	137.6618	131.9478	127.3076	122.3190	120.4019	124.1435	128.0895	133.3266	139.1287	144.1306	(44)
Energy content	228.8611	201.3796	211.5811	180.6299	171.3805	150.4055	145.6157	153.7156	157.9472	180.9230	198.2143	225.6736	(45)
Energy content (annual)										Total = Sum(45)m =		2206.3269	
Distribution loss (46)m = 0.15 x (45)m													
34.3292	30.2069	31.7372	27.0945	25.7071	22.5608	21.8424	23.0573	23.6921	27.1384	29.7322	33.8510	(46)	
Water storage loss:													
Store volume													170.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.5003 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8102 (55)
Total storage loss													
25.1153	22.6848	25.1153	24.3051	25.1153	24.3051	25.1153	25.1153	24.3051	25.1153	24.3051	25.1153	(56)	
If cylinder contains dedicated solar storage													
25.1153	22.6848	25.1153	24.3051	25.1153	24.3051	25.1153	25.1153	24.3051	25.1153	24.3051	25.1153	(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	(59)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)	
Total heat required for water heating calculated for each month													
277.2388	245.0756	259.9588	227.4470	219.7582	197.2226	193.9934	202.0933	204.7643	229.3007	245.0315	274.0513	(62)	
WWHRS	-32.3791	-28.6363	-29.9863	-24.8299	-23.1405	-19.8015	-18.5608	-19.7375	-20.4874	-24.1524	-27.3617	-31.7795	(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													
244.8597	216.4392	229.9724	202.6172	196.6176	177.4211	175.4326	182.3557	184.2769	205.1483	217.6697	242.2718	(64)	
Total per year (kWh/year)													
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
													0.0000 (64a)
Heat gains from water heating, kWh/month													
114.7985	101.9155	109.0529	97.5131	95.6862	87.4635	87.1194	89.8126	89.9711	98.8591	103.3600	113.7386	(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	138.9870	138.9870	138.9870	138.9870	138.9870	138.9870	138.9870	138.9870	138.9870	138.9870	138.9870	138.9870	(66)
Lighting gains (calculated in Appendix L, equation L9a), also see Table 5	133.0882	147.3477	133.0882	137.5245	133.0882	137.5245	133.0882	133.0882	137.5245	133.0882	137.5245	133.0882	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	263.8623	266.6004	259.7005	245.0116	226.4694	209.0425	197.4001	194.6621	201.5619	216.2509	234.7930	252.2200	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.8987	36.8987	36.8987	36.8987	36.8987	36.8987	36.8987	36.8987	36.8987	36.8987	36.8987	36.8987	(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)

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Losses e.g. evaporation (negative values) (Table 5)	-111.1896	-111.1896	-111.1896	-111.1896	-111.1896	-111.1896	-111.1896	-111.1896	-111.1896	-111.1896	-111.1896	-111.1896 (71)
Water heating gains (Table 5)	154.2990	151.6600	146.5764	135.4349	128.6104	121.4771	117.0959	120.7158	124.9599	132.8751	143.5555	152.8745 (72)
Total internal gains	618.9456	633.3041	607.0613	585.6671	555.8642	532.7402	512.2804	513.1622	528.7424	549.9102	583.5691	605.8788 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
Southeast				10.6400	36.7938	0.6300	0.7000			0.7700			119.6433 (77)
Southwest				2.6800	36.7938	0.6300	0.7000			0.7700			30.1357 (79)
Northwest				11.0000	11.2829	0.6300	0.7000			0.7700			37.9303 (81)
Solar gains	187.7094	332.3375	488.1837	660.9757	791.5465	808.3430	769.9568	669.1022	547.4800	376.3267	227.1270	159.1555	(83)
Total gains	806.6550	965.6416	1095.2449	1246.6428	1347.4107	1341.0831	1282.2373	1182.2644	1076.2224	926.2370	810.6961	765.0343	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	35.8310	35.9321	36.0318	36.5073	36.5976	37.0242	37.0242	37.1043	36.8587	36.5976	36.4153	36.2266
alpha	3.3887	3.3955	3.4021	3.4338	3.4398	3.4683	3.4683	3.4736	3.4572	3.4398	3.4277	3.4151
util living area	0.9798	0.9628	0.9320	0.8591	0.7359	0.5694	0.4307	0.4803	0.7024	0.8974	0.9652	0.9829 (86)
MIT	19.0348	19.3392	19.7587	20.2867	20.6848	20.9065	20.9729	20.9606	20.8021	20.2695	19.5664	18.9913 (87)
Th 2	19.8551	19.8579	19.8607	19.8738	19.8763	19.8877	19.8877	19.8898	19.8833	19.8763	19.8713	19.8661 (88)
util rest of house	0.9752	0.9547	0.9170	0.8283	0.6808	0.4867	0.3284	0.3744	0.6243	0.8677	0.9562	0.9790 (89)
MIT 2	17.5939	17.9789	18.5038	19.1508	19.6003	19.8268	19.8766	19.8721	19.7373	19.1491	18.2791	17.5457 (90)
Living area fraction	18.1535	18.5072	18.9912	19.5919	20.0214	20.2461	20.3023	20.2948	20.1508	19.5842	18.7790	18.1071 (92)
MIT	18.1535	18.5072	18.9912	19.5919	20.0214	20.2461	20.3023	20.2948	20.1508	19.5842	18.7790	18.1071 (93)
Temperature adjustment												0.0000
adjusted MIT	18.1535	18.5072	18.9912	19.5919	20.0214	20.2461	20.3023	20.2948	20.1508	19.5842	18.7790	18.1071 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9658	0.9421	0.9027	0.8195	0.6885	0.5145	0.3674	0.4143	0.6445	0.8585	0.9446	0.9706 (94)
Ext temp.	779.0614	909.7045	988.7048	1021.6297	927.7412	689.9695	471.1559	489.8231	693.6545	795.1447	765.7747	742.5140 (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	1861.0424	1822.8058	1668.6818	1409.7193	1094.4657	734.0399	481.3352	505.2668	790.1853	1181.6321	1543.7578	1847.8456 (97)
Space heating requirement - total per year (kWh/year)	804.9938	613.6041	505.9028	279.4245	124.0430	0.0000	0.0000	0.0000	0.0000	287.5466	560.1478	822.3667 (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)	804.9938	613.6041	505.9028	279.4245	124.0430	0.0000	0.0000	0.0000	0.0000	287.5466	560.1478	822.3667 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3998.0294 (99)
Space heating per m ²												38.1491 (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
Space heating efficiency (main heating system 1)	804.9938	613.6041	505.9028	279.4245	124.0430	0.0000	0.0000	0.0000	0.0000	287.5466	560.1478	822.3667 (98)
Space heating fuel (main heating system)	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 efficiency (main heating system 2)	872.1493	664.7932	548.1071	302.7351	134.3912	0.0000	0.0000	0.0000	0.0000	311.5348	606.8774	890.9715 (211)
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 (212)
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 (213)
Water heating	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 requirement	244.8597	216.4392	229.9724	202.6172	196.6176	177.4211	175.4326	182.3557	184.2769	205.1483	217.6697	242.2718 (64)
Efficiency of water heater (217)m	86.5240	86.2631	85.7767	84.7809	83.0563	79.8000	79.8000	79.8000	79.8000	84.8170	86.0831	79.8000 (216)
Fuel for water heating, kWh/month	282.9962	250.9059	268.1059	238.9892	236.7280	222.3322	219.8404	228.5160	230.9234	241.8717	252.8601	279.8308 (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	7.0685	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	27.6531	22.1843	19.9745	14.6342	11.3039	9.2354	10.3118	13.4036	17.4100	22.8429	25.8010	28.4217 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-54.0981	-74.3340	-104.1644	-114.0645	-120.4538	-111.4807	-110.0210	-105.0315	-95.9550	-83.4508	-58.7486	-46.9945 (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)												

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(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	-36.7553	-76.5123	-150.6372	-224.2340	-294.6200	-295.4017	-291.9940	-248.1435	-183.0581	-108.8221	-48.8682	-29.1334	(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												4331.5595	(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												2953.8996	(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)												223.1764	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-3066.9767	(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												4527.6588	(238)

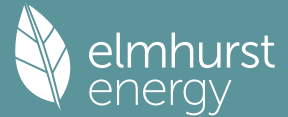
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4331.5595	0.2100	909.6275	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2953.8996	0.2100	620.3189	(264)
Space and water heating			1529.9464	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	223.1764	0.1443	32.2113	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1078.7968	0.1352	-145.8002	
PV Unit electricity exported	-1988.1799	0.1262	-250.8219	
Total			-396.6221	(269)
Total CO2, kg/year			1177.4648	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.2400	(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	4331.5595	1.1300	4894.6622	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2953.8996	1.1300	3337.9066	(278)
Space and water heating			8232.5688	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	223.1764	1.5338	342.3154	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1078.7968	1.4995	-1617.6834	
PV Unit electricity exported	-1988.1799	0.4631	-920.7116	
Total			-2538.3950	(283)
Total Primary energy kWh/year			6166.5899	(286)
Target Primary Energy Rate (TPER)			58.8400	(287)

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Property Reference	Studio Mid GF - Apt				Issued on Date	30/08/2024	
Assessment Reference	Studio Mid GF			Prop Type Ref			
Property	Apartment, Studio Mid GF, Edmansons Close, Tottenham, N17 6XD						
SAP Rating	80 C	DER	4.86	TER	20.15		
Environmental	97 A	% DER < TER				75.88	
CO ₂ Emissions (t/year)	0.15	DFEE	57.04	TFEE	50.71		
Compliance Check	See BREL	% DFEE < TFEE				-12.48	
% DPER < TPER	53.47	DPER	49.98	TPER	107.41		
Assessor Details	Miss Eleanor Ballinger				Assessor ID	M976-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	37.6000	2.5000	94.0000
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	37.6000		
Dwelling volume			94.0000

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)

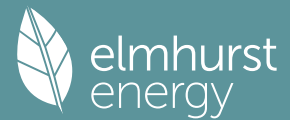
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.0000	(17)
Infiltration rate	0.1500	(18)
Number of sides sheltered	3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (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	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366 (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) =												81.0000 (23c)
Effective ac	0.2432	0.2403	0.2374	0.2229	0.2200	0.2054	0.2054	0.2025	0.2112	0.2200	0.2258	0.2316 (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
Door to corridor			1.2000	1.0000	1.2000		(26)
Window (Uw = 0.90)			11.0400	0.8687	9.5907		(27)
Heat Loss Floor 1			37.6000	0.1300	4.8880	75.0000	2820.0000 (28a)
External Wall	37.6000	11.0400	26.5600	0.1800	4.7808	60.0000	1593.6000 (29a)
Corridor Wall	27.2700	1.2000	26.0700	0.1800	4.6926	60.0000	1564.2000 (29a)
Total net area of external elements Aum(A, m ²)			102.4700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	25.1521		(33)
Party Wall 1			15.6600	0.0000	0.0000	45.0000	704.7000 (32)
Party Ceiling 1			37.6000			30.0000	1128.0000 (32b)
Internal Wall 1			21.8000			9.0000	196.2000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	8006.7000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							212.9442 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	

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E5 Ground floor (normal)	12.8000	0.1600	2.0480
E5 Ground floor (normal)	10.1000	0.3200	3.2320
E7 Party floor between dwellings (in blocks of flats)	7.6500	0.1000	0.7650
E7 Party floor between dwellings (in blocks of flats)	10.1000	0.1400	1.4140
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.1500	0.2500	1.2875
E16 Corner (normal)	5.0000	0.0900	0.4500
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250
E18 Party wall between dwellings	2.5000	0.0600	0.1500
E25 Staggered party wall between dwellings	7.5000	0.1200	0.9000
P1 Party wall - Ground floor	5.8000	0.1000	0.5800
P2 Party wall - Intermediate floor within a dwelling	5.8000	0.0000	0.0000
E1 Steel lintel with perforated steel base plate	5.8000	0.1500	0.8700
E3 Sill	4.6000	0.0400	0.1840
E4 Jamb	16.4000	0.0500	0.8200
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			12.4755 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	37.6276 (37)

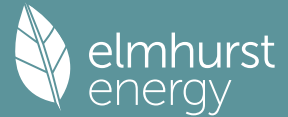
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 7.5446	Feb 7.4545	Mar 7.3643	Apr 6.9136	May 6.8234	Jun 6.3727	Jul 6.3727	Aug 6.2825	Sep 6.5530	Oct 6.8234	Nov 7.0037	Dec 7.1840 (38)
Heat transfer coeff	45.1723	45.0821	44.9920	44.5412	44.4511	44.0003	44.0003	43.9102	44.1806	44.4511	44.6314	44.8117 (39)
Average = Sum(39)m / 12 =												44.5187
HLP	Jan 1.2014	Feb 1.1990	Mar 1.1966	Apr 1.1846	May 1.1822	Jun 1.1702	Jul 1.1702	Aug 1.1678	Sep 1.1750	Oct 1.1822	Nov 1.1870	Dec 1.1918 (40)
HLP (average)												1.1840
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												1.3441 (42)
Hot water usage for mixer showers	52.6002	51.8097	50.6578	48.4539	46.8275	45.0137	43.9827	45.1259	46.3790	48.3265	50.5777	52.3986 (42a)
Hot water usage for baths	20.2297	19.9293	19.5062	18.7261	18.1420	17.4943	17.1444	17.5646	18.0220	18.7151	19.5112	20.1613 (42b)
Hot water usage for other uses	28.3950	27.3625	26.3300	25.2974	24.2649	23.2323	23.2323	24.2649	25.2974	26.3300	27.3625	28.3950 (42c)
Average daily hot water use (litres/day)												93.0654 (43)
Daily hot water use	Jan 101.2250	Feb 99.1015	Mar 96.4940	Apr 92.4774	May 89.2343	Jun 85.7403	Jul 84.3595	Aug 86.9553	Sep 89.6984	Oct 93.3715	Nov 97.4514	Dec 100.9550 (44)
Energy conte	160.3156	141.1192	148.3076	126.5970	120.1265	105.4277	102.0255	107.6688	110.6071	126.7042	138.8374	158.0712 (45)
Energy content (annual)										Total = Sum(45)m =		1545.8079
Distribution loss (46)m = 0.15 x (45)m	24.0473	21.1679	22.2461	18.9895	18.0190	15.8142	15.3038	16.1503	16.5911	19.0056	20.8256	23.7107 (46)
Water storage loss:												170.0000 (47)
Store volume												1.2000 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.6480 (55)
Enter (49) or (54) in (55)												
Total storage loss	20.0880	18.1440	20.0880	19.4400	20.0880	19.4400	20.0880	20.0880	19.4400	20.0880	19.4400	20.0880 (56)
If cylinder contains dedicated solar storage	20.0880	18.1440	20.0880	19.4400	20.0880	19.4400	20.0880	20.0880	19.4400	20.0880	19.4400	20.0880 (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	203.6660	180.2744	191.6580	168.5490	163.4769	147.3797	145.3759	151.0192	152.5591	170.0546	180.7894	201.4216 (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	203.6660	180.2744	191.6580	168.5490	163.4769	147.3797	145.3759	151.0192	152.5591	170.0546	180.7894	201.4216 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2056.2239 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
												0.0000 (64a)
Heat gains from water heating, kWh/month	87.9852	78.2463	83.9926	75.6551	74.6224	68.6163	68.6038	70.4802	70.3385	76.8095	79.7250	87.2390 (65)

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts	Jan 67.2056	Feb 67.2056	Mar 67.2056	Apr 67.2056	May 67.2056	Jun 67.2056	Jul 67.2056	Aug 67.2056	Sep 67.2056	Oct 67.2056	Nov 67.2056	Dec 67.2056 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	58.2808	64.5252	58.2808	60.2235	58.2808	60.2235	58.2808	58.2808	60.2235	58.2808	60.2235	58.2808 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	115.5483	116.7473	113.7258	107.2933	99.1735	91.5420	86.4437	85.2447	88.2662	94.6987	102.8185	110.4500 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.7206	29.7206	29.7206	29.7206	29.7206	29.7206	29.7206	29.7206	29.7206	29.7206	29.7206	29.7206 (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)	-53.7645	-53.7645	-53.7645	-53.7645	-53.7645	-53.7645	-53.7645	-53.7645	-53.7645	-53.7645	-53.7645	-53.7645 (71)
Water heating gains (Table 5)	118.2597	116.4379	112.8933	105.0765	100.2989	95.3004	92.2094	94.7315	97.6923	103.2385	110.7292	117.2567 (72)
Total internal gains	335.2505	340.8721	328.0616	315.7550	300.9149	290.2277	280.0956	281.4187	289.3437	299.3797	316.9329	329.1492 (73)

6. Solar gains												
[Jan]			Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
Southwest			2.8800	36.7938	0.3500	0.8000			0.7700			20.5617 (79)

