



HODKINSON



Energy Statement

Chase New Homes

West End Road, Ruislip

Final

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Executive Summary

The proposed development comprises the partial demolition of 1 Grade II Listed Building and conversion of listed buildings to provide 3 dwellings. In addition to this, the demolition and redevelopment of the remainder of the Barn Hotel site for residential use (total of 71 dwellings) with associated infrastructure, open space and landscaping. The development is located in Ruislip, in the London Borough of Hillingdon.

The Energy Statement supports a planning resubmission following the refusal of full planning permission in June 2023 and grant of Listed Building Consent in October 2023. The re-designed scheme takes into account the Council's comments received through the process of the pre-application engagement with the LPA.

No negative comments were received in relation to the energy strategy submitted for planning in 2023. This updated Energy Statement reflects the massing changes of the development and accounts for the industry updates in relation to available heating and ventilation systems.

The energy strategy has been formulated following the London Plan Energy Hierarchy: *Be Lean*, *Be Clean* and *Be Green*. The overriding objective in the formulation of the strategy is to maximise the reductions in CO₂ emissions through the application of this hierarchy with a cost-effective and technically appropriate approach and to minimise the emission of other pollutants.

A range of **Be Lean** energy efficiency measures are proposed for the new dwellings which enable the proposed development to significantly reduce regulated CO₂ emissions by 11% over the Part L 2021 baseline through energy efficiency measures alone. These include very well insulated building fabric, efficient mechanical ventilation systems and low energy lighting throughout.

The refurbished buildings will be thermally upgraded as far as technically feasible, preserving their Grade II listed character. The external walls will be internally insulated, roof insulation will be upgraded, where space allows for it, and all windows will be fitted with secondary glazing panels. All new elements required for the extension of the buildings will meet Part L 2021 standards. The proposed improvements will result in approximately 19% CO₂ emissions reduction over the baseline scenario determined by Part L 2021 limiting values for existing dwellings.

Be Clean: The opportunity for the proposed development to link into an existing or planned decentralised energy network has been considered. The proposal is located approximately 4km away from the nearest planned district heat network. As the development is relatively small, a heat network serving only the development would not benefit from the economy of scale and therefore the system's running costs would be higher when compared to individual heating systems. A connection to district heating is concluded to be impractical and unfeasible.

Be Green: A feasibility study has been undertaken to establish suitability of the new extension for integration of renewable technology on site. It has been concluded that the most feasible technologies for the development will be:

- > Individual monobloc air source heat pumps (ASHP) water cylinders fitted in new flats,
- > Air source heat pumps (ASHP) fitted to the new houses and refurbished Grade II listed buildings,
- > Photovoltaic panels (PV) mounted on flat roofs of the new buildings; total system size 37kWp.

A highly optimised energy strategy based on passive design, building fabric performance and building services systems and controls, and suitable low and zero carbon systems will allow the scheme to achieve an improvement on total regulated carbon dioxide emissions over the baseline scenario of 68%, exceeding the London Plan carbon emissions reduction target of 35%.

Zero Carbon: The on-site 'zero carbon' target for the development will be met through payment towards Hillingdon Council's carbon offsetting fund. The funds secured by the council will be ring-fenced to deliver carbon emissions savings off site through a variety of projects and will be secured through Section 106 legal agreements.

Be Seen: The Client will commit to carrying out energy monitoring and reporting at each stage of the planning, construction and in-use processes to enable the GLA to record the estimated and actual energy uses in new developments, helping to achieve net zero-carbon buildings and providing a number of environmental and socio-economic benefits.

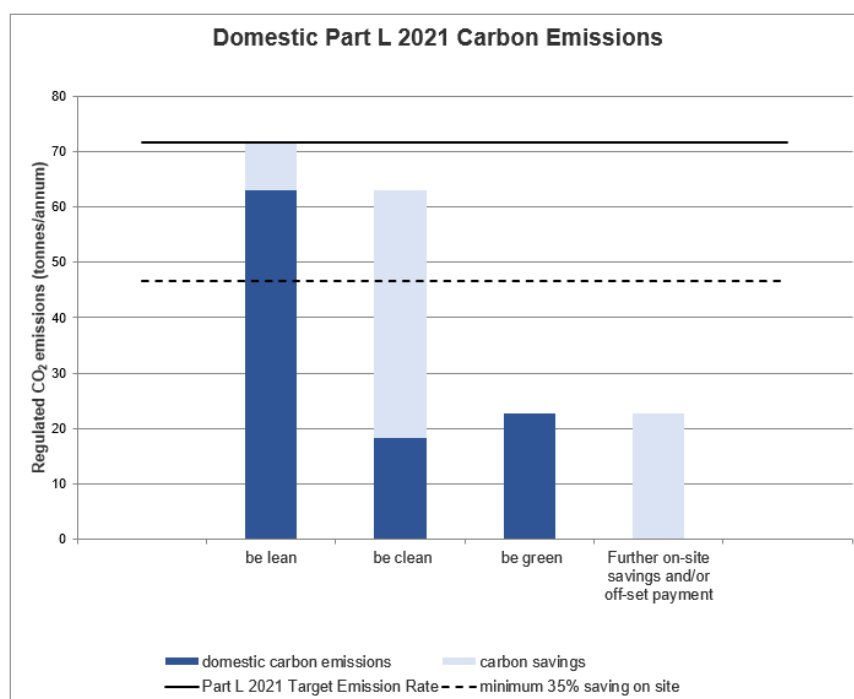


Figure i: Energy hierarchy regulated carbon emissions from the development (source: GLA carbon emissions reporting spreadsheet)