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Northwest	8.1600		11.2829		0.3500		0.8000		0.7700		17.8650 (81)	
Solar gains	38.4267	71.3889	113.4394	166.9762	211.1416	220.2218	207.9031	173.3321	131.7234	83.1498	47.1070	32.1860 (83)
Total gains	373.6772	412.2611	441.5009	482.7312	512.0565	510.4494	487.9988	454.7508	421.0671	382.5295	364.0399	361.3352 (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	49.2356	49.3340	49.4329	49.9332	50.0344	50.5470	50.5470	50.6508	50.3407	50.0344	49.8323	49.6318
alpha	4.2824	4.2889	4.2955	4.3289	4.3356	4.3698	4.3698	4.3767	4.3560	4.3356	4.3222	4.3088
util living area	0.9745	0.9598	0.9308	0.8542	0.7170	0.5325	0.3925	0.4370	0.6645	0.8806	0.9562	0.9775 (86)
Living	19.7530	19.9445	20.2278	20.5940	20.8516	20.9685	20.9933	20.9895	20.9195	20.5976	20.1273	19.7205
Non living	18.5090	18.7491	19.0994	19.5382	19.8140	19.9259	19.9416	19.9419	19.8874	19.5553	18.9880	18.4738
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.3621	19.9445	20.2278	20.5940	20.8516	20.9685	20.9933	20.9895	20.9195	20.5976	20.1273	19.8995 (87)
Th 2	19.9189	19.9208	19.9227	19.9323	19.9343	19.9439	19.9439	19.9458	19.9400	19.9343	19.9304	19.9266 (88)
util rest of house	0.9680	0.9498	0.9135	0.8195	0.6577	0.4521	0.3004	0.3403	0.5825	0.8440	0.9435	0.9718 (89)
MIT 2	19.3568	18.7491	19.0994	19.5382	19.8140	19.9259	19.9416	19.9419	19.8874	19.5553	18.9880	18.7356 (90)
Living area fraction									FLA = Living area / (4) =			
MIT	20.2364	19.7951	20.0867	20.4620	20.7219	20.8382	20.8619	20.8586	20.7905	20.4674	19.9849	19.7540 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2364	19.7951	20.0867	20.4620	20.7219	20.8382	20.8619	20.8586	20.7905	20.4674	19.9849	19.7540 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9700	0.9485	0.9164	0.8376	0.7024	0.5206	0.3806	0.4243	0.6493	0.8636	0.9443	0.9707 (94)
Useful gains	362.4851	391.0129	404.6068	404.3530	359.6672	265.7364	185.7459	192.9578	273.3944	330.3608	343.7448	350.7507 (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	719.8840	671.5031	611.2942	514.9876	401.0334	274.4828	187.5241	195.7762	295.5912	438.6147	575.0709	697.0011 (97)
Space heating kWh	265.9048	188.4894	153.7754	79.6569	30.7764	0.0000	0.0000	0.0000	0.0000	80.5409	166.5548	257.6103 (98a)
Space heating requirement - total per year (kWh/year)												1223.3090
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	265.9048	188.4894	153.7754	79.6569	30.7764	0.0000	0.0000	0.0000	0.0000	80.5409	166.5548	257.6103 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1223.3090
Space heating per m2										(98c) / (4) =		32.5348 (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 %)												223.7466 (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	265.9048	188.4894	153.7754	79.6569	30.7764	0.0000	0.0000	0.0000	0.0000	80.5409	166.5548	257.6103 (98)
Space heating efficiency (main heating system 1)	223.7466	223.7466	223.7466	223.7466	223.7466	0.0000	0.0000	0.0000	0.0000	223.7466	223.7466	223.7466 (210)
Space heating fuel (main heating system)	118.8420	84.2424	68.7275	35.6014	13.7550	0.0000	0.0000	0.0000	0.0000	35.9965	74.4391	115.1349 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	203.6660	180.2744	191.6580	168.5490	163.4769	147.3797	145.3759	151.0192	152.5591	170.0546	180.7894	201.4216 (64)
Efficiency of water heater (217)m	191.9076	191.9076	191.9076	191.9076	191.9076	191.9076	191.9076	191.9076	191.9076	191.9076	191.9076	191.9076 (216)
Fuel for water heating, kWh/month	106.1271	93.9381	99.8700	87.8282	85.1852	76.7972	75.7531	78.6937	79.4961	88.6127	94.2065	104.9576 (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	5.9998	5.4192	5.9998	5.8063	5.9998	5.8063	5.9998	5.9998	5.8063	5.9998	5.8063	5.9998 (231)
Lighting	12.9335	10.3758	9.3422	6.8445	5.2869	4.3194	4.8229	6.2690	8.1428	10.6838	12.0673	13.2930 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-20.1818	-33.1788	-55.5820	-68.5397	-76.3041	-70.6369	-69.4222	-63.6229	-52.4413	-39.8683	-23.2857	-16.6902 (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												546.7387 (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	191.9076
Water heating fuel used	1071.4655 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.6160)	
mechanical ventilation fans (SFP = 0.6160)	70.6429 (230a)
Total electricity for the above, kWh/year	70.6429 (231)
Electricity for lighting (calculated in Appendix L)	104.3811 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-589.7541 (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	1203.4741 (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	546.7387	0.1558	85.1748	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1071.4655	0.1409	150.9339	(264)
Space and water heating			236.1087	(265)
Pumps, fans and electric keep-hot	70.6429	0.1387	9.7990	(267)
Energy for lighting	104.3811	0.1443	15.0654	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-589.7541	0.1328	-78.3403	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-78.3403	(269)
Total CO2, kg/year			182.6329	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.8600	(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	546.7387	1.5767	862.0626	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1071.4655	1.5209	1629.5626	(278)
Space and water heating			2491.6252	(279)
Pumps, fans and electric keep-hot	70.6429	1.5128	106.8685	(281)
Energy for lighting	104.3811	1.5338	160.1032	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-589.7541	1.4909	-879.2397	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-879.2397	(283)
Total Primary energy kWh/year			1879.3573	(286)
Dwelling Primary energy Rate (DPER)			49.9800	(287)

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

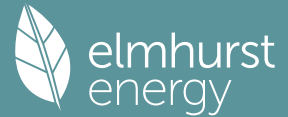
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	37.6000 (1b)	x 2.5000 (2b)	= 94.0000 (1b) - (3b)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	37.6000		(4)	
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)... (3n)	= 94.0000 (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	Air changes per hour	
Pressure test	20.0000 / (5) =	0.2128 (8)
Pressure Test Method	Yes	
Measured/design AP50	Blower Door	
Infiltration rate	5.0000	(17)
Number of sides sheltered	0.4628	(18)
	3	(19)

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Shelter factor (20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3586 (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													
Effective ac	0.4573	0.4483	0.4393	0.3945	0.3855	0.3407	0.3407	0.3317	0.3586	0.3855	0.4035	0.4214	(22b)
	0.6045	0.6005	0.5965	0.5778	0.5743	0.5580	0.5580	0.5550	0.5643	0.5743	0.5814	0.5888	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.2000	1.0000	1.2000			(26)
TER Opening Type (Uw = 1.20)			8.2000	1.1450	9.3893			(27)
Heat Loss Floor 1			37.6000	0.1300	4.8880			(28a)
External Wall	37.6000	8.2000	29.4000	0.1800	5.2920			(29a)
Corridor Wall	27.2700	1.2000	26.0700	0.1800	4.6926			(29a)
Total net area of external elements Aum(A, m2)			102.4700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	25.4619			(33)
Party Wall 1			15.6600	0.0000	0.0000			(32)

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

222.9442 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E5 Ground floor (normal)	12.8000	0.1600	2.0480	
E5 Ground floor (normal)	10.1000	0.1600	1.6160	
E7 Party floor between dwellings (in blocks of flats)	7.6500	0.0700	0.5355	
E7 Party floor between dwellings (in blocks of flats)	10.1000	0.0700	0.7070	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.1500	0.0200	0.1030	
E16 Corner (normal)	5.0000	0.0900	0.4500	
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250	
E18 Party wall between dwellings	2.5000	0.0600	0.1500	
E25 Staggered party wall between dwellings	7.5000	0.0600	0.4500	
P1 Party wall - Ground floor	5.8000	0.0800	0.4640	
P2 Party wall - Intermediate floor within a dwelling	5.8000	0.0000	0.0000	
E1 Steel lintel with perforated steel base plate	5.8000	0.0500	0.2900	
E3 Sill	4.6000	0.0500	0.2300	
E4 Jamb	16.4000	0.0500	0.8200	

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

7.6385 (36)

Point Thermal Bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 33.1004 (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	18.7531	18.6272	18.5037	17.9239	17.8154	17.3105	17.3105	17.2170	17.5050	17.8154	18.0349	18.2643	(38)
Heat transfer coeff	51.8535	51.7276	51.6041	51.0243	50.9159	50.4109	50.4109	50.3174	50.6054	50.9159	51.1353	51.3647	(39)
Average = Sum(39)m / 12 =												51.0238	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3791	1.3757	1.3725	1.3570	1.3541	1.3407	1.3407	1.3382	1.3459	1.3541	1.3600	1.3661	(40)
HLP (average)												1.3570	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.3441 (42)
Hot water usage for mixer showers	46.7557	46.0531	45.0292	43.0701	41.6244	40.0122	39.0958	40.1119	41.2258	42.9569	44.9580	46.5766	(42a)
Hot water usage for baths	20.2297	19.9293	19.5062	18.7261	18.1420	17.4943	17.1444	17.5646	18.0220	18.7151	19.5112	20.1613	(42b)
Hot water usage for other uses	28.3950	27.3625	26.3300	25.2974	24.2649	23.2323	23.2323	24.2649	25.2974	26.3300	27.3625	28.3950	(42c)
Average daily hot water use (litres/day)												87.6770	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.3805	93.3449	90.8653	87.0937	84.0313	80.7388	79.4725	81.9413	84.5452	88.0019	91.8317	95.1330	(44)
Energy conte	151.0594	132.9218	139.6566	119.2269	113.1222	99.2777	96.1151	101.4605	104.2527	119.4177	130.8311	148.9552	(45)
Energy content (annual)										Total = Sum(45)m =		1456.2969	
Distribution loss (46)m = 0.15 x (45)m	22.6589	19.9383	20.9485	17.8840	16.9683	14.8917	14.4173	15.2191	15.6379	17.9127	19.6247	22.3433	(46)

Water storage loss:

Store volume

170.0000 (47)

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

1.5003 (48)

Temperature factor from Table 2b

0.5400 (49)

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

0.8102 (55)

Total storage loss

25.1153 22.6848 25.1153 24.3051 25.1153 24.3051 25.1153 25.1153 24.3051 25.1153 24.3051 25.1153 (56)

If cylinder contains dedicated solar storage

25.1153 22.6848 25.1153 24.3051 25.1153 24.3051 25.1153 25.1153 24.3051 25.1153 24.3051 25.1153 (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

199.4371 176.6178 188.0343 166.0440 161.4999 146.0949 144.4928 149.8382 151.0698 167.7954 177.6482 197.3329 (62)

WWHRS -21.3748 -18.9040 -19.7952 -16.3912 -15.2760 -13.0718 -12.2527 -13.0295 -13.5246 -15.9440 -18.0626 -20.9789 (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 178.0623 157.7138 168.2391 149.6528 146.2239 133.0231 132.2401 136.8086 137.5452 151.8514 159.5856 176.3540 (64)

Total per year (kWh/year) = Sum(64)m = 1827.3000 (64)

12Total per year (kWh/year)

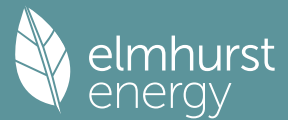
Electric shower(s) 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (64a)

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

Heat gains from water heating, kWh/month

88.9294 79.1533 85.1380 77.0966 76.3153 70.4636 70.6604 72.4378 72.1177 78.4085 80.9550 88.2298 (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	67.2056	67.2056	67.2056	67.2056	67.2056	67.2056	67.2056	67.2056	67.2056	67.2056	67.2056	67.2056 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	58.3191	64.5676	58.3191	60.2631	58.3191	60.2631	58.3191	58.3191	60.2631	58.3191	60.2631	58.3191 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	115.5483	116.7473	113.7258	107.2933	99.1735	91.5420	86.4437	85.2447	88.2662	94.6987	102.8185	110.4500 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.7206	29.7206	29.7206	29.7206	29.7206	29.7206	29.7206	29.7206	29.7206	29.7206	29.7206	29.7206 (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)	-53.7645	-53.7645	-53.7645	-53.7645	-53.7645	-53.7645	-53.7645	-53.7645	-53.7645	-53.7645	-53.7645	-53.7645 (71)
Water heating gains (Table 5)	119.5288	117.7876	114.4328	107.0787	102.5743	97.8660	94.9737	97.3626	100.1635	105.3878	112.4376	118.5884 (72)
Total internal gains	339.5578	345.2642	332.6393	320.7967	306.2286	292.8328	282.8982	284.0881	291.8545	304.5673	321.6808	333.5191 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W
Southwest					2.1400	36.7938	0.6300	0.7000			0.7700	24.0636 (79)
Northwest					6.0600	11.2829	0.6300	0.7000			0.7700	20.8962 (81)
Solar gains	44.9598	83.5240	132.7174	195.3451	247.0086	257.6291	243.2188	202.7788	154.1062	97.2827	55.1154	37.6583 (83)
Total gains	384.5176	428.7882	465.3567	516.1418	553.2372	550.4619	526.1170	486.8668	445.9606	401.8499	376.7962	371.1774 (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	44.9059	45.0152	45.1229	45.6356	45.7329	46.1910	46.1910	46.2768	46.0134	45.7329	45.5366	45.3332
alpha	3.9937	4.0010	4.0082	4.0424	4.0489	4.0794	4.0794	4.0851	4.0676	4.0489	4.0358	4.0222
util living area	0.9779	0.9647	0.9379	0.8663	0.7352	0.5567	0.4143	0.4632	0.6946	0.8950	0.9622	0.9806 (86)
MIT	19.5392	19.7493	20.0691	20.4902	20.7999	20.9514	20.9885	20.9821	20.8817	20.4911	19.9579	19.5086 (87)
Th 2	20.3105	20.3121	20.3138	20.3215	20.3229	20.3296	20.3296	20.3309	20.3271	20.3229	20.3200	20.3170 (88)
util rest of house	0.9746	0.9595	0.9287	0.8471	0.7003	0.5060	0.3539	0.4001	0.6456	0.8757	0.9558	0.9777 (89)
MIT 2	18.9525	19.1611	19.4759	19.8857	20.1683	20.2988	20.3242	20.3219	20.2455	19.8941	19.3748	18.9272 (90)
Living area fraction	19.4658	19.6758	19.9950	20.4147	20.7210	20.8698	20.9054	20.8996	20.8022	20.4165	19.8850	19.4359 (92)
MIT	19.4658	19.6758	19.9950	20.4147	20.7210	20.8698	20.9054	20.8996	20.8022	20.4165	19.8850	19.4359 (93)
Temperature adjustment												0.0000
adjusted MIT	19.4658	19.6758	19.9950	20.4147	20.7210	20.8698	20.9054	20.8996	20.8022	20.4165	19.8850	19.4359 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9698	0.9540	0.9240	0.8499	0.7213	0.5471	0.4059	0.4539	0.6808	0.8786	0.9511	0.9732 (94)
Useful gains	372.9091	409.0577	429.9747	438.6900	399.0404	301.1803	213.5605	220.9894	303.6106	353.0758	358.3776	361.2303 (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	786.4017	764.3165	696.3969	587.5286	459.3107	316.0679	217.0414	226.4065	339.1659	499.8156	653.7647	782.5879 (97)
Space heating kWh	307.6385	238.7340	198.2181	107.1638	44.8411	0.0000	0.0000	0.0000	0.0000	109.1744	212.6787	313.4901 (98a)
Space heating requirement - total per year (kWh/year)												1531.9386
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	307.6385	238.7340	198.2181	107.1638	44.8411	0.0000	0.0000	0.0000	0.0000	109.1744	212.6787	313.4901 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1531.9386
Space heating per m ²										(98c) / (4) =		40.7430 (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	307.6385	238.7340	198.2181	107.1638	44.8411	0.0000	0.0000	0.0000	0.0000	109.1744	212.6787	313.4901 (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)	333.3028	258.6500	214.7542	116.1038	48.5819	0.0000	0.0000	0.0000	0.0000	118.2821	230.4211	339.6425 (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	178.0623	157.7138	168.2391	149.6528	146.2239	133.0231	132.2401	136.8086	137.5452	151.8514	159.5856	176.3540 (64)
Efficiency of water heater												79.8000 (216)

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(217)m	85.2742	84.9869	84.4285	83.3239	81.7444	79.8000	79.8000	79.8000	79.8000	83.3325	84.7047	85.3351	(217)
Fuel for water heating, kWh/month	208.8115	185.5742	199.2682	179.6037	178.8795	166.6956	165.7144	171.4394	172.3624	182.2235	188.4024	206.6606	(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	7.0685	7.3041	7.0685	7.3041	7.0685	(231)
Lighting	12.1176	9.7212	8.7528	6.4127	4.9533	4.0469	4.5186	5.8735	7.6290	10.0097	11.3060	12.4543	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-13.1031	-19.2384	-28.8031	-33.8052	-37.7348	-35.7391	-35.3469	-32.7542	-28.3652	-22.6640	-14.6902	-11.2441	(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	-5.2481	-11.2307	-22.6636	-34.5269	-46.1050	-46.4461	-45.8551	-38.5828	-27.9919	-16.1728	-7.0470	-4.1328	(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												1659.7385	(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												2205.6354	(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)												97.7956	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-619.4914	(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												3429.6781	(238)

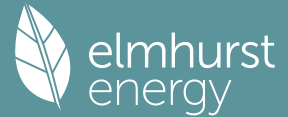
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1659.7385	0.2100	348.5451 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2205.6354	0.2100	463.1834 (264)
Space and water heating			811.7285 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	97.7956	0.1443	14.1149 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-313.4884	0.1337	-41.9105
PV Unit electricity exported	-306.0029	0.1255	-38.4050
Total			-80.3155 (269)
Total CO2, kg/year			757.4572 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			20.1500 (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	1659.7385	1.1300	1875.5045 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2205.6354	1.1300	2492.3680 (278)
Space and water heating			4367.8725 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	97.7956	1.5338	150.0022 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-313.4884	1.4940	-468.3666
PV Unit electricity exported	-306.0029	0.4607	-140.9677
Total			-609.3343 (283)
Total Primary energy kWh/year			4038.6411 (286)
Target Primary Energy Rate (TPER)			107.4100 (287)

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Property Reference	Studio Mid MF - Apt				Issued on Date	30/08/2024	
Assessment Reference	Studio Mid MF			Prop Type Ref			
Property	Apartment, Studio Mid MF, Edmansons Close, Tottenham, N17 6XD						
SAP Rating	81 B	DER	4.37	TER	16.63		
Environmental	97 A	% DER < TER				73.72	
CO ₂ Emissions (t/year)	0.14	DFEE	46.00	TFEE	39.41		
Compliance Check	See BREL	% DFEE < TFEE				-16.73	
% DPER < TPER	48.64	DPER	45.15	TPER	87.91		
Assessor Details	Miss Eleanor Ballinger				Assessor ID	M976-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	37.6000	2.5000	94.0000
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	37.6000		
Dwelling volume			94.0000

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	3	(19)

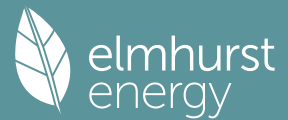
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1162 (21)

	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	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1162	0.1250	0.1308	0.1366 (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) =												81.0000 (23c)
Effective ac	0.2432	0.2403	0.2374	0.2229	0.2200	0.2054	0.2054	0.2025	0.2112	0.2200	0.2258	0.2316 (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
Door to corridor			1.2000	1.0000	1.2000		(26)
Window (Uw = 0.90)			11.0400	0.8687	9.5907		(27)
External Wall	37.6000	11.0400	26.5600	0.1800	4.7808	60.0000	1593.6000 (29a)
Corridor Wall	27.2700	1.2000	26.0700	0.1800	4.6926	60.0000	1564.2000 (29a)
Total net area of external elements Aum(A, m ²)			64.8700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	20.2641		(33)
Party Wall 1			15.6600	0.0000	0.0000	45.0000	704.7000 (32)
Party Floor 1			37.6000			40.0000	1504.0000 (32d)
Party Ceiling 1			37.6000			30.0000	1128.0000 (32b)
Internal Wall 1			21.8000			9.0000	196.2000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	6690.7000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							177.9442 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	

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E2 Other lintels (including other steel lintels)	6.3000	0.1500	0.9450
E3 Sill	5.1000	0.0400	0.2040
E4 Jamb	18.1400	0.0500	0.9070
E7 Party floor between dwellings (in blocks of flats)	15.3000	0.1000	1.5300
E7 Party floor between dwellings (in blocks of flats)	20.2000	0.1400	2.8280
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	10.3000	0.2500	2.5750
E16 Corner (normal)	5.0000	0.0900	0.4500
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250
E18 Party wall between dwellings	2.5000	0.0600	0.1500
E25 Staggered party wall between dwellings	7.5000	0.1200	0.9000
P2 Party wall - Intermediate floor within a dwelling	11.6000	0.0000	0.0000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			10.2640 (36)
Point Thermal Bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	30.5281 (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	7.5446	7.4545	7.3643	6.9136	6.8234	6.3727	6.3727	6.2825	6.5530	6.8234	7.0037	7.1840 (38)
Average = Sum(39)m / 12 =	38.0728	37.9826	37.8925	37.4417	37.3516	36.9008	36.9008	36.8107	37.0811	37.3516	37.5319	37.7122 (39)
												37.4192
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0126	1.0102	1.0078	0.9958	0.9934	0.9814	0.9814	0.9790	0.9862	0.9934	0.9982	1.0030 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	0.9952
												31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.3441 (42)
Hot water usage for mixer showers	52.6002	51.8097	50.6578	48.4539	46.8275	45.0137	43.9827	45.1259	46.3790	48.3265	50.5777	52.3986 (42a)
Hot water usage for baths	20.2297	19.9293	19.5062	18.7261	18.1420	17.4943	17.1444	17.5646	18.0220	18.7151	19.5112	20.1613 (42b)
Hot water usage for other uses	28.3950	27.3625	26.3300	25.2974	24.2649	23.2323	23.2323	24.2649	25.2974	26.3300	27.3625	28.3950 (42c)
Average daily hot water use (litres/day)												93.0654 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	101.2250	99.1015	96.4940	92.4774	89.2343	85.7403	84.3595	86.9553	89.6984	93.3715	97.4514	100.9550 (44)
Energy content (annual)	160.3156	141.1192	148.3076	126.5970	120.1265	105.4277	102.0255	107.6688	110.6071	126.7042	138.8374	158.0712 (45)
Distribution loss (46)m = 0.15 x (45)m	24.0473	21.1679	22.2461	18.9895	18.0190	15.8142	15.3038	16.1503	16.5911	19.0056	20.8256	23.7107 (46)
Water storage loss:												
Store volume												170.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.2000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.6480 (55)
Total storage loss	20.0880	18.1440	20.0880	19.4400	20.0880	19.4400	20.0880	20.0880	19.4400	20.0880	19.4400	20.0880 (56)
If cylinder contains dedicated solar storage	20.0880	18.1440	20.0880	19.4400	20.0880	19.4400	20.0880	20.0880	19.4400	20.0880	19.4400	20.0880 (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	203.6660	180.2744	191.6580	168.5490	163.4769	147.3797	145.3759	151.0192	152.5591	170.0546	180.7894	201.4216 (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	203.6660	180.2744	191.6580	168.5490	163.4769	147.3797	145.3759	151.0192	152.5591	170.0546	180.7894	201.4216 (64)
Total per year (kWh/year)												2056.2239 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Heat gains from water heating, kWh/month	87.9852	78.2463	83.9926	75.6551	74.6224	68.6163	68.6038	70.4802	70.3385	76.8095	79.7250	87.2390 (65)

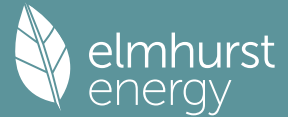
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	67.2056	67.2056	67.2056	67.2056	67.2056	67.2056	67.2056	67.2056	67.2056	67.2056	67.2056	67.2056 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	58.2808	64.5252	58.2808	60.2235	58.2808	60.2235	58.2808	58.2808	60.2235	58.2808	60.2235	58.2808 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	115.5483	116.7473	113.7258	107.2933	99.1735	91.5420	86.4437	85.2447	88.2662	94.6987	102.8185	110.4500 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.7206	29.7206	29.7206	29.7206	29.7206	29.7206	29.7206	29.7206	29.7206	29.7206	29.7206	29.7206 (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)	-53.7645	-53.7645	-53.7645	-53.7645	-53.7645	-53.7645	-53.7645	-53.7645	-53.7645	-53.7645	-53.7645	-53.7645 (71)
Water heating gains (Table 5)	118.2597	116.4379	112.8933	105.0765	100.2989	95.3004	92.2094	94.7315	97.6923	103.2385	110.7292	117.2567 (72)
Total internal gains	335.2505	340.8721	328.0616	315.7550	300.9149	290.2277	280.0956	281.4187	289.3437	299.3797	316.9329	329.1492 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Southwest	2.8800	36.7938	0.3500	0.8000	0.7700	20.5617 (79)
Northwest	8.1600	11.2829	0.3500	0.8000	0.7700	17.8650 (81)

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Solar gains	38.4267	71.3889	113.4394	166.9762	211.1416	220.2218	207.9031	173.3321	131.7234	83.1498	47.1070	32.1860 (83)
Total gains	373.6772	412.2611	441.5009	482.7312	512.0565	510.4494	487.9988	454.7508	421.0671	382.5295	364.0399	361.3352 (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	48.8151	48.9310	49.0474	49.6379	49.7577	50.3655	50.3655	50.4889	50.1206	49.7577	49.5187	49.2819	
alpha	4.2543	4.2621	4.2698	4.3092	4.3172	4.3577	4.3577	4.3659	4.3414	4.3172	4.3012	4.2855	
util living area	0.9542	0.9306	0.8872	0.7850	0.6316	0.4539	0.3309	0.3692	0.5782	0.8181	0.9245	0.9592 (86)	
Living	19.9344	20.1299	20.3973	20.7161	20.9081	20.9828	20.9965	20.9945	20.9523	20.7105	20.2910	19.9023	
Non living	18.8620	19.1044	19.4305	19.8076	20.0114	20.0880	20.0974	20.0984	20.0614	19.8126	19.3149	18.8282	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.4549	20.1299	20.3973	20.7161	20.9081	20.9828	20.9965	20.9945	20.9523	20.7105	20.2910	20.0559 (87)	
Th 2	20.0729	20.0749	20.0769	20.0868	20.0888	20.0989	20.0989	20.1009	20.0948	20.0888	20.0848	20.0808 (88)	
util rest of house	0.9453	0.9176	0.8666	0.7500	0.5812	0.3932	0.2640	0.2985	0.5118	0.7797	0.9083	0.9511 (89)	
MIT 2	19.5901	19.1044	19.4305	19.8076	20.0114	20.0880	20.0974	20.0984	20.0614	19.8126	19.3149	19.0539 (90)	
Living area fraction									fLA = Living area / (4) =				0.8750 (91)
MIT	20.3468	20.0017	20.2764	20.6026	20.7960	20.8709	20.8842	20.8825	20.8410	20.5983	20.1690	19.9306 (92)	
Temperature adjustment												0.0000	
adjusted MIT	20.3468	20.0017	20.2764	20.6026	20.7960	20.8709	20.8842	20.8825	20.8410	20.5983	20.1690	19.9306 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9481	0.9165	0.8714	0.7704	0.6207	0.4453	0.3223	0.3601	0.5669	0.8021	0.9100	0.9496 (94)
Useful gains	354.2900	377.8284	384.7076	371.8871	317.8211	227.3167	157.3005	163.7403	238.7105	306.8089	331.2622	343.1355 (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	610.9461	573.6031	522.0229	438.1637	339.7509	231.4013	158.0888	165.0033	249.9624	373.4516	490.5048	593.2358 (97)
Space heating kWh	190.9521	131.5606	102.1625	47.7192	16.3157	0.0000	0.0000	0.0000	0.0000	49.5822	114.6546	186.0746 (98a)
Space heating requirement - total per year (kWh/year)												839.0216
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	190.9521	131.5606	102.1625	47.7192	16.3157	0.0000	0.0000	0.0000	0.0000	49.5822	114.6546	186.0746 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												839.0216
Space heating per m2										(98c) / (4) =		22.3144 (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 %)												214.2510 (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	190.9521	131.5606	102.1625	47.7192	16.3157	0.0000	0.0000	0.0000	0.0000	49.5822	114.6546	186.0746 (98)
Space heating efficiency (main heating system 1)	214.2510	214.2510	214.2510	214.2510	214.2510	0.0000	0.0000	0.0000	0.0000	214.2510	214.2510	214.2510 (210)
Space heating fuel (main heating system)	89.1254	61.4049	47.6836	22.2726	7.6152	0.0000	0.0000	0.0000	0.0000	23.1421	53.5142	86.8489 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	203.6660	180.2744	191.6580	168.5490	163.4769	147.3797	145.3759	151.0192	152.5591	170.0546	180.7894	201.4216 (64)
Efficiency of water heater (217)m	185.6384	185.6384	185.6384	185.6384	185.6384	185.6384	185.6384	185.6384	185.6384	185.6384	185.6384	185.6384 (216)
Fuel for water heating, kWh/month	109.7111	97.1105	103.2427	90.7942	88.0620	79.3907	78.3113	81.3513	82.1808	91.6053	97.3879	108.5021 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	6.2141	5.6127	6.2141	6.0136	6.2141	6.0136	6.2141	6.2141	6.0136	6.2141	6.0136	6.2141 (231)
Lighting	12.9335	10.3758	9.3422	6.8445	5.2869	4.3194	4.8229	6.2690	8.1428	10.6838	12.0673	13.2930 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-19.9942	-32.7645	-54.7108	-67.5054	-75.8318	-71.1465	-69.9205	-64.0430	-52.7289	-39.4757	-23.0616	-16.5532 (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												391.6069 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												185.6384
Water heating fuel used												1107.6499 (219)

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Space cooling fuel	0.0000 (221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.6380)	
mechanical ventilation fans (SFP = 0.6380)	73.1658 (230a)
Total electricity for the above, kWh/year	73.1658 (231)
Electricity for lighting (calculated in Appendix L)	104.3811 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-587.7363 (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	1089.0674 (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	391.6069	0.1563	61.2223 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1107.6499	0.1409	156.0311 (264)
Space and water heating			217.2534 (265)
Pumps, fans and electric keep-hot	73.1658	0.1387	10.1490 (267)
Energy for lighting	104.3811	0.1443	15.0654 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-587.7363	0.1327	-77.9889
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-77.9889 (269)
Total CO2, kg/year			164.4789 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.3700 (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	391.6069	1.5788	618.2521 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1107.6499	1.5209	1684.5945 (278)
Space and water heating			2302.8466 (279)
Pumps, fans and electric keep-hot	73.1658	1.5128	110.6853 (281)
Energy for lighting	104.3811	1.5338	160.1032 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-587.7363	1.4903	-875.9162
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-875.9162 (283)
Total Primary energy kWh/year			1697.7189 (286)
Dwelling Primary energy Rate (DPER)			45.1500 (287)

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

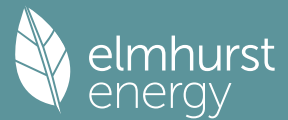
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	37.6000 (1b)	2.5000 (2b)	94.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	37.6000		94.0000 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	94.0000 (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) = 0.2128 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4628 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3586 (21)

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Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Effective ac	0.4573	0.4483	0.4393	0.3945	0.3855	0.3407	0.3407	0.3317	0.3586	0.3855	0.4035	0.4214	(22b)
	0.6045	0.6005	0.5965	0.5778	0.5743	0.5580	0.5580	0.5550	0.5643	0.5743	0.5814	0.5888	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.2000	1.0000	1.2000			(26)
TER Opening Type (Uw = 1.20)			8.2000	1.1450	9.3893			(27)
External Wall	37.6000	8.2000	29.4000	0.1800	5.2920			(29a)
Corridor Wall	27.2700	1.2000	26.0700	0.1800	4.6926			(29a)
Total net area of external elements Aum(A, m2)			64.8700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	20.5739			(33)
Party Wall 1			15.6600	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							187.9442	(35)
List of Thermal Bridges								
K1 Element				Length	Psi-value		Total	
E2 Other lintels (including other steel lintels)				6.3000	0.0500		0.3150	
E3 Sill				5.1000	0.0500		0.2550	
E4 Jamb				18.1400	0.0500		0.9070	
E7 Party floor between dwellings (in blocks of flats)				15.3000	0.0700		1.0710	
E7 Party floor between dwellings (in blocks of flats)				20.2000	0.0700		1.4140	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation				10.3000	0.0200		0.2060	
E16 Corner (normal)				5.0000	0.0900		0.4500	
E17 Corner (inverted - internal area greater than external area)				2.5000	-0.0900		-0.2250	
E18 Party wall between dwellings				2.5000	0.0600		0.1500	
E25 Staggered party wall between dwellings				7.5000	0.0600		0.4500	
P2 Party wall - Intermediate floor within a dwelling				11.6000	0.0000		0.0000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.9930	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss						(33) + (36) + (36a) =	25.5669	(37)

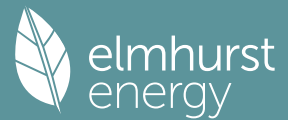
4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.3441	(42)
Hot water usage for mixer showers	46.7557	46.0531	45.0292	43.0701	41.6244	40.0122	39.0958	40.1119	41.2258	42.9569	44.9580	46.5766	(42a)	
Hot water usage for baths	20.2297	19.9293	19.5062	18.7261	18.1420	17.4943	17.1444	17.5646	18.0220	18.7151	19.5112	20.1613	(42b)	
Hot water usage for other uses	28.3950	27.3625	26.3300	25.2974	24.2649	23.2323	23.2323	24.2649	25.2974	26.3300	27.3625	28.3950	(42c)	
Average daily hot water use (litres/day)													87.6770	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Energy content (annual)	95.3805	93.3449	90.8653	87.0937	84.0313	80.7388	79.4725	81.9413	84.5452	88.0019	91.8317	95.1330	(44)	
Distribution loss (46)m = 0.15 x (45)m	151.0594	132.9218	139.6566	119.2269	113.1222	99.2777	96.1151	101.4605	104.2527	119.4177	130.8311	148.9552	(45)	
Water storage loss:										Total = Sum(45)m =		1456.2969		
Store volume	22.6589	19.9383	20.9485	17.8840	16.9683	14.8917	14.4173	15.2191	15.6379	17.9127	19.6247	22.3433	(46)	
a) If manufacturer declared loss factor is known (kWh/day):													170.0000	(47)
Temperature factor from Table 2b													1.5003	(48)
Enter (49) or (54) in (55)													0.5400	(49)
Total storage loss													0.8102	(55)
If cylinder contains dedicated solar storage	25.1153	22.6848	25.1153	24.3051	25.1153	24.3051	25.1153	25.1153	24.3051	25.1153	24.3051	25.1153	(56)	
Primary loss	25.1153	22.6848	25.1153	24.3051	25.1153	24.3051	25.1153	25.1153	24.3051	25.1153	24.3051	25.1153	(57)	
Combi 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)	
Total heat required for water heating calculated for each month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)	
WWHRS	199.4371	176.6178	188.0343	166.0440	161.4999	146.0949	144.4928	149.8382	151.0698	167.7954	177.6482	197.3329	(62)	
PV diverter	-21.3748	-18.9040	-19.7952	-16.3912	-15.2760	-13.0718	-12.2527	-13.0295	-13.5246	-15.9440	-18.0626	-20.9789	(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	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)	
12Total per year (kWh/year)	178.0623	157.7138	168.2391	149.6528	146.2239	133.0231	132.2401	136.8086	137.5452	151.8514	159.5856	176.3540	(64)	
Electric shower(s)								Total per year (kWh/year) = Sum(64)m =				1827.3000	(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														
	88.9294	79.1533	85.1380	77.0966	76.3153	70.4636	70.6604	72.4378	72.1177	78.4085	80.9550	88.2298	(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	67.2056	67.2056	67.2056	67.2056	67.2056	67.2056	67.2056	67.2056	67.2056	67.2056	67.2056	67.2056	(66)