CONTENTS

Executive Summary	2
1. INTRODUCTION	5
2. DEVELOPMENT OVERVIEW	6
3. PLANNING POLICIES & GUIDANCE	9
National Policy: National Planning Policy Framework	9
Regional Policy: The London Plan	10
Local Policy: London Borough of Hillingdon	12
Summary of Requirements	12
4. BUILDING REGULATIONS BASELINE	13
Methodology	13
5. BE LEAN: ENERGY EFFICIENCY MEASURES	15
CO ₂ Emissions Following <i>Be Lean</i> Measures	19
6. BE CLEAN: DECENTRALISED ENERGY	20
7. BE GREEN: RENEWABLE ENERGY	21
CO ₂ Emissions Following <i>Be Green</i> Measures	23
8. BE SEEN: ENERGY MONITORING	26
9. SUMMARY	28
10. APPENDICES	30

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 the residential development at West End Road in Ruislip, the London Borough (LB) of Hillingdon.
- 1.2** The energy strategy for the development has been formulated following The London Plan Energy Hierarchy: *Be Lean, Be Clean* and *Be Green*. The overriding objective in the formulation of the strategy is to maximise the reductions in CO₂ emissions through the application of this hierarchy with a cost-effective and technically appropriate approach and to minimise the emission of other pollutants.

Objectives

- 1.3** The objectives of this report are to:
- > Demonstrate how the proposed development has been assessed against the policy requirements of the Hillingdon Local Plan, Policy DME1 2 and The London Plan, Policy SI 2.
 - > Identify the most suitable passive and energy efficient design approach for the scheme, the feasibility of low and zero carbon (LZC) technologies and operational best practice.
 - > Identify the drivers relating to an energy efficient design over and above minimum compliance with current Building Regulations and energy targets.
 - > Identify the most cost-effective heating solutions to ensure the operational costs for residents are minimised.

2. DEVELOPMENT OVERVIEW

Planning History

- 2.1** This submission follows the refusal of full planning permission in June 2023 and grant of Listed Building Consent in October 2023 as well as detailed pre-application engagement between January and July 2024.
- 2.2** The application was refused for 11 reasons; these are summarised as follows:
- 1. The development would be overdevelopment of the site, detrimental to the setting of the Grade II listed buildings. A lack of detail of the treatment of the historic fabric of the listed buildings was provided to enable the benefits of the scheme to be weighed against any potential harms.*
 - 2. The proposal would be visually dominant, and overdevelopment of the site at odds with the distinctive suburban character of the surrounding area, harming the visual amenity and character of the area.*
 - 3. The unit mix fails to provide sufficient family sized units to reflect housing need in the Borough.*
 - 4. Cycle parking design does not conform to the London Cycling Design Standards.*
 - 5. Insufficient information on overheating and any mitigation required.*
 - 6. Insufficient information on levels of daylight and sunlight amenity.*
 - 7. Suitable SuDs was not shown to be incorporated.*
 - 8. Inadequate information on potential harm to bat roosts.*
 - 9. Failure to provide adequate provision of disabled units.*
 - 10. Failure to provide adequate levels of amenity space for future occupants.*
 - 11. Absence of completed S106 Agreement.*
- 2.3** On 24 October 2023 the parallel Listed Building Consent (LBC) application was granted (LPA Ref. 7969/APP/2023/1833). This approval therefore addressed part of reason for refusal 1.
- 2.4** The updated Statement has been prepared following feedback and discussion on application 7969/APP/2024/2451 originally submitted in October 2024.
- 2.5** This new scheme is a fresh design approach to development on the site which has taken account of all matters raised during engagement with the Local Planning Authority to date. This approach has

enabled the Applicant to develop a sensitive and attractive scheme which responds to local context, including the sites heritage significance, and will add positively to the quality of the area.

2.6 The proposed description of development is as follows:

“The partial demolition of the Grade II Listed Building and conversion of the Listed Buildings to accommodate 3 residential units and the replacement of the existing hotel buildings (C1 Use Class) with new build flat blocks and houses (Class C3) that range between two and four storeys in height to accommodate 68 residential units (a total of 71 residential dwellings within the development) together with the creation of new public realm, landscaping improvements, provision of car parking (including disabled parking bays), cycle parking, refuse stores and servicing arrangements with associated forms of development.”

Site Location & Proposed Development

2.7 The proposed development is located off West End Road in Ruislip, in the London Borough of Hillingdon. The site is located to the south of overground rail line (Metropolitan and Piccadilly) and Ruislip train station and to the east of West End Road (A4180). Please refer to Figure 1 for site location plan.