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	58.3191	64.5676	58.3191	60.2631	58.3191	60.2631	58.3191	58.3191	60.2631	58.3191	60.2631	58.3191 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	115.5483	116.7473	113.7258	107.2933	99.1735	91.5420	86.4437	85.2447	88.2662	94.6987	102.8185	110.4500 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.7206	29.7206	29.7206	29.7206	29.7206	29.7206	29.7206	29.7206	29.7206	29.7206	29.7206	29.7206 (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)	-53.7645	-53.7645	-53.7645	-53.7645	-53.7645	-53.7645	-53.7645	-53.7645	-53.7645	-53.7645	-53.7645	-53.7645 (71)
Water heating gains (Table 5)	119.5288	117.7876	114.4328	107.0787	102.5743	97.8660	94.9737	97.3626	100.1635	105.3878	112.4376	118.5884 (72)
Total internal gains	339.5578	345.2642	332.6393	320.7967	306.2286	292.8328	282.8982	284.0881	291.8545	304.5673	321.6808	333.5191 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d		Gains W	
Southwest				2.1400	36.7938	0.6300	0.7000		0.7700		24.0636 (79)	
Northwest				6.0600	11.2829	0.6300	0.7000		0.7700		20.8962 (81)	
Solar gains	44.9598	83.5240	132.7174	195.3451	247.0086	257.6291	243.2188	202.7788	154.1062	97.2827	55.1154	37.6583 (83)
Total gains	384.5176	428.7882	465.3567	516.1418	553.2372	550.4619	526.1170	486.8668	445.9606	401.8499	376.7962	371.1774 (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	44.2909	44.4171	44.5415	45.1353	45.2482	45.7811	45.7811	45.8811	45.5743	45.2482	45.0204	44.7848
alpha	3.9527	3.9611	3.9694	4.0090	4.0165	4.0521	4.0521	4.0587	4.0383	4.0165	4.0014	3.9857
util living area	0.9624	0.9418	0.9027	0.8080	0.6594	0.4832	0.3550	0.3981	0.6168	0.8441	0.9377	0.9666 (86)
MIT	19.6958	19.9149	20.2273	20.6133	20.8630	20.9700	20.9932	20.9893	20.9215	20.6032	20.1055	19.6654 (87)
Th 2	20.4106	20.4123	20.4140	20.4217	20.4231	20.4298	20.4298	20.4311	20.4272	20.4231	20.4202	20.4171 (88)
util rest of house	0.9581	0.9353	0.8919	0.7883	0.6288	0.4438	0.3102	0.3508	0.5756	0.8234	0.9297	0.9627 (89)
MIT 2	19.1926	19.4090	19.7147	20.0881	20.3148	20.4097	20.4262	20.4252	20.3710	20.0855	19.6045	19.1677 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.6329	19.8517	20.1632	20.5477	20.7944	20.8999	20.9223	20.9188	20.8527	20.5385	20.0429	19.6032 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.6329	19.8517	20.1632	20.5477	20.7944	20.8999	20.9223	20.9188	20.8527	20.5385	20.0429	19.6032 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9514	0.9283	0.8869	0.7928	0.6487	0.4764	0.3489	0.3914	0.6065	0.8278	0.9239	0.9563 (94)
Useful gains	365.8234	398.0445	412.7211	409.1959	358.8901	262.2206	183.5711	190.5612	270.4807	332.6506	348.1219	354.9570 (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	679.5557	660.7747	602.1452	506.5670	394.5383	270.1245	185.3308	193.3322	290.8505	431.1554	564.3336	675.1414 (97)
Space heating kWh	233.4168	176.5547	140.9316	70.1072	26.5223	0.0000	0.0000	0.0000	0.0000	73.2876	155.6724	238.2172 (98a)
Space heating requirement - total per year (kWh/year)												1114.7099
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	233.4168	176.5547	140.9316	70.1072	26.5223	0.0000	0.0000	0.0000	0.0000	73.2876	155.6724	238.2172 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1114.7099
Space heating per m2										(98c) / (4) =		29.6465 (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	233.4168	176.5547	140.9316	70.1072	26.5223	0.0000	0.0000	0.0000	0.0000	73.2876	155.6724	238.2172 (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)	252.8893	191.2835	152.6886	75.9558	28.7349	0.0000	0.0000	0.0000	0.0000	79.4015	168.6592	258.0901 (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	178.0623	157.7138	168.2391	149.6528	146.2239	133.0231	132.2401	136.8086	137.5452	151.8514	159.5856	176.3540 (64)
Efficiency of water heater (217)m	84.6678	84.3135	83.6653	82.4664	81.0614	79.8000	79.8000	79.8000	79.8000	82.5226	84.0041	79.8000 (216)
Fuel for water heating, kWh/month	210.3070	187.0565	201.0859	181.4713	180.3867	166.6956	165.7144	171.4394	172.3624	184.0119	189.9735	208.1248 (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	12.1176	9.7212	8.7528	6.4127	4.9533	4.0469	4.5186	5.8735	7.6290	10.0097	11.3060	12.4543 (232)

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Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-18.1881	-25.9590	-37.8003	-43.1231	-47.0993	-44.2564	-43.7809	-41.0707	-36.3274	-30.0315	-20.1345	-15.6935	(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	-9.3388	-19.7446	-39.3998	-59.3751	-78.6604	-79.0215	-78.0222	-65.9348	-48.2083	-28.2236	-12.4714	-7.3719	(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												1207.7030	(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												2218.6293	(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)												97.7956	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-929.2371	(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												2680.8909	(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	1207.7030	0.2100	253.6176	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2218.6293	0.2100	465.9122	(264)
Space and water heating			719.5298	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	97.7956	0.1443	14.1149	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-403.4648	0.1343	-54.1702	
PV Unit electricity exported	-525.7722	0.1258	-66.1524	
Total			-120.3226	(269)
Total CO2, kg/year			625.2514	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.6300	(273)

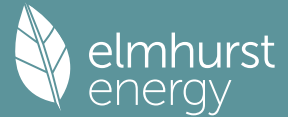
13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1207.7030	1.1300	1364.7044	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2218.6293	1.1300	2507.0512	(278)
Space and water heating			3871.7555	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	97.7956	1.5338	150.0022	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-403.4648	1.4962	-603.6612	
PV Unit electricity exported	-525.7722	0.4618	-242.8239	
Total			-846.4851	(283)
Total Primary energy kWh/year			3305.3733	(286)
Target Primary Energy Rate (TPER)			87.9100	(287)

Appendix G

SAP TER/DER Worksheets – *Refurbishment, Be Green*

Full SAP Calculation Printout



Property Reference	House Type 1 End - Refurb				Issued on Date	30/08/2024
Assessment Reference	Type 1 End - Improved GREEN			Prop Type Ref		
Property	House Type 1, Edmansons Close, Tottenham, N17 6XD					
SAP Rating	31 F	DER	22.17	TER	14.01	
Environmental	85 B	% DER < TER				-58.24
CO ₂ Emissions (t/year)	0.9	DFEE	108.94	TFEE	42.76	
Compliance Check	See BREL	% DFEE < TFEE				-154.75
% DPER < TPER	-211.67	DPER	229.70	TPER	73.70	
Assessor Details	Miss Eleanor Ballinger				Assessor ID	M976-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	30.0000 (1b)	x 2.4000 (2b)	= 72.0000 (1b) - (3b)
First floor	17.8000 (1c)	x 2.6000 (2c)	= 46.2800 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	47.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 118.2800 (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	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) = 0.2536 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	8.0000 (17)
Infiltration rate	0.6536 (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) = 0.6046 (21)

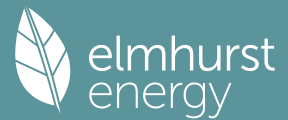
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.7709	0.7558	0.7407	0.6651	0.6500	0.5744	0.5744	0.5593	0.6046	0.6500	0.6802	0.7104 (22b)
Effective ac	0.7971	0.7856	0.7743	0.7212	0.7112	0.6650	0.6650	0.6564	0.6828	0.7112	0.7313	0.7523 (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
Front door			1.8900	3.0000	5.6700		(26)
Refurb (Uw = 2.70)			4.4500	2.4368	10.8439		(27)
New (Uw = 1.40)			3.6800	1.3258	4.8788		(27)
Ground floor			30.0000	0.4500	13.5000		(28a)
External Wall	71.4800	10.0200	61.4600	0.5500	33.8030		(29a)
1st Floor	17.8000		17.8000	0.1100	1.9580		(30)
Ground floor	12.2000		12.2000	0.1100	1.3420		(30)
Total net area of external elements Aum(A, m ²)			131.4800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	71.9957		(33)
Party Wall			26.1100	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							26.2960 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	98.2917 (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
	31.1139	30.6635	30.2221	28.1487	27.7607	25.9549	25.9549	25.6205	26.6505	27.7607	28.5455	29.3660 (38)

Full SAP Calculation Printout



Heat transfer coeff
129.4055 128.9552 128.5137 126.4403 126.0524 124.2465 124.2465 123.9121 124.9421 126.0524 126.8372 127.6576 (39)
Average = Sum(39)m / 12 = 126.4385

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.7072	2.6978	2.6886	2.6452	2.6371	2.5993	2.5993	2.5923	2.6139	2.6371	2.6535	2.6707	(40)
HLP (average)												2.6452	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.6256 (42)
Hot water usage for mixer showers 57.9094 57.0391 55.7709 53.3446 51.5540 49.5571 48.4221 49.6807 51.0603 53.2043 55.6828 57.6875 (42a)
Hot water usage for baths 22.2592 21.9286 21.4631 20.6047 19.9620 19.2493 18.8644 19.3266 19.8300 20.5925 21.4686 22.1839 (42b)
Hot water usage for other uses 31.2775 30.1401 29.0028 27.8654 26.7280 25.5907 25.5907 26.7280 27.8654 29.0028 30.1401 31.2775 (42c)
Average daily hot water use (litres/day) 102.4623 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	111.4460	109.1078	106.2368	101.8147	98.2440	94.3971	92.8772	95.7353	98.7556	102.7996	107.2915	111.1489	(44)
Energy conte	176.5033	155.3681	163.2820	139.3792	132.2553	116.0723	112.3269	118.5403	121.7756	139.4981	152.8564	174.0323	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m	26.4755	23.3052	24.4923	20.9069	19.8383	17.4108	16.8490	17.7811	18.2663	20.9247	22.9285	26.1048	(46)
Water storage loss:													
Store volume													50.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.2000 (48)
Temperature factor from Table 2b													0.6000 (49)
Enter (49) or (54) in (55)													0.7200 (55)
Total storage loss	22.3200	20.1600	22.3200	21.6000	22.3200	21.6000	22.3200	22.3200	21.6000	22.3200	21.6000	22.3200	(56)
If cylinder contains dedicated solar storage	22.3200	20.1600	22.3200	21.6000	22.3200	21.6000	22.3200	22.3200	21.6000	22.3200	21.6000	22.3200	(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	198.8233	175.5281	185.6020	160.9792	154.5753	137.6723	134.6469	140.8603	143.3756	161.8181	174.4564	196.3523	(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	198.8233	175.5281	185.6020	160.9792	154.5753	137.6723	134.6469	140.8603	143.3756	161.8181	174.4564	196.3523	(64)
12Total per year (kWh/year)													1964.6897 (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	76.5433	67.7879	72.1473	63.6236	61.8309	55.8740	55.2047	57.2707	57.7704	64.2391	68.1047	75.7217	(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	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	73.6144	81.5017	73.6144	76.0682	73.6144	76.0682	73.6144	73.6144	76.0682	73.6144	76.0682	73.6144	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	141.5228	142.9913	139.2906	131.4122	121.4671	112.1201	105.8757	104.4072	108.1079	115.9863	125.9314	135.2784	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	(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)	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	(71)
Water heating gains (Table 5)	102.8808	100.8748	96.9721	88.3661	83.1060	77.6028	74.1998	76.9767	80.2366	86.3429	94.5899	101.7765	(72)
Total internal gains	368.4016	375.7514	360.2607	346.2301	328.5712	313.1748	301.0736	302.3819	311.7964	326.3273	346.9732	361.0530	(73)

6. Solar gains

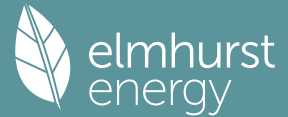
[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W							
Northeast	1.0600	11.2829	0.8500	0.7000	0.7700	4.9315	(75)						
Southwest	3.3900	36.7938	0.8500	0.7000	0.7700	51.4310	(79)						
Northeast	3.6800	11.2829	0.6300	0.7000	0.7700	12.6894	(75)						
Solar gains	69.0519	123.4739	184.4889	254.6490	309.0129	317.2404	301.4998	259.3424	208.5335	140.6567	83.7742	58.4043	(83)
Total gains	437.4535	499.2253	544.7496	600.8791	637.5841	630.4152	602.5734	561.7243	520.3299	466.9840	430.7473	419.4573	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	25.6515	25.7411	25.8295	26.2531	26.3338	26.7166	26.7166	26.7887	26.5679	26.3338	26.1709	26.0027	
alpha	2.7101	2.7161	2.7220	2.7502	2.7556	2.7811	2.7811	2.7859	2.7712	2.7556	2.7447	2.7335	
util living area	0.9895	0.9841	0.9749	0.9521	0.9052	0.8141	0.6988	0.7412	0.8850	0.9618	0.9841	0.9907	(86)
MIT	17.9806	18.2274	18.6660	19.3117	19.9498	20.4997	20.7771	20.7271	20.2890	19.4792	18.6425	17.9634	(87)

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Th 2	18.9035	18.9087	18.9138	18.9379	18.9424	18.9637	18.9637	18.9677	18.9555	18.9424	18.9333	18.9237 (88)
util rest of house	0.9854	0.9778	0.9640	0.9283	0.8485	0.6779	0.4511	0.5094	0.7884	0.9377	0.9766	0.9871 (89)
MIT 2	16.3550	16.6024	17.0391	17.6840	18.2861	18.7600	18.9250	18.9108	18.6077	17.8595	17.0315	16.3499 (90)
Living area fraction									FLA = Living area / (4) =			0.3734 (91)
MIT	16.9621	17.2092	17.6466	18.2918	18.9074	19.4097	19.6166	19.5891	19.2355	18.4643	17.6331	16.9524 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.8121	17.0592	17.4966	18.1418	18.7574	19.2597	19.4666	19.4391	19.0855	18.3143	17.4831	16.8024 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9788	0.9691	0.9528	0.9150	0.8415	0.7035	0.5262	0.5774	0.7970	0.9265	0.9682	0.9811	(94)
Useful gains	428.1797	483.8068	519.0163	549.8008	536.5186	443.4781	317.0678	324.3444	414.6939	432.6378	417.0481	411.5412	(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	1619.1310	1567.9891	1413.2181	1168.5409	889.5977	578.9492	356.1681	376.5783	622.9043	972.4085	1316.9614	1608.7946	(97)
Space heating kWh	886.0678	728.5705	665.2862	445.4928	262.6908	0.0000	0.0000	0.0000	0.0000	401.5894	647.9375	890.7565	(98a)
Space heating requirement - total per year (kWh/year)												4928.3915	
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	886.0678	728.5705	665.2862	445.4928	262.6908	0.0000	0.0000	0.0000	0.0000	401.5894	647.9375	890.7565	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4928.3915	
Space heating per m2											(98c) / (4) =	103.1044	(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 %)													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	886.0678	728.5705	665.2862	445.4928	262.6908	0.0000	0.0000	0.0000	0.0000	401.5894	647.9375	890.7565 (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)	886.0678	728.5705	665.2862	445.4928	262.6908	0.0000	0.0000	0.0000	0.0000	401.5894	647.9375	890.7565 (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	198.8233	175.5281	185.6020	160.9792	154.5753	137.6723	134.6469	140.8603	143.3756	161.8181	174.4564	196.3523 (64)	
Efficiency of water heater	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000 (216)	
Fuel for water heating, kWh/month	198.8233	175.5281	185.6020	160.9792	154.5753	137.6723	134.6469	140.8603	143.3756	161.8181	174.4564	196.3523 (219)	
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)	
Pumps and Fa	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822 (231)	
Lighting	15.2956	12.2707	11.0484	8.0945	6.2525	5.1083	5.7037	7.4139	9.6299	12.6350	14.2712	15.7207 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)	
Annual totals kWh/year													
Space heating fuel - main system 1												4928.3915 (211)	
Space heating fuel - main system 2												0.0000 (213)	
Space heating fuel - secondary												0.0000 (215)	
Efficiency of water heater												100.0000	
Water heating fuel used												1964.6897 (219)	
Space cooling fuel												0.0000 (221)	
Electricity for pumps and fans:													
central heating pump												41.0000 (230c)	
Total electricity for the above, kWh/year												41.0000 (231)	
Electricity for lighting (calculated in Appendix L)												123.4445 (232)	
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000 (233)	
Wind generation												0.0000 (234)	
Hydro-electric generation (Appendix N)												0.0000 (235a)	
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)	
Appendix Q - special features													
Energy saved or generated												-0.0000 (236)	
Energy used												0.0000 (237)	
Total delivered energy for all uses												7057.5256 (238)	

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

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	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	4928.3915	0.1540	758.8178 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1964.6897	0.1412	277.4040 (264)
Space and water heating			1036.2218 (265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872 (267)
Energy for lighting	123.4445	0.1443	17.8168 (268)
Total CO2, kg/year			1059.7259 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			22.1700 (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	4928.3915	1.5700	7737.7380 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1964.6897	1.5221	2990.4579 (278)
Space and water heating			10728.1958 (279)
Pumps, fans and electric keep-hot	41.0000	1.5128	62.0248 (281)
Energy for lighting	123.4445	1.5338	189.3432 (282)
Total Primary energy kWh/year			10979.5639 (286)
Dwelling Primary energy Rate (DPER)			229.7000 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	30.0000 (1b)	x 2.4000 (2b)	= 72.0000 (1b) - (3b)
First floor	17.8000 (1c)	x 2.6000 (2c)	= 46.2800 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	47.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	118.2800 (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) = 0.1691 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4191 (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) = 0.3877 (21)

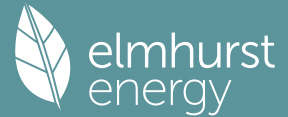
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4943	0.4846	0.4749	0.4264	0.4167	0.3683	0.3683	0.3586	0.3877	0.4167	0.4361	0.4555 (22b)
Effective ac	0.6221	0.6174	0.6128	0.5909	0.5868	0.5678	0.5678	0.5643	0.5751	0.5868	0.5951	0.6037 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.20)			8.1300	1.1450	9.3092		(27)
Ground Floor			30.0000	0.1300	3.9000		(28a)
External Wall	71.4800	10.0200	61.4600	0.1800	11.0628		(29a)
1st Floor	17.8000		17.8000	0.1100	1.9580		(30)
Ground floor	12.2000		12.2000	0.1100	1.3420		(30)
Total net area of external elements Aum(A, m2)			131.4800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.4620		(33)
Party Wall			26.1100	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (User defined value 0.050 * total exposed area)							6.5740 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	36.0360 (37)

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

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(38)m	Jan 24.2840	Feb 24.0988	Mar 23.9173	Apr 23.0650	May 22.9055	Jun 22.1631	Jul 22.1631	Aug 22.0256	Sep 22.4491	Oct 22.9055	Nov 23.2281	Dec 23.5654	(38)
Heat transfer coeff	60.3199	60.1348	59.9533	59.1009	58.9415	58.1991	58.1991	58.0616	58.4850	58.9415	59.2641	59.6014	(39)
Average = Sum(39)m / 12 =												59.1002	
HLP	Jan 1.2619	Feb 1.2580	Mar 1.2543	Apr 1.2364	May 1.2331	Jun 1.2176	Jul 1.2176	Aug 1.2147	Sep 1.2235	Oct 1.2331	Nov 1.2398	Dec 1.2469	(40)
HLP (average)												1.2364	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.6256	(42)
Hot water usage for mixer showers														
51.4750	50.7014	49.5742	47.4174	45.8258	44.0508	43.0419	44.1606	45.3869	47.2927	49.4958	51.2778	(42a)		
Hot water usage for baths														
22.2592	21.9286	21.4631	20.6047	19.9620	19.2493	18.8644	19.3266	19.8300	20.5925	21.4686	22.1839	(42b)		
Hot water usage for other uses														
31.2775	30.1401	29.0028	27.8654	26.7280	25.5907	25.5907	26.7280	27.8654	29.0028	30.1401	31.2775	(42c)		
Average daily hot water use (litres/day)													96.5301	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Daily hot water use														
105.0116	102.7701	100.0400	95.8875	92.5158	88.8908	87.4969	90.2153	93.0823	96.8880	101.1045	104.7392	(44)		
Energy content (annual)	166.3128	146.3433	153.7578	131.2652	124.5440	109.3016	105.8199	111.7053	114.7797	131.4761	144.0419	163.9962	(45)	
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1603.3439		
24.9469	21.9515	23.0637	19.6898	18.6816	16.3952	15.8730	16.7558	17.2170	19.7214	21.6063	24.5994	(46)		
Water storage loss:														
Store volume													50.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):													0.7584	(48)
Temperature factor from Table 2b													0.5400	(49)
Enter (49) or (54) in (55)													0.4095	(55)
Total storage loss														
12.6948	11.4663	12.6948	12.2853	12.6948	12.2853	12.6948	12.6948	12.2853	12.6948	12.2853	12.6948	(56)		
If cylinder contains dedicated solar storage														
12.6948	11.4663	12.6948	12.2853	12.6948	12.2853	12.6948	12.6948	12.2853	12.6948	12.2853	12.6948	(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														
202.2700	178.8208	189.7149	166.0625	160.5012	144.0988	141.7771	147.6625	149.5770	167.4333	178.8392	199.9534	(62)		
WWHRS	-23.5322	-20.8121	-21.7932	-18.0456	-16.8179	-14.3912	-13.4894	-14.3447	-14.8897	-17.5533	-19.8857	-23.0964	(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														
178.7377	158.0087	167.9217	148.0169	143.6833	129.7077	128.2877	133.3178	134.6873	149.8800	158.9534	176.8570	(64)		
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		1808.0592	(64)	
Electric shower(s)													1808	(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														
84.0647	74.6411	79.8902	71.4835	70.1766	64.1806	63.9509	65.9078	66.0021	72.4816	75.7317	83.2945	(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	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	73.6144	81.5017	73.6144	76.0682	73.6144	76.0682	73.6144	73.6144	76.0682	73.6144	76.0682	73.6144	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	141.5228	142.9913	139.2906	131.4122	121.4671	112.1201	105.8757	104.4072	108.1079	115.9863	125.9314	135.2784	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	(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)	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	(71)
Water heating gains (Table 5)	112.9902	111.0731	107.3793	99.2826	94.3234	89.1397	85.9555	88.5857	91.6696	97.4214	105.1830	111.9550	(72)
Total internal gains	378.5110	385.9497	370.6679	357.1467	339.7885	324.7116	312.8292	313.9909	323.2293	337.4058	357.5662	371.2314	(73)

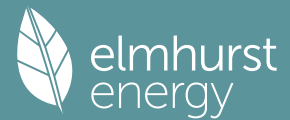
6. Solar gains

[Jan]														
			Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d		Gains W				
Northeast			4.7400	11.2829	0.6300	0.7000		0.7700		16.3445	(75)			
Southwest			3.3900	36.7938	0.6300	0.7000		0.7700		38.1194	(79)			
Solar gains	54.4640	98.2013	148.7837	208.5209	255.6228	263.4786	249.9830	213.3593	169.2369	112.4215	66.2240	45.9701	(83)	
Total gains	432.9750	484.1510	519.4516	565.6676	595.4113	588.1902	562.8122	527.3502	492.4663	449.8272	423.7902	417.2015	(84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)														
tau	Jan 55.0307	Feb 55.2001	Mar 55.3672	Apr 56.1657	May 56.3176	Jun 57.0360	Jul 57.0360	Aug 57.1711	Sep 56.7572	Oct 56.3176	Nov 56.0111	Dec 55.6941		
alpha	4.6687	4.6800	4.6911	4.7444	4.7545	4.8024	4.8024	4.8114	4.7838	4.7545	4.7341	4.7129		
util living area														
0.9888	0.9801	0.9620	0.9071	0.7904	0.6054	0.4493	0.4968	0.7360	0.9265	0.9786	0.9905	0.9905	(86)	

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MIT	19.7270	19.9143	20.1866	20.5540	20.8287	20.9637	20.9929	20.9887	20.9091	20.5665	20.0975	19.7041 (87)
Th 2	19.8708	19.8738	19.8768	19.8910	19.8936	19.9060	19.9060	19.9083	19.9012	19.8936	19.8883	19.8827 (88)
util rest of house	0.9853	0.9739	0.9498	0.8778	0.7302	0.5134	0.3406	0.3838	0.6482	0.8967	0.9708	0.9875 (89)
MIT 2	18.4251	18.6633	19.0054	19.4573	19.7571	19.8866	19.9039	19.9046	19.8442	19.4842	18.9073	18.4045 (90)
Living area fraction									fLA = Living area / (4) =			0.3734 (91)
MIT	18.9113	19.1305	19.4465	19.8669	20.1573	20.2888	20.3106	20.3094	20.2418	19.8883	19.3518	18.8898 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9113	19.1305	19.4465	19.8669	20.1573	20.2888	20.3106	20.3094	20.2418	19.8883	19.3518	18.8898 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9812	0.9686	0.9440	0.8770	0.7458	0.5467	0.3813	0.4262	0.6774	0.8965	0.9659	0.9839 (94)	
Useful gains	424.8545	468.9288	490.3835	496.0994	444.0322	321.5858	214.6085	224.7324	333.5917	403.2642	409.3403	410.4660 (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	881.3518	855.7459	776.1836	648.1528	498.4847	331.0857	215.9512	226.9886	359.2060	547.4688	726.0893	875.5337 (97)	
Space heating kWh	339.6340	259.9411	212.6353	109.4785	40.5126	0.0000	0.0000	0.0000	0.0000	107.2882	228.0593	346.0104 (98a)	
Space heating requirement - total per year (kWh/year)												1643.5594	
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	339.6340	259.9411	212.6353	109.4785	40.5126	0.0000	0.0000	0.0000	0.0000	107.2882	228.0593	346.0104 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												1643.5594	
Space heating per m2										(98c) / (4) =		34.3841 (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	339.6340	259.9411	212.6353	109.4785	40.5126	0.0000	0.0000	0.0000	0.0000	107.2882	228.0593	346.0104 (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)	367.9675	281.6263	230.3741	118.6116	43.8924	0.0000	0.0000	0.0000	0.0000	116.2385	247.0848	374.8758 (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	178.7377	158.0087	167.9217	148.0169	143.6833	129.7077	128.2877	133.3178	134.6873	149.8800	158.9534	176.8570 (64)	
Efficiency of water heater (217)m	85.4760	85.1686	84.5903	83.3935	81.6194	79.8000	79.8000	79.8000	79.8000	83.3231	84.8687	79.8000 (216)	
Fuel for water heating, kWh/month	209.1087	185.5246	198.5117	177.4920	176.0406	162.5409	160.7615	167.0650	168.7811	179.8780	187.2932	206.7609 (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	15.2956	12.2707	11.0484	8.0945	6.2525	5.1083	5.7037	7.4139	9.6299	12.6350	14.2712	15.7207 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)	-27.2033	-37.9156	-53.9188	-60.0080	-64.2650	-59.9066	-59.2351	-56.1708	-50.6383	-43.1382	-29.7804	-23.5767 (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)	-16.7226	-35.0158	-69.2729	-103.5529	-136.4153	-136.8134	-135.1316	-114.5826	-84.2592	-49.8221	-22.2503	-13.2297 (233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)	
Annual totals kWh/year													
Space heating fuel - main system 1												1780.6710 (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												2179.7582 (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)												123.4445 (232)	
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1482.8252 (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												2687.0486 (238)	

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

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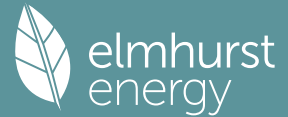


	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1780.6710	0.2100	373.9409 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2179.7582	0.2100	457.7492 (264)
Space and water heating			831.6901 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	123.4445	0.1443	17.8168 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-565.7568	0.1348	-76.2539
PV Unit electricity exported	-917.0683	0.1260	-115.5956
Total			-191.8494 (269)
Total CO2, kg/year			669.5868 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.0100 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1780.6710	1.1300	2012.1583 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2179.7582	1.1300	2463.1268 (278)
Space and water heating			4475.2851 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	123.4445	1.5338	189.3432 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-565.7568	1.4981	-847.5841
PV Unit electricity exported	-917.0683	0.4627	-424.3228
Total			-1271.9070 (283)
Total Primary energy kWh/year			3522.8222 (286)
Target Primary Energy Rate (TPER)			73.7000 (287)

Full SAP Calculation Printout



Property Reference	House Type 1 Mid - Refurb			Issued on Date	30/08/2024
Assessment Reference	Type 1 Mid Improved GREEN	Prop Type Ref			
Property	House Type 1, Edmansons Close, Tottenham, N17 6XD				
SAP Rating	39 E	DER	19.06	TER	12.35
Environmental	87 B	% DER < TER			-54.33
CO ₂ Emissions (t/year)	0.77	DFEE	88.67	TFEE	35.11
Compliance Check	See BREL	% DFEE < TFEE			-152.54
% DPER < TPER	-205.45	DPER	197.84	TPER	64.77
Assessor Details	Miss Eleanor Ballinger			Assessor ID	M976-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	30.0000 (1b)	x 2.4000 (2b)	= 72.0000 (1b) - (3b)
First floor	17.8000 (1c)	x 2.6000 (2c)	= 46.2800 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	47.8000		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 118.2800 (5)
Dwelling volume			

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	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) = 0.2536 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	8.0000 (17)
Infiltration rate	0.6536 (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) = 0.5556 (21)

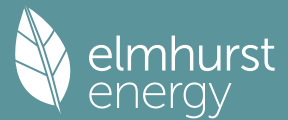
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.7084	0.6945	0.6806	0.6111	0.5973	0.5278	0.5278	0.5139	0.5556	0.5973	0.6250	0.6528 (22b)
Effective ac	0.7509	0.7412	0.7316	0.6868	0.6784	0.6393	0.6393	0.6321	0.6543	0.6784	0.6953	0.7131 (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
Front door			1.8900	3.0000	5.6700		(26)
Refurb (Uw = 2.70)			4.4500	2.4368	10.8439		(27)
New (Uw = 1.40)			3.6800	1.3258	4.8788		(27)
Ground floor			30.0000	0.4500	13.5000		(28a)
External Wall	45.0000	10.0200	34.9800	0.5500	19.2390		(29a)
1st Floor	17.8000		17.8000	0.1100	1.9580		(30)
Ground floor	12.2000		12.2000	0.1100	1.3420		(30)
Total net area of external elements Aum(A, m ²)			105.0000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	57.4317		(33)
Party Wall			52.2200	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							21.0000 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	78.4317 (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
	29.3094	28.9291	28.5564	26.8056	26.4780	24.9531	24.9531	24.6707	25.5405	26.4780	27.1407	27.8335 (38)

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Heat transfer coeff
107.7411 107.3608 106.9880 105.2372 104.9096 103.3848 103.3848 103.1024 103.9721 104.9096 105.5723 106.2651 (39)
Average = Sum(39)m / 12 = 105.2356

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.2540	2.2460	2.2382	2.2016	2.1948	2.1629	2.1629	2.1570	2.1751	2.1948	2.2086	2.2231	(40)
HLP (average)												2.2016	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.6256 (42)
Hot water usage for mixer showers 57.9094 57.0391 55.7709 53.3446 51.5540 49.5571 48.4221 49.6807 51.0603 53.2043 55.6828 57.6875 (42a)
Hot water usage for baths 22.2592 21.9286 21.4631 20.6047 19.9620 19.2493 18.8644 19.3266 19.8300 20.5925 21.4686 22.1839 (42b)
Hot water usage for other uses 31.2775 30.1401 29.0028 27.8654 26.7280 25.5907 25.5907 26.7280 27.8654 29.0028 30.1401 31.2775 (42c)
Average daily hot water use (litres/day) 102.4623 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	111.4460	109.1078	106.2368	101.8147	98.2440	94.3971	92.8772	95.7353	98.7556	102.7996	107.2915	111.1489	(44)
Energy conte	176.5033	155.3681	163.2820	139.3792	132.2553	116.0723	112.3269	118.5403	121.7756	139.4981	152.8564	174.0323	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m	26.4755	23.3052	24.4923	20.9069	19.8383	17.4108	16.8490	17.7811	18.2663	20.9247	22.9285	26.1048	(46)
Water storage loss:													
Store volume													50.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.2000 (48)
Temperature factor from Table 2b													0.6000 (49)
Enter (49) or (54) in (55)													0.7200 (55)
Total storage loss	22.3200	20.1600	22.3200	21.6000	22.3200	21.6000	22.3200	22.3200	21.6000	22.3200	21.6000	22.3200	(56)
If cylinder contains dedicated solar storage	22.3200	20.1600	22.3200	21.6000	22.3200	21.6000	22.3200	22.3200	21.6000	22.3200	21.6000	22.3200	(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	198.8233	175.5281	185.6020	160.9792	154.5753	137.6723	134.6469	140.8603	143.3756	161.8181	174.4564	196.3523	(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	198.8233	175.5281	185.6020	160.9792	154.5753	137.6723	134.6469	140.8603	143.3756	161.8181	174.4564	196.3523	(64)
12Total per year (kWh/year)													1964.6897 (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	76.5433	67.7879	72.1473	63.6236	61.8309	55.8740	55.2047	57.2707	57.7704	64.2391	68.1047	75.7217	(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	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	73.6144	81.5017	73.6144	76.0682	73.6144	76.0682	73.6144	73.6144	76.0682	73.6144	76.0682	73.6144	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	141.5228	142.9913	139.2906	131.4122	121.4671	112.1201	105.8757	104.4072	108.1079	115.9863	125.9314	135.2784	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	(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)	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	(71)
Water heating gains (Table 5)	102.8808	100.8748	96.9721	88.3661	83.1060	77.6028	74.1998	76.9767	80.2366	86.3429	94.5899	101.7765	(72)
Total internal gains	368.4016	375.7514	360.2607	346.2301	328.5712	313.1748	301.0736	302.3819	311.7964	326.3273	346.9732	361.0530	(73)

6. Solar gains

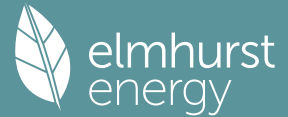
[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W							
Northeast	1.0600	11.2829	0.8500	0.7000	0.7700	4.9315	(75)						
Southwest	3.3900	36.7938	0.8500	0.7000	0.7700	51.4310	(79)						
Northeast	3.6800	11.2829	0.6300	0.7000	0.7700	12.6894	(75)						
Solar gains	69.0519	123.4739	184.4889	254.6490	309.0129	317.2404	301.4998	259.3424	208.5335	140.6567	83.7742	58.4043	(83)
Total gains	437.4535	499.2253	544.7496	600.8791	637.5841	630.4152	602.5734	561.7243	520.3299	466.9840	430.7473	419.4573	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	30.8095	30.9186	31.0263	31.5425	31.6410	32.1077	32.1077	32.1956	31.9263	31.6410	31.4424	31.2374	
alpha	3.0540	3.0612	3.0684	3.1028	3.1094	3.1405	3.1405	3.1464	3.1284	3.1094	3.0962	3.0825	
util living area	0.9899	0.9840	0.9735	0.9462	0.8882	0.7765	0.6437	0.6913	0.8631	0.9578	0.9840	0.9912	(86)
MIT	18.4490	18.6870	19.0890	19.6734	20.2288	20.6741	20.8731	20.8371	20.4929	19.7871	19.0379	18.4309	(87)

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Th 2	19.1694	19.1744	19.1792	19.2023	19.2067	19.2270	19.2270	19.2308	19.2191	19.2067	19.1979	19.1887 (88)
util rest of house	0.9861	0.9780	0.9627	0.9216	0.8298	0.6459	0.4297	0.4855	0.7663	0.9334	0.9768	0.9879 (89)
MIT 2	16.9836	17.2222	17.6218	18.2040	18.7197	19.0922	19.2030	19.1945	18.9668	18.3267	17.5877	16.9781 (90)
Living area fraction									fLA = Living area / (4) =			0.3734 (91)
MIT	17.5308	17.7692	18.1697	18.7527	19.2833	19.6829	19.8266	19.8079	19.5367	18.8721	18.1293	17.5206 (92)
Temperature adjustment												-0.1500
adjusted MIT	17.3808	17.6192	18.0197	18.6027	19.1333	19.5329	19.6766	19.6579	19.3867	18.7221	17.9793	17.3706 (93)

8. Space heating requirement

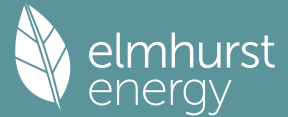
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9805	0.9704	0.9527	0.9104	0.8268	0.6731	0.4918	0.5439	0.7781	0.9239	0.9695	0.9828	(94)
Useful gains	428.9095	484.4263	518.9985	547.0486	527.1254	424.3040	296.3427	305.5117	404.8893	431.4530	417.5881	412.2453	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1409.3399	1365.5445	1232.4723	1021.0896	779.8213	509.9870	318.0773	335.8949	549.6690	852.0840	1148.5489	1399.5783	(97)
Space heating kWh	729.4402	592.1114	530.8245	341.3095	188.0058	0.0000	0.0000	0.0000	0.0000	312.9495	526.2917	734.5758	(98a)
Space heating requirement - total per year (kWh/year)												3955.5084	
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	729.4402	592.1114	530.8245	341.3095	188.0058	0.0000	0.0000	0.0000	0.0000	312.9495	526.2917	734.5758	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3955.5084	
Space heating per m2										(98c) / (4) =		82.7512	(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 %)													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	729.4402	592.1114	530.8245	341.3095	188.0058	0.0000	0.0000	0.0000	0.0000	312.9495	526.2917	734.5758	(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)	729.4402	592.1114	530.8245	341.3095	188.0058	0.0000	0.0000	0.0000	0.0000	312.9495	526.2917	734.5758	(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	198.8233	175.5281	185.6020	160.9792	154.5753	137.6723	134.6469	140.8603	143.3756	161.8181	174.4564	196.3523	(64)
Efficiency of water heater	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(216)
Fuel for water heating, kWh/month	198.8233	175.5281	185.6020	160.9792	154.5753	137.6723	134.6469	140.8603	143.3756	161.8181	174.4564	196.3523	(217)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(219)
(221)m	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822	(221)
Pumps and Fa	15.2956	12.2707	11.0484	8.0945	6.2525	5.1083	5.7037	7.4139	9.6299	12.6350	14.2712	15.7207	(231)
Lighting													(232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
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)
(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	(235a)
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)
(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	(235c)
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)
(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	(233b)
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)
(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	(234b)
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)
(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	(235b)
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)
(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	(235d)
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)
(235d)m													
Annual totals kWh/year													
Space heating fuel - main system 1												3955.5084	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												100.0000	
Water heating fuel used												1964.6897	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
Total electricity for the above, kWh/year												41.0000	(231)
Electricity for lighting (calculated in Appendix L)												123.4445	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												6084.6425	(238)