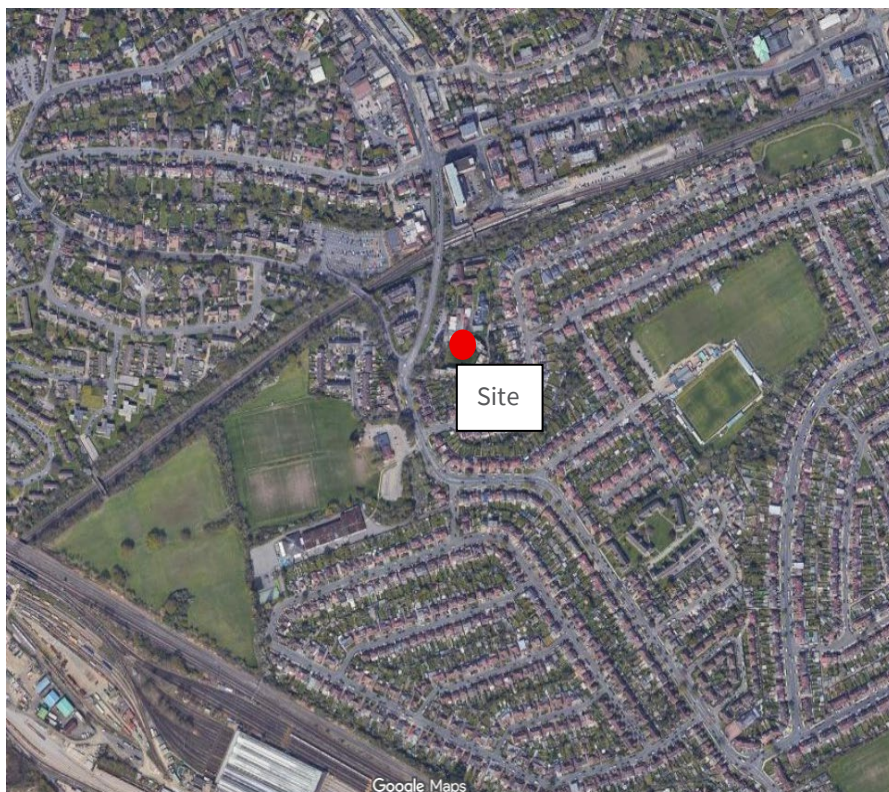


Figure 1: Site location (source: Google maps, Map data 2026)

2.8 The proposed development comprises a redevelopment of the site to provide 71 dwellings spread across three apartment blocks, houses and two refurbished Grade II listed buildings. Please refer to the Figure 2 below for the proposed site plan, for context.



Figure 2: Proposed Block Plan (source: Aros Architects, February 2026)

3. PLANNING POLICIES & GUIDANCE

- 3.1 The following planning policies and material considerations have informed the sustainable design of the proposed development.

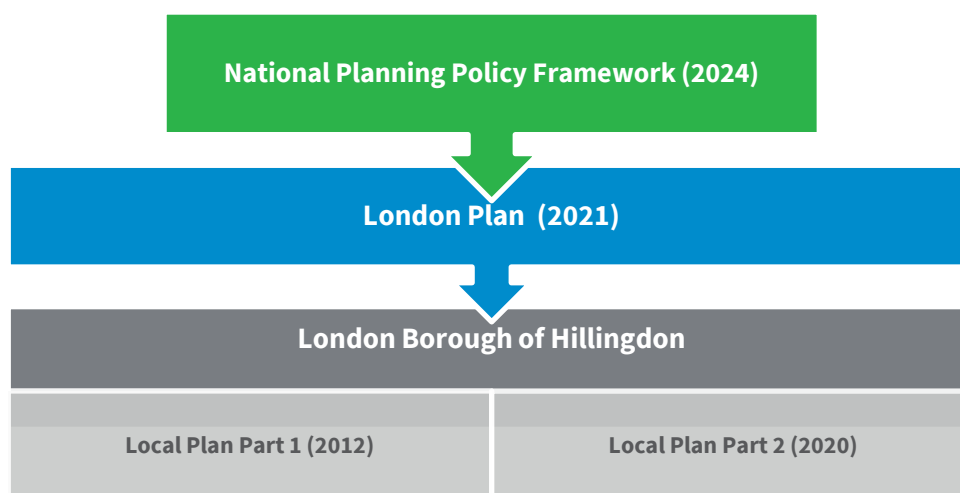


Figure 3: Relevant Planning Policy and Guidance Documents

National Policy: National Planning Policy Framework

- 3.2 The revised National Planning Policy Framework (NPPF) was published in December 2024 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 National General Assembly). 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 and safe built environment, with accessible services and open spaces that reflect current and future needs and support communities' health, social and cultural well-being; and
- c) An environmental objective – to contribute to protecting and enhancing our natural, built and historic environment; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy.

Regional Policy: The London Plan

The London Plan (2021)

3.5 The following policies in the London Plan are considered relevant to the proposed development and this Statement