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

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	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3955.5084	0.1543	610.2438 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1964.6897	0.1412	277.4040 (264)
Space and water heating			887.6478 (265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872 (267)
Energy for lighting	123.4445	0.1443	17.8168 (268)
Total CO2, kg/year			911.1518 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			19.0600 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	3955.5084	1.5712	6214.7957 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1964.6897	1.5221	2990.4579 (278)
Space and water heating			9205.2536 (279)
Pumps, fans and electric keep-hot	41.0000	1.5128	62.0248 (281)
Energy for lighting	123.4445	1.5338	189.3432 (282)
Total Primary energy kWh/year			9456.6217 (286)
Dwelling Primary energy Rate (DPER)			197.8400 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	30.0000 (1b)	x 2.4000 (2b)	= 72.0000 (1b) - (3b)
First floor	17.8000 (1c)	x 2.6000 (2c)	= 46.2800 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	47.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	118.2800 (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) = 0.1691 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4191 (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) = 0.3562 (21)

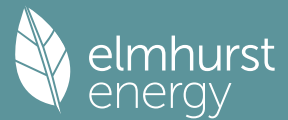
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4542	0.4453	0.4364	0.3918	0.3829	0.3384	0.3384	0.3295	0.3562	0.3829	0.4008	0.4186 (22b)
Effective ac	0.6031	0.5991	0.5952	0.5768	0.5733	0.5573	0.5573	0.5543	0.5634	0.5733	0.5803	0.5876 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.20)			8.1300	1.1450	9.3092		(27)
Ground Floor			30.0000	0.1300	3.9000		(28a)
External Wall	45.0000	10.0200	34.9800	0.1800	6.2964		(29a)
1st Floor	17.8000		17.8000	0.1100	1.9580		(30)
Ground floor	12.2000		12.2000	0.1100	1.3420		(30)
Total net area of external elements Aum(A, m2)			105.0000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.6956		(33)
Party Wall			52.2200	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (User defined value 0.050 * total exposed area)							5.2500 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	29.9456 (37)

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

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(38)m	Jan 23.5422	Feb 23.3858	Mar 23.2326	Apr 22.5128	May 22.3282	Jun 21.7513	Jul 21.7513	Aug 21.6352	Sep 21.9928	Oct 22.3782	Nov 22.6506	Dec 22.9354	(38)
Heat transfer coeff	53.4877	53.3314	53.1781	52.4584	52.3237	51.6969	51.6969	51.5808	51.9383	52.3237	52.5962	52.8810	(39)
Average = Sum(39)m / 12 =												52.4577	
HLP	Jan 1.1190	Feb 1.1157	Mar 1.1125	Apr 1.0975	May 1.0946	Jun 1.0815	Jul 1.0815	Aug 1.0791	Sep 1.0866	Oct 1.0946	Nov 1.1003	Dec 1.1063	(40)
HLP (average)												1.0974	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.6256	(42)
Hot water usage for mixer showers														
51.4750	50.7014	49.5742	47.4174	45.8258	44.0508	43.0419	44.1606	45.3869	47.2927	49.4958	51.2778	(42a)		
Hot water usage for baths														
22.2592	21.9286	21.4631	20.6047	19.9620	19.2493	18.8644	19.3266	19.8300	20.5925	21.4686	22.1839	(42b)		
Hot water usage for other uses														
31.2775	30.1401	29.0028	27.8654	26.7280	25.5907	25.5907	26.7280	27.8654	29.0028	30.1401	31.2775	(42c)		
Average daily hot water use (litres/day)													96.5301	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Daily hot water use														
105.0116	102.7701	100.0400	95.8875	92.5158	88.8908	87.4969	90.2153	93.0823	96.8880	101.1045	104.7392	(44)		
Energy content (annual)	166.3128	146.3433	153.7578	131.2652	124.5440	109.3016	105.8199	111.7053	114.7797	131.4761	144.0419	163.9962	(45)	
Distribution loss (46)m = 0.15 x (45)m										Total =	Sum(45)m =	1603.3439		
24.9469	21.9515	23.0637	19.6898	18.6816	16.3952	15.8730	16.7558	17.2170	19.7214	21.6063	24.5994	(46)		
Water storage loss:														
Store volume													50.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):													0.7584	(48)
Temperature factor from Table 2b													0.5400	(49)
Enter (49) or (54) in (55)													0.4095	(55)
Total storage loss														
12.6948	11.4663	12.6948	12.2853	12.6948	12.2853	12.6948	12.6948	12.2853	12.6948	12.2853	12.6948	(56)		
If cylinder contains dedicated solar storage														
12.6948	11.4663	12.6948	12.2853	12.6948	12.2853	12.6948	12.6948	12.2853	12.6948	12.2853	12.6948	(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														
202.2700	178.8208	189.7149	166.0625	160.5012	144.0988	141.7771	147.6625	149.5770	167.4333	178.8392	199.9534	(62)		
WWHRS	-23.5322	-20.8121	-21.7932	-18.0456	-16.8179	-14.3912	-13.4894	-14.3447	-14.8897	-17.5533	-19.8857	-23.0964	(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														
178.7377	158.0087	167.9217	148.0169	143.6833	129.7077	128.2877	133.3178	134.6873	149.8800	158.9534	176.8570	(64)		
12Total per year (kWh/year)										Total per year (kWh/year) =	Sum(64)m =	1808.0592	(64)	
Electric shower(s)												1808	(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														
84.0647	74.6411	79.8902	71.4835	70.1766	64.1806	63.9509	65.9078	66.0021	72.4816	75.7317	83.2945	(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	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	81.2787	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	73.6144	81.5017	73.6144	76.0682	73.6144	76.0682	73.6144	73.6144	76.0682	73.6144	76.0682	73.6144	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	141.5228	142.9913	139.2906	131.4122	121.4671	112.1201	105.8757	104.4072	108.1079	115.9863	125.9314	135.2784	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	31.1279	(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)	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	-65.0229	(71)
Water heating gains (Table 5)	112.9902	111.0731	107.3793	99.2826	94.3234	89.1397	85.9555	88.5857	91.6696	97.4214	105.1830	111.9550	(72)
Total internal gains	378.5110	385.9497	370.6679	357.1467	339.7885	324.7116	312.8292	313.9909	323.2293	337.4058	357.5662	371.2314	(73)

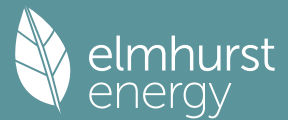
6. Solar gains

[Jan]													
				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
Northeast				4.7400	11.2829		0.6300		0.7000		0.7700		16.3445 (75)
Southwest				3.3900	36.7938		0.6300		0.7000		0.7700		38.1194 (79)
Solar gains	54.4640	98.2013	148.7837	208.5209	255.6228	263.4786	249.9830	213.3593	169.2369	112.4215	66.2240	45.9701	(83)
Total gains	432.9750	484.1510	519.4516	565.6676	595.4113	588.1902	562.8122	527.3502	492.4663	449.8272	423.7902	417.2015	(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	62.0599	62.2419	62.4212	63.2777	63.4405	64.2098	64.2098	64.3543	63.9113	63.4405	63.1119	62.7720	
alpha	5.1373	5.1495	5.1614	5.2185	5.2294	5.2807	5.2807	5.2903	5.2608	5.2294	5.2075	5.1848	
util living area													
	0.9874	0.9765	0.9534	0.8834	0.7446	0.5504	0.4021	0.4463	0.6846	0.9078	0.9746	0.9894 (86)	

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MIT	19.9496	20.1292	20.3772	20.6942	20.9020	20.9838	20.9974	20.9956	20.9518	20.6923	20.2802	19.9248 (87)
Th 2	19.9854	19.9880	19.9906	20.0029	20.0052	20.0160	20.0160	20.0179	20.0118	20.0052	20.0006	19.9957 (88)
util rest of house	0.9835	0.9695	0.9396	0.8512	0.6856	0.4710	0.3133	0.3529	0.6029	0.8747	0.9658	0.9861 (89)
MIT 2	18.7898	19.0172	19.3262	19.7096	19.9287	20.0074	20.0152	20.0165	19.9822	19.7184	19.2187	18.7661 (90)
Living area fraction	19.2229	19.4325	19.7187	20.0773	20.2922	20.3720	20.3820	20.3821	20.3443	20.0821	19.6151	19.1988 (92)
MIT	19.2229	19.4325	19.7187	20.0773	20.2922	20.3720	20.3820	20.3821	20.3443	20.0821	19.6151	19.1988 (93)
Temperature adjustment												0.0000
adjusted MIT	19.2229	19.4325	19.7187	20.0773	20.2922	20.3720	20.3820	20.3821	20.3443	20.0821	19.6151	19.1988 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9798	0.9648	0.9352	0.8539	0.7036	0.5003	0.3465	0.3879	0.6316	0.8776	0.9615	0.9827	(94)
Useful gains	424.2151	467.0948	485.7740	483.0034	418.9068	294.2532	195.0357	204.5445	311.0464	394.7742	407.4917	409.9944	(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	798.1903	775.0357	702.9434	586.3429	449.5739	298.3949	195.5162	205.4017	324.3191	496.1381	658.2467	793.1506	(97)
Space heating kWh	278.2376	206.9363	161.5740	74.4045	22.8164	0.0000	0.0000	0.0000	0.0000	75.4147	180.5436	285.0681	(98a)
Space heating requirement - total per year (kWh/year)												1284.9952	
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	278.2376	206.9363	161.5740	74.4045	22.8164	0.0000	0.0000	0.0000	0.0000	75.4147	180.5436	285.0681	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1284.9952	
Space heating per m2												26.8827	(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	278.2376	206.9363	161.5740	74.4045	22.8164	0.0000	0.0000	0.0000	0.0000	75.4147	180.5436	285.0681	(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)	301.4492	224.1996	175.0531	80.6116	24.7198	0.0000	0.0000	0.0000	0.0000	81.7061	195.6052	308.8496	(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	178.7377	158.0087	167.9217	148.0169	143.6833	129.7077	128.2877	133.3178	134.6873	149.8800	158.9534	176.8570	(64)
Efficiency of water heater (217)m	85.0483	84.6657	83.9734	82.6005	80.9239	79.8000	79.8000	79.8000	79.8000	82.6024	84.3461	85.1243	(216)
Fuel for water heating, kWh/month	210.1603	186.6265	199.9701	179.1961	177.5536	162.5409	160.7615	167.0650	168.7811	181.4476	188.4537	207.7633	(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	15.2956	12.2707	11.0484	8.0945	6.2525	5.1083	5.7037	7.4139	9.6299	12.6350	14.2712	15.7207	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-27.2033	-37.9156	-53.9188	-60.0080	-64.2650	-59.9066	-59.2351	-56.1708	-50.6383	-43.1382	-29.7804	-23.5767	(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	-16.7226	-35.0158	-69.2729	-103.5529	-136.4153	-136.8134	-135.1316	-114.5826	-84.2592	-49.8221	-22.2503	-13.2297	(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												1392.1941	(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												2190.3196	(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)												123.4445	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1482.8252	(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												2309.1331	(238)

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

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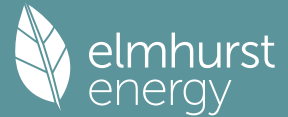


	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1392.1941	0.2100	292.3608 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2190.3196	0.2100	459.9671 (264)
Space and water heating			752.3279 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	123.4445	0.1443	17.8168 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-565.7568	0.1348	-76.2539
PV Unit electricity exported	-917.0683	0.1260	-115.5956
Total			-191.8494 (269)
Total CO2, kg/year			590.2246 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.3500 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1392.1941	1.1300	1573.1794 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2190.3196	1.1300	2475.0612 (278)
Space and water heating			4048.2405 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	123.4445	1.5338	189.3432 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-565.7568	1.4981	-847.5841
PV Unit electricity exported	-917.0683	0.4627	-424.3228
Total			-1271.9070 (283)
Total Primary energy kWh/year			3095.7776 (286)
Target Primary Energy Rate (TPER)			64.7700 (287)

Full SAP Calculation Printout



Property Reference	House Type 2 End - Refurb				Issued on Date	30/08/2024
Assessment Reference	Type 2 End Improved GREEN			Prop Type Ref		
Property	House Type 2, Edmansons Close, Tottenham, N17 6XD					
SAP Rating	50 E	DER	11.60	TER	10.35	
Environmental	90 B	% DER < TER				-12.08
CO ₂ Emissions (t/year)	0.99	DFEE	96.75	TFEE	40.09	
Compliance Check	See BREL	% DFEE < TFEE				-141.33
% DPER < TPER	-123.16	DPER	120.71	TPER	54.09	
Assessor Details	Miss Eleanor Ballinger				Assessor ID	M976-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	61.1500 (1b)	x 2.4000 (2b)	= 146.7600 (1b) - (3b)
First floor	36.5000 (1c)	x 2.6000 (2c)	= 94.9000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	97.6500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 241.6600 (5)

2. Ventilation rate

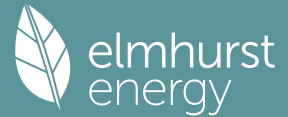
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	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) = 0.1241 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	8.0000 (17)
Infiltration rate	0.5241 (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) = 0.4848 (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	0.6182	0.6060	0.5939	0.5333	0.5212	0.4606	0.4606	0.4485	0.4848	0.5212	0.5454	0.5697 (22b)
Effective ac	0.6911	0.6836	0.6764	0.6422	0.6358	0.6061	0.6061	0.6006	0.6175	0.6358	0.6487	0.6623 (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					
Front door			1.8900	3.0000	5.6700		(26)					
Refurb (Uw = 2.70)			10.7900	2.4368	26.2933		(27)					
New (Uw = 1.40)			7.3600	1.3258	9.7576		(27)					
Ground Floor			61.1500	0.5000	30.5750		(28a)					
External Wall	118.8600	20.0400	98.8200	0.5500	54.3510		(29a)					
1st Floor	36.5000		36.5000	0.1100	4.0150		(30)					
Ground floor	24.6500		24.6500	0.1100	2.7115		(30)					
Total net area of external elements Aum(A, m2)			241.1600				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	133.3734		(33)					
Party Wall			25.9800	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Default value 0.200 * total exposed area)							48.2320 (36)					
Point Thermal bridges						(36a) =	0.0000					
Total fabric heat loss						(33) + (36) + (36a) =	181.6054 (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
	55.1105	54.5189	53.9389	51.2150	50.7053	48.3328	48.3328	47.8935	49.2467	50.7053	51.7363	52.8142 (38)

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Heat transfer coeff
236.7159 236.1243 235.5443 232.8204 232.3107 229.9382 229.9382 229.4989 230.8521 232.3107 233.3417 234.4196 (39)
Average = Sum(39)m / 12 = 232.8179

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.4241	2.4181	2.4121	2.3842	2.3790	2.3547	2.3547	2.3502	2.3641	2.3790	2.3896	2.4006	(40)
HLP (average)												2.3842	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.7167 (42)
Hot water usage for mixer showers 78.4908 77.3112 75.5924 72.3036 69.8766 67.1701 65.6317 67.3375 69.2074 72.1135 75.4728 78.1900 (42a)
Hot water usage for baths 30.1264 29.6790 29.0489 27.8872 27.0173 26.0528 25.5318 26.1574 26.8387 27.8708 29.0564 30.0246 (42b)
Hot water usage for other uses 42.4515 40.9078 39.3641 37.8204 36.2768 34.7331 34.7331 36.2768 37.8204 39.3641 40.9078 42.4515 (42c)
Average daily hot water use (litres/day) 138.8901 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	151.0687	147.8980	144.0054	138.0113	133.1707	127.9559	125.8965	129.7717	133.8665	139.3484	145.4371	150.6661	(44)
Energy conte	239.2559	210.6048	221.3310	188.9306	179.2734	157.3367	152.2609	160.6845	165.0708	189.0944	207.2018	235.9068	(45)
Energy content (annual)												2306.9517	
Distribution loss (46)m = 0.15 x (45)m	35.8884	31.5907	33.1996	28.3396	26.8910	23.6005	22.8391	24.1027	24.7606	28.3642	31.0803	35.3860	(46)
Water storage loss:												170.0000	(47)
Store volume												1.2000	(48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400	(49)
Temperature factor from Table 2b												0.6480	(55)
Enter (49) or (54) in (55)													
Total storage loss	20.0880	18.1440	20.0880	19.4400	20.0880	19.4400	20.0880	20.0880	19.4400	20.0880	19.4400	20.0880	(56)
If cylinder contains dedicated solar storage	20.0880	18.1440	20.0880	19.4400	20.0880	19.4400	20.0880	20.0880	19.4400	20.0880	19.4400	20.0880	(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	282.6063	249.7600	264.6814	230.8826	222.6238	199.2887	195.6113	204.0349	207.0228	232.4448	249.1538	279.2572	(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	282.6063	249.7600	264.6814	230.8826	222.6238	199.2887	195.6113	204.0349	207.0228	232.4448	249.1538	279.2572	(64)
12Total per year (kWh/year)												2817.3677	(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	114.2329	101.3503	108.2729	96.3810	94.2887	85.8761	85.3071	88.1079	88.4477	97.5542	102.4562	113.1193	(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	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	129.4273	143.2945	129.4273	133.7416	129.4273	133.7416	129.4273	129.4273	133.7416	129.4273	133.7416	129.4273	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	252.4717	255.0916	248.4896	234.4348	216.6931	200.0184	188.8787	186.2588	192.8608	206.9156	224.6573	241.3320	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	(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)	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	(71)
Water heating gains (Table 5)	153.5389	150.8189	145.5281	133.8625	126.7322	119.2723	114.6600	118.4246	122.8440	131.1213	142.3003	152.0421	(72)
Total internal gains	599.1881	612.9552	587.1952	565.7891	536.6028	516.7825	496.7162	497.8609	513.1965	531.2144	564.4493	586.5516	(73)

6. Solar gains

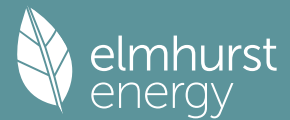
[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W							
Southeast	8.6700	36.7938	0.8500	0.7000	0.7700	131.5359	(77)						
Northwest	2.1200	11.2829	0.8500	0.7000	0.7700	9.8630	(81)						
Northwest	7.3600	11.2829	0.6300	0.7000	0.7700	25.3789	(81)						
Solar gains	166.7777	295.7901	435.8059	592.1013	710.7725	726.5568	691.7706	600.0376	489.4277	335.2946	201.8931	141.3476	(83)
Total gains	765.9658	908.7453	1023.0011	1157.8904	1247.3752	1243.3393	1188.4868	1097.8985	1002.6242	866.5089	766.3424	727.8992	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	28.6472	28.7190	28.7897	29.1265	29.1904	29.4916	29.4916	29.5481	29.3749	29.1904	29.0615	28.9278	
alpha	2.9098	2.9146	2.9193	2.9418	2.9460	2.9661	2.9661	2.9699	2.9583	2.9460	2.9374	2.9285	
util living area	0.9932	0.9882	0.9791	0.9556	0.9054	0.8070	0.6849	0.7333	0.8878	0.9682	0.9889	0.9942	(86)
Living	18.1556	18.4106	18.8455	19.4668	20.0751	20.5785	20.8220	20.7742	20.3683	19.5854	18.7740	18.1258	

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Non living	15.9369	16.2634	16.8176	17.6049	18.3380	18.8815	19.0648	19.0457	18.6920	17.7676	16.7384	15.9061
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	31	28	31	30	31	30	31	31	30	31	30	31
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0
MIT	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000 (87)
Th 2	19.0656	19.0692	19.0727	19.0895	19.0926	19.1073	19.1073	19.1101	19.1017	19.0926	19.0863	19.0796 (88)
util rest of house												
	0.9906	0.9836	0.9701	0.9340	0.8512	0.6763	0.4541	0.5158	0.7975	0.9483	0.9837	0.9919 (89)
MIT 2	19.0656	19.0692	19.0727	19.0895	19.0926	19.1073	19.1073	19.1101	19.1017	19.0926	19.0863	19.0796 (90)
Living area fraction												0.1331 (91)
MIT	19.3231	19.3262	19.3293	19.3438	19.3466	19.3593	19.3593	19.3617	19.3544	19.3466	19.3410	19.3353 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3231	19.3262	19.3293	19.3438	19.3466	19.3593	19.3593	19.3617	19.3544	19.3466	19.3410	19.3353 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9910	0.9843	0.9716	0.9376	0.8603	0.6983	0.4917	0.5524	0.8136	0.9518	0.9846	0.9923	(94)
Useful gains	759.0517	894.5023	993.9334	1085.6257	1073.0864	868.2757	584.3464	606.4582	815.6881	824.7039	754.5175	722.2933	(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	3556.2073	3406.3840	3021.8712	2431.5354	1776.3765	1094.3467	634.4702	679.7018	1212.9856	2031.9183	2856.3452	3548.0086	(97)
Space heating kWh	2081.0838	1687.9845	1508.7857	969.0550	523.2478	0.0000	0.0000	0.0000	0.0000	898.1675	1513.3159	2102.3322	(98a)
Space heating requirement - total per year (kWh/year)												11283.9724	
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	2081.0838	1687.9845	1508.7857	969.0550	523.2478	0.0000	0.0000	0.0000	0.0000	898.1675	1513.3159	2102.3322	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												11283.9724	
Space heating per m2										(98c) / (4) =		115.5553	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													249.2945 (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	2081.0838	1687.9845	1508.7857	969.0550	523.2478	0.0000	0.0000	0.0000	0.0000	898.1675	1513.3159	2102.3322	(98)
Space heating efficiency (main heating system 1)	249.2945	249.2945	249.2945	249.2945	249.2945	0.0000	0.0000	0.0000	0.0000	249.2945	249.2945	249.2945	(210)
Space heating fuel (main heating system)	834.7892	677.1045	605.2221	388.7189	209.8914	0.0000	0.0000	0.0000	0.0000	360.2837	607.0393	843.3126	(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	282.6063	249.7600	264.6814	230.8826	222.6238	199.2887	195.6113	204.0349	207.0228	232.4448	249.1538	279.2572	(64)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(216)
Fuel for water heating, kWh/month	282.6063	249.7600	264.6814	230.8826	222.6238	199.2887	195.6113	204.0349	207.0228	232.4448	249.1538	279.2572	(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	31.3594	25.1577	22.6517	16.5956	12.8189	10.4732	11.6939	15.2001	19.7435	25.9045	29.2591	32.2310	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												4526.3617	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												100.0000	
Water heating fuel used												2817.3677	(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)												253.0887	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												7596.8180	(238)

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

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year
Space heating - main system 1	4526.3617	0.1543	698.4203 (261)
Total CO ₂ associated with community systems			0.0000 (373)
Water heating (other fuel)	2817.3677	0.1411	397.4151 (264)
Space and water heating			1095.8354 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	253.0887	0.1443	36.5285 (268)
Total CO ₂ , kg/year			1132.3639 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.6000 (273)

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

	Energy kWh/year	Primary energy factor kg CO ₂ /kWh	Primary energy kWh/year
Space heating - main system 1	4526.3617	1.5713	7112.1038 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	2817.3677	1.5216	4286.8869 (278)
Space and water heating			11398.9907 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	253.0887	1.5338	388.1959 (282)
Total Primary energy kWh/year			11787.1866 (286)
Dwelling Primary energy Rate (DPER)			120.7100 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	61.1500 (1b)	x 2.4000 (2b)	= 146.7600 (1b) - (3b)
First floor	36.5000 (1c)	x 2.6000 (2c)	= 94.9000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	97.6500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	241.6600 (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	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) =	0.1241 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3741	(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) =		0.3461 (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	0.4413	0.4326	0.4239	0.3807	0.3720	0.3288	0.3288	0.3201	0.3461	0.3720	0.3893	0.4066 (22b)
Effective ac	0.5974	0.5936	0.5899	0.5725	0.5692	0.5540	0.5540	0.5512	0.5599	0.5692	0.5758	0.5827 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.20)			18.1500	1.1450	20.7824		(27)
Ground Floor			61.1500	0.1300	7.9495		(28a)
External Wall	118.8600	20.0400	98.8200	0.1800	17.7876		(29a)
1st Floor	36.5000		36.5000	0.1100	4.0150		(30)
Ground floor	24.6500		24.6500	0.1100	2.7115		(30)
Total net area of external elements Aum (A, m ²)			241.1600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		55.1360		(33)
Party Wall			25.9800	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (User defined value 0.050 * total exposed area)							12.0580 (36)

elmhurst
energy

$$\begin{aligned} & (36a) = 0.0000 \\ (33) + (36) + (36a) &= 67.1940 \quad (37) \end{aligned}$$

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	47.6375	47.3360	47.0405	45.6526	45.3929	44.1840	44.1840	43.9602	44.6497	45.3929	45.9182	46.4675 (38)
Heat transfer coeff												
Average = Sum(39)m / 12 =	114.8316	114.5301	114.2346	112.8466	112.5869	111.3781	111.3781	111.1542	111.8437	112.5869	113.1123	113.6615 (39) 112.8454

4. Water heating energy requirements (kWh/year)

assumed occupancy													2.7167 (42)
Hot water usage for mixer showers	69.7696	68.7211	67.1932	64.2699	62.1126	59.7067	58.3393	59.8556	61.5177	64.1009	67.0870	69.5023 (42a)	
Hot water usage for baths	30.1264	29.6790	29.0489	27.8872	27.0173	26.0528	25.5318	26.1574	26.8387	27.8708	29.0564	30.0246 (42b)	
Hot water usage for other uses	42.4515	40.9078	39.3641	37.8204	36.2768	34.7331	34.7331	36.2768	37.8204	39.3641	40.9078	42.4515 (42c)	
Average daily hot water use (litres/day)												130.8494 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	142.3475	139.3079	135.6063	129.9776	125.4067	120.4926	118.6041	122.2898	126.1768	131.3358	137.0512	141.9784 (44)	
Energy content (annual)	225.4437	198.3726	208.4218	177.9328	168.8215	148.1597	143.4414	151.4203	155.5886	178.2214	195.2546	222.3038 (45)	
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		2173.3821	
	33.8166	29.7559	31.2633	26.6899	25.3232	22.2240	21.5162	22.7130	23.3383	26.7332	29.2882	33.3456 (46)	
Water storage loss:													
Store volume												170.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):												1.5003 (48)	
Temperature factor from Table 2b												0.5400 (49)	
Enter (49) or (54) in (55)												0.8102 (55)	
Total storage loss	25.1153	22.6848	25.1153	24.3051	25.1153	24.3051	25.1153	25.1153	24.3051	25.1153	24.3051	25.1153 (56)	
If cylinder contains dedicated solar storage	25.1153	22.6848	25.1153	24.3051	25.1153	24.3051	25.1153	25.1153	24.3051	25.1153	24.3051	25.1153 (57)	
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)	
Total heat required for water heating calculated for each month	273.8214	242.0686	256.7995	224.7499	217.1992	194.9768	191.8191	199.7980	202.4058	226.5991	242.0717	270.6815 (62)	
WWHRS	-31.8957	-28.2089	-29.5387	-24.4592	-22.7951	-19.5059	-18.2837	-19.4429	-20.1816	-23.7919	-26.9533	-31.3051 (63a)	
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)	
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)	
Output from w/h	241.9256	213.8597	227.2608	200.2907	194.4041	175.4709	173.5354	180.3551	182.2242	202.8072	215.1184	239.3764 (64)	
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2446.6287 (64)	
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)	
												0.0000 (64a)	
Heat gains from water heating, kWh/month	113.6622	100.9157	108.0024	96.6164	94.8353	86.7168	86.3964	89.0494	89.1869	97.9608	102.3758	112.6182 (65)	

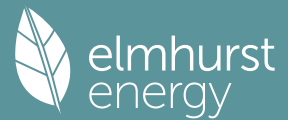
Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	135.8340	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	129.4273	143.2945	129.4273	133.7416	129.4273	133.7416	129.4273	129.4273	133.7416	129.4273	133.7416	129.4273	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	252.4717	255.0916	248.4896	234.4348	216.6931	200.0184	188.8787	186.2588	192.8608	206.9156	224.6573	241.3320	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	36.5834	(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)	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	-108.6672	(71)
Water heating gains (Table 5)	152.7718	150.1721	145.1645	134.1894	127.4668	120.4400	116.1242	119.6901	123.8707	131.6677	142.1887	151.3685	(72)
Total internal gains	601.4210	615.3085	589.8317	569.1159	540.3374	517.9501	498.1804	499.1264	514.2233	534.7608	567.3377	588.8780	(73)

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Southeast	8.6700	36.7938	0.6300	0.7000	0.7700	97.4913 (77)
Northwest	9.4800	11.2829	0.6300	0.7000	0.7700	32.6891 (81)

Solar gains	130.1804	232.6033	347.0988	478.4137	579.9872	595.2016	565.7609	487.0153	392.1060	264.8524	157.9034	110.1278 (83)
Total gains	731.6014	847.9118	936.9304	1047.5297	1120.3246	1113.1518	1063.9413	986.1417	906.3292	799.6133	725.2412	699.0058 (84)

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	59.0539	59.2093	59.3625	60.0926	60.2312	60.8850	60.8850	61.0076	60.6315	60.2312	59.9515	59.6618

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alpha	4.9369	4.9473	4.9575	5.0062	5.0154	5.0590	5.0590	5.0672	5.0421	5.0154	4.9968	4.9775
util living area	0.9947	0.9883	0.9733	0.9224	0.8043	0.6145	0.4556	0.5094	0.7610	0.9479	0.9886	0.9957 (86)
MIT	19.6998	19.9003	20.1857	20.5623	20.8399	20.9683	20.9942	20.9901	20.9099	20.5469	20.0625	19.6712 (87)
Th 2	19.9393	19.9418	19.9442	19.9557	19.9578	19.9678	19.9678	19.9697	19.9640	19.9578	19.9535	19.9489 (88)
util rest of house	0.9929	0.9845	0.9645	0.8972	0.7477	0.5261	0.3514	0.4000	0.6780	0.9254	0.9842	0.9943 (89)
MIT 2	18.4399	18.6962	19.0569	19.5225	19.8282	19.9506	19.9661	19.9663	19.9057	19.5162	18.9126	18.4104 (90)
Living area fraction	18.6076	18.8565	19.2072	19.6609	19.9629	20.0861	20.1029	20.1026	20.0394	19.6535	19.0656	18.5782 (92)
MIT												0.1331 (91)
Temperature adjustment												0.0000
adjusted MIT	18.6076	18.8565	19.2072	19.6609	19.9629	20.0861	20.1029	20.1026	20.0394	19.6535	19.0656	18.5782 (93)

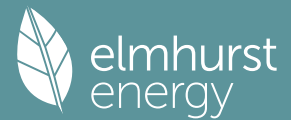
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9897	0.9791	0.9563	0.8886	0.7480	0.5367	0.3652	0.4144	0.6847	0.9169	0.9790	0.9916 (94)
Useful gains	724.0625	830.2135	896.0046	930.8023	838.0030	597.4121	388.6030	408.6866	620.5566	733.1792	709.9784	693.1318 (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	1642.9672	1598.4379	1451.6040	1214.3367	930.2931	611.0300	390.1508	411.5641	664.2829	1019.3010	1353.4619	1634.2515 (97)
Space heating kWh	683.6651	516.2468	413.3659	204.1448	68.6639	0.0000	0.0000	0.0000	0.0000	212.8747	463.3081	700.1931 (98a)
Space heating requirement - total per year (kWh/year)												3262.4624
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	683.6651	516.2468	413.3659	204.1448	68.6639	0.0000	0.0000	0.0000	0.0000	212.8747	463.3081	700.1931 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3262.4624
Space heating per m2										(98c) / (4) =		33.4098 (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	683.6651	516.2468	413.3659	204.1448	68.6639	0.0000	0.0000	0.0000	0.0000	212.8747	463.3081	700.1931 (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)	740.6989	559.3140	447.8504	221.1753	74.3921	0.0000	0.0000	0.0000	0.0000	230.6335	501.9590	758.6057 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	241.9256	213.8597	227.2608	200.2907	194.4041	175.4709	173.5354	180.3551	182.2242	202.8072	215.1184	239.3764 (64)
Efficiency of water heater (217)m	86.2573	85.9603	85.3839	84.1026	81.9684	79.8000	79.8000	79.8000	79.8000	84.1686	85.7340	79.8000 (216)
Fuel for water heating, kWh/month	280.4698	248.7891	266.1637	238.1505	237.1696	219.8883	217.4629	226.0089	228.3511	240.9535	250.9137	277.3137 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	26.8924	21.5741	19.4251	14.2317	10.9929	8.9813	10.0281	13.0349	16.9311	22.2145	25.0913	27.6399 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-52.9546	-72.5797	-101.4537	-110.8162	-116.8022	-108.0355	-106.6375	-101.9226	-93.2903	-81.3707	-57.4487	-46.0248 (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)	-36.5811	-76.0787	-149.6521	-222.5754	-292.2513	-292.9453	-289.5465	-246.1298	-181.6758	-108.1134	-48.6072	-28.9989 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												3534.6288 (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												2931.6349 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												86.0000 (231)
Electricity for lighting (calculated in Appendix L)												217.0374 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-3022.4920 (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												3746.8092 (238)

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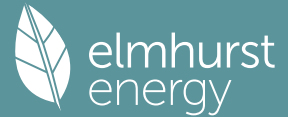
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3534.6288	0.2100	742.2721 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2931.6349	0.2100	615.6433 (264)
Space and water heating			1357.9154 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	217.0374	0.1443	31.3252 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1049.3365	0.1352	-141.8724
PV Unit electricity exported	-1973.1554	0.1262	-248.9803
Total			-390.8527 (269)
Total CO2, kg/year			1010.3172 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.3500 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	3534.6288	1.1300	3994.1306 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2931.6349	1.1300	3312.7475 (278)
Space and water heating			7306.8781 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	217.0374	1.5338	332.8992 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1049.3365	1.4997	-1573.7085
PV Unit electricity exported	-1973.1554	0.4632	-913.9543
Total			-2487.6628 (283)
Total Primary energy kWh/year			5282.2152 (286)
Target Primary Energy Rate (TPER)			54.0900 (287)

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Property Reference	House Type 2 Mid - Refurb			Issued on Date	30/08/2024
Assessment Reference	Type 2 Mid Improved GREEN	Prop Type Ref			
Property	House Type 2, Edmansons Close, Tottenham, N17 6XD				
SAP Rating	55 D	DER	10.38	TER	9.52
Environmental	91 B	% DER < TER			-9.03
CO ₂ Emissions (t/year)	0.88	DFEE	85.84	TFEE	36.32
Compliance Check	See BREL	% DFEE < TFEE			-136.37
% DPER < TPER	-117.53	DPER	108.01	TPER	49.65
Assessor Details	Miss Eleanor Ballinger			Assessor ID	M976-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	61.1500 (1b)	x 2.4000 (2b)	= 146.7600 (1b) - (3b)
First floor	36.5000 (1c)	x 2.6000 (2c)	= 94.9000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	97.6500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 241.6600 (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	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) = 0.1241 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	8.0000 (17)
Infiltration rate	0.5241 (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) = 0.4455 (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	0.5680	0.5569	0.5458	0.4901	0.4789	0.4232	0.4232	0.4121	0.4455	0.4789	0.5012	0.5235 (22b)
Effective ac	0.6613	0.6551	0.6489	0.6201	0.6147	0.5896	0.5896	0.5849	0.5992	0.6147	0.6256	0.6370 (25)

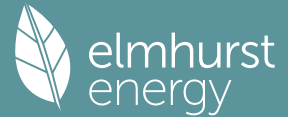
3. Heat losses and heat loss parameter

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
Front door			1.8900	3.0000	5.6700		(26)
Refurb (Uw = 2.70)			10.7900	2.4368	26.2933		(27)
New (Uw = 1.40)			7.3600	1.3258	9.7576		(27)
Ground floor			61.1500	0.4500	27.5175		(28a)
External Wall	93.0000	20.0400	72.9600	0.5500	40.1280		(29a)
1st Floor	36.5000		36.5000	0.1100	4.0150		(30)
Ground floor	24.6500		24.6500	0.1100	2.7115		(30)
Total net area of external elements Aum(A, m ²)			215.3000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	116.0929		(33)
Party Wall			51.9600	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							43.0600 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	159.1529 (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	52.7399	52.2403	51.7506	49.4504	49.0201	47.0167	47.0167	46.6457	47.7884	49.0201	49.8907	50.8009 (38)

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Heat transfer coeff
211.8928 211.3932 210.9035 208.6033 208.1730 206.1696 206.1696 205.7986 206.9413 208.1730 209.0436 209.9538 (39)
Average = Sum(39)m / 12 = 208.6013

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.1699	2.1648	2.1598	2.1362	2.1318	2.1113	2.1113	2.1075	2.1192	2.1318	2.1407	2.1501	(40)
HLP (average)												2.1362	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.7167 (42)
Hot water usage for mixer showers 78.4908 77.3112 75.5924 72.3036 69.8766 67.1701 65.6317 67.3375 69.2074 72.1135 75.4728 78.1900 (42a)
Hot water usage for baths 30.1264 29.6790 29.0489 27.8872 27.0173 26.0528 25.5318 26.1574 26.8387 27.8708 29.0564 30.0246 (42b)
Hot water usage for other uses 42.4515 40.9078 39.3641 37.8204 36.2768 34.7331 34.7331 36.2768 37.8204 39.3641 40.9078 42.4515 (42c)
Average daily hot water use (litres/day) 138.8901 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	151.0687	147.8980	144.0054	138.0113	133.1707	127.9559	125.8965	129.7717	133.8665	139.3484	145.4371	150.6661	(44)
Energy conte	239.2559	210.6048	221.3310	188.9306	179.2734	157.3367	152.2609	160.6845	165.0708	189.0944	207.2018	235.9068	(45)
Energy content (annual)										Total = Sum(45)m =		2306.9517	
Distribution loss (46)m = 0.15 x (45)m	35.8884	31.5907	33.1996	28.3396	26.8910	23.6005	22.8391	24.1027	24.7606	28.3642	31.0803	35.3860	(46)
Water storage loss:													
Store volume												170.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.2000	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												0.7200	(55)
Total storage loss	22.3200	20.1600	22.3200	21.6000	22.3200	21.6000	22.3200	22.3200	21.6000	22.3200	21.6000	22.3200	(56)
If cylinder contains dedicated solar storage	22.3200	20.1600	22.3200	21.6000	22.3200	21.6000	22.3200	22.3200	21.6000	22.3200	21.6000	22.3200	(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	261.5759	230.7648	243.6510	210.5306	201.5934	178.9367	174.5809	183.0045	186.6708	211.4144	228.8018	258.2268	(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)
FV 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	261.5759	230.7648	243.6510	210.5306	201.5934	178.9367	174.5809	183.0045	186.6708	211.4144	228.8018	258.2268	(64)
12Total per year (kWh/year)												2569.7517	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower (s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month	97.4086	86.1541	91.4486	80.0994	77.4644	69.5945	68.4828	71.2836	72.1661	80.7299	86.1746	96.2950	(65)

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

Metabolic gains (Table 5), Watts
(66)m 135.8340 135.8340 135.8340 135.8340 135.8340 135.8340 135.8340 135.8340 135.8340 135.8340 135.8340 135.8340 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 129.4273 143.2945 129.4273 133.7416 129.4273 133.7416 129.4273 129.4273 133.7416 129.4273 133.7416 129.4273 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 252.4717 255.0916 248.4896 234.4348 216.6931 200.0184 188.8787 186.2588 192.8608 206.9156 224.6573 241.3320 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 36.5834 36.5834 36.5834 36.5834 36.5834 36.5834 36.5834 36.5834 36.5834 36.5834 36.5834 36.5834 (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) -108.6672 -108.6672 -108.6672 -108.6672 -108.6672 -108.6672 -108.6672 -108.6672 -108.6672 -108.6672 -108.6672 -108.6672 (71)
Water heating gains (Table 5) 130.9255 128.2055 122.9147 111.2492 104.1188 96.6590 92.0467 95.8113 100.2306 108.5079 119.6869 129.4288 (72)
Total internal gains 576.5748 590.3418 564.5818 543.1757 513.9894 494.1691 474.1029 475.2476 490.5832 508.6010 541.8360 563.9383 (73)

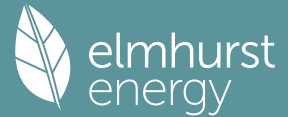
6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W							
Northeast	2.1200	11.2829	0.8500	0.7000	0.7700	9.8630	(75)						
Southwest	8.6700	36.7938	0.8500	0.7000	0.7700	131.5359	(79)						
Northeast	7.3600	11.2829	0.6300	0.7000	0.7700	25.3789	(75)						
Solar gains	166.7777	295.7901	435.8059	592.1013	710.7725	726.5568	691.7706	600.0376	489.4277	335.2946	201.8931	141.3476	(83)
Total gains	743.3525	886.1319	1000.3878	1135.2770	1224.7619	1220.7259	1165.8735	1075.2852	980.0109	843.8956	743.7290	705.2859	(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 32.0032 32.0788 32.1533 32.5079 32.5751 32.8916 32.8916 32.9509 32.7690 32.5751 32.4394 32.2988
alpha 3.1335 3.1386 3.1436 3.1672 3.1717 3.1928 3.1928 3.1967 3.1846 3.1717 3.1626 3.1533
util living area 0.9940 0.9891 0.9797 0.9546 0.8991 0.7902 0.6590 0.7112 0.8807 0.9686 0.9900 0.9950 (86)
Living 18.4081 18.6588 19.0732 19.6596 20.2226 20.6685 20.8703 20.8299 20.4730 19.7451 18.9825 18.3762

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Non living	16.3420	16.6630	17.1910	17.9328	18.6064	19.0799	19.2274	19.2119	18.9074	18.0537	17.0870	16.3083
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	31	28	31	30	31	30	31	31	30	31	30	31
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0
MIT	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000 (87)
Th 2	19.2225	19.2257	19.2289	19.2441	19.2469	19.2602	19.2602	19.2626	19.2550	19.2469	19.2412	19.2352 (88)
util rest of house												
	0.9918	0.9850	0.9713	0.9334	0.8451	0.6639	0.4470	0.5085	0.7923	0.9498	0.9853	0.9931 (89)
MIT 2	19.2225	19.2257	19.2289	19.2441	19.2469	19.2602	19.2602	19.2626	19.2550	19.2469	19.2412	19.2352 (90)
Living area fraction									FLA = Living area / (4) =			
MIT	19.4591	19.4619	19.4647	19.4778	19.4803	19.4918	19.4918	19.4939	19.4873	19.4803	19.4753	0.1331 (91)
Temperature adjustment												19.4701 (92)
adjusted MIT	19.4591	19.4619	19.4647	19.4778	19.4803	19.4918	19.4918	19.4939	19.4873	19.4803	19.4753	0.0000
												19.4701 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9921	0.9856	0.9727	0.9369	0.8540	0.6845	0.4801	0.5413	0.8076	0.9530	0.9861	0.9934	(94)
Useful gains	737.5148	873.3913	973.0719	1063.6110	1045.9640	835.5828	559.7765	582.0195	791.4423	804.2547	733.3905	700.6333	(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	3212.1042	3078.2937	2734.3034	2206.5692	1619.6451	1008.5366	596.1973	636.7237	1114.8642	1848.6354	2586.9787	3206.0183	(97)
Space heating kWh	1841.0945	1481.6944	1310.3563	822.9299	426.8187	0.0000	0.0000	0.0000	0.0000	777.0192	1334.5835	1864.0065	(98a)
Space heating requirement - total per year (kWh/year)												9858.5029	
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	1841.0945	1481.6944	1310.3563	822.9299	426.8187	0.0000	0.0000	0.0000	0.0000	777.0192	1334.5835	1864.0065	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												9858.5029	
Space heating per m2										(98c) / (4) =		100.9575	(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 %)													248.0848 (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	1841.0945	1481.6944	1310.3563	822.9299	426.8187	0.0000	0.0000	0.0000	0.0000	777.0192	1334.5835	1864.0065	(98)
Space heating efficiency (main heating system 1)	248.0848	248.0848	248.0848	248.0848	248.0848	0.0000	0.0000	0.0000	0.0000	248.0848	248.0848	248.0848	(210)
Space heating fuel (main heating system)	742.1231	597.2532	528.1888	331.7131	172.0455	0.0000	0.0000	0.0000	0.0000	313.2071	537.9545	751.3586	(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	261.5759	230.7648	243.6510	210.5306	201.5934	178.9367	174.5809	183.0045	186.6708	211.4144	228.8018	258.2268	(64)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(216)
Fuel for water heating, kWh/month	261.5759	230.7648	243.6510	210.5306	201.5934	178.9367	174.5809	183.0045	186.6708	211.4144	228.8018	258.2268	(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	31.3594	25.1577	22.6517	16.5956	12.8189	10.4732	11.6939	15.2001	19.7435	25.9045	29.2591	32.2310	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												3973.8440	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												100.0000	
Water heating fuel used												2569.7517	(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)												253.0887	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												6796.6843	(238)

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

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year
Space heating - main system 1	3973.8440	0.1545	613.7832 (261)
Total CO ₂ associated with community systems			0.0000 (373)
Water heating (other fuel)	2569.7517	0.1413	363.0677 (264)
Space and water heating			976.8509 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	253.0887	0.1443	36.5285 (268)
Total CO ₂ , kg/year			1013.3794 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.3800 (273)

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

	Energy kWh/year	Primary energy factor kg CO ₂ /kWh	Primary energy kWh/year
Space heating - main system 1	3973.8440	1.5718	6246.2342 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	2569.7517	1.5224	3912.2934 (278)
Space and water heating			10158.5276 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	253.0887	1.5338	388.1959 (282)
Total Primary energy kWh/year			10546.7234 (286)
Dwelling Primary energy Rate (DPER)			108.0100 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	61.1500 (1b)	x 2.4000 (2b)	= 146.7600 (1b) - (3b)
First floor	36.5000 (1c)	x 2.6000 (2c)	= 94.9000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	97.6500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	241.6600 (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	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) = 0.1241 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3741 (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) = 0.3180 (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	0.4055	0.3975	0.3896	0.3498	0.3419	0.3021	0.3021	0.2942	0.3180	0.3419	0.3578	0.3737 (22b)
Effective ac	0.5822	0.5790	0.5759	0.5612	0.5584	0.5456	0.5456	0.5433	0.5506	0.5584	0.5640	0.5698 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.20)			18.1500	1.1450	20.7824		(27)
Ground Floor			61.1500	0.1300	7.9495		(28a)
External Wall	93.0000	20.0400	72.9600	0.1800	13.1328		(29a)
1st Floor	36.5000		36.5000	0.1100	4.0150		(30)
Ground floor	24.6500		24.6500	0.1100	2.7115		(30)
Total net area of external elements Aum(A, m ²)			215.3000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	50.4812		(33)
Party Wall			51.9600	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (User defined value 0.050 * total exposed area)							10.7650 (36)

$$\begin{aligned} (33) + (36) + (36a) &= 61.2462 \quad (37) \end{aligned}$$
[illegible]

4. Water heating energy requirements (kWh/year)

Hot water usage for mixer showers	69.7696	68.7211	67.1932	64.2699	62.1126	59.7067	58.3393	59.8556	61.5177	64.1009	67.0870	69.5023	(42a)
Hot water usage for baths	30.1264	29.6790	29.0489	27.8872	27.0173	26.0528	25.5318	26.1574	26.8387	27.8708	29.0564	30.0246	(42b)
Hot water usage for other uses	42.4515	40.9078	39.3641	37.8204	36.2768	34.7331	34.7331	36.2768	37.8204	39.3641	40.9078	42.4515	(42c)
Average daily hot water use (litres/day)												130.8494	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	142.3475	139.3079	135.6063	129.9776	125.4067	120.4926	118.6041	122.2898	126.1768	131.3358	137.0512	141.9784 (44)
Energy content	225.4437	198.3726	208.4218	177.9328	168.8215	148.1597	143.4414	151.4203	155.5886	178.2214	195.2546	222.3038 (45)
Energy content (annual)										Total =	Sum(45)m =	2173.3821

119.0022	100.9107	100.0024	90.0104	94.0000	00.7100	00.9904	09.0494	09.1000	97.9000	102.9700	112.0102	(00)
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5. Internal gains (see Table 5 and 5a)

6. Solar gains

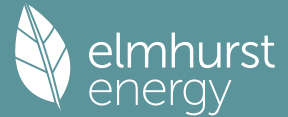
[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	9.4800	11.2829	0.6300	0.7000	0.7700	32.6891 (75)
Southwest	8.6700	36.7938	0.6300	0.7000	0.7700	97.4913 (79)

Solar gains	130.1804	232.6033	347.0988	478.4137	579.9872	595.2016	565.7609	487.0153	392.1060	264.8524	157.9034	110.1278 (83)
Total gains	731.6014	847.9118	936.9304	1047.5297	1120.3246	1113.1518	1063.9413	986.1417	906.3292	799.6133	725.2412	699.0058 (84)

7. Mean internal temperature (heating season)

tau	62.9784	63.1276	63.2746	63.9742	64.1068	64.7315	64.7315	64.8485	64.4894	64.1068	63.8391	63.5616
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alpha	5.1986	5.2085	5.2183	5.2649	5.2738	5.3154	5.3154	5.3232	5.2993	5.2738	5.2559	5.2374
util living area	0.9944	0.9874	0.9704	0.9122	0.7814	0.5854	0.4303	0.4823	0.7354	0.9413	0.9877	0.9956 (86)
MIT	19.8145	20.0115	20.2853	20.6367	20.8796	20.9791	20.9966	20.9939	20.9343	20.6139	20.1559	19.7836 (87)
Th 2	19.9987	20.0008	20.0029	20.0127	20.0145	20.0231	20.0231	20.0247	20.0198	20.0145	20.0108	20.0069 (88)
util rest of house	0.9927	0.9834	0.9609	0.8853	0.7247	0.5033	0.3364	0.3829	0.6544	0.9172	0.9831	0.9942 (89)
MIT 2	18.6287	18.8802	19.2252	19.6556	19.9182	20.0118	20.0221	20.0226	19.9778	19.6402	19.0727	18.5955 (90)
Living area fraction	18.7866	19.0308	19.3663	19.7862	20.0462	20.1406	20.1518	20.1519	20.1052	19.7698	19.2169	18.7537 (92)
MIT	18.7866	19.0308	19.3663	19.7862	20.0462	20.1406	20.1518	20.1519	20.1052	19.7698	19.2169	18.7537 (93)
Temperature adjustment												0.0000
adjusted MIT	18.7866	19.0308	19.3663	19.7862	20.0462	20.1406	20.1518	20.1519	20.1052	19.7698	19.2169	18.7537 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9895	0.9782	0.9531	0.8781	0.7267	0.5135	0.3489	0.3961	0.6620	0.9097	0.9780	0.9915 (94)
Useful gains	723.9452	829.3862	892.9791	919.8302	814.1694	571.5655	371.1743	390.5893	600.0161	727.4083	709.2733	693.0853 (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	1559.8550	1517.9487	1378.9030	1153.9336	882.8625	580.4296	372.0842	392.3428	631.4617	969.9900	1287.1062	1552.7011 (97)
Space heating kWh	621.9169	462.7140	361.5274	168.5545	51.1077	0.0000	0.0000	0.0000	0.0000	180.4808	416.0397	639.5542 (98a)
Space heating requirement - total per year (kWh/year)												2901.8951
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	621.9169	462.7140	361.5274	168.5545	51.1077	0.0000	0.0000	0.0000	0.0000	180.4808	416.0397	639.5542 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2901.8951
Space heating per m2										(98c) / (4) =		29.7173 (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	621.9169	462.7140	361.5274	168.5545	51.1077	0.0000	0.0000	0.0000	0.0000	180.4808	416.0397	639.5542 (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)	673.7995	501.3153	391.6873	182.6159	55.3713	0.0000	0.0000	0.0000	0.0000	195.5372	450.7473	692.9081 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	241.9256	213.8597	227.2608	200.2907	194.4041	175.4709	173.5354	180.3551	182.2242	202.8072	215.1184	239.3764 (64)
Efficiency of water heater (217)m	86.0811	85.7433	85.0956	83.6755	81.5199	79.8000	79.8000	79.8000	79.8000	83.7992	85.5129	79.8000 (216)
Fuel for water heating, kWh/month	281.0439	249.4186	267.0652	239.3661	238.4743	219.8883	217.4629	226.0089	228.3511	242.0157	251.5625	277.8481 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	26.8924	21.5741	19.4251	14.2317	10.9929	8.9813	10.0281	13.0349	16.9311	22.2145	25.0913	27.6399 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-52.9546	-72.5797	-101.4537	-110.8162	-116.8022	-108.0355	-106.6375	-101.9226	-93.2903	-81.3707	-57.4487	-46.0248 (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	-36.5811	-76.0787	-149.6521	-222.5754	-292.2513	-292.9453	-289.5465	-246.1298	-181.6758	-108.1134	-48.6072	-28.9989 (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												3143.9817 (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												2938.5057 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												86.0000 (231)
Electricity for lighting (calculated in Appendix L)												217.0374 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-3022.4920 (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												3363.0328 (238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3143.9817	0.2100	660.2362 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2938.5057	0.2100	617.0862 (264)
Space and water heating			1277.3224 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	217.0374	0.1443	31.3252 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1049.3365	0.1352	-141.8724
PV Unit electricity exported	-1973.1554	0.1262	-248.9803
Total			-390.8527 (269)
Total CO2, kg/year			929.7241 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.5200 (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	3143.9817	1.1300	3552.6994 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2938.5057	1.1300	3320.5114 (278)
Space and water heating			6873.2108 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	217.0374	1.5338	332.8992 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1049.3365	1.4997	-1573.7085
PV Unit electricity exported	-1973.1554	0.4632	-913.9543
Total			-2487.6628 (283)
Total Primary energy kWh/year			4848.5479 (286)
Target Primary Energy Rate (TPER)			49.6500 (287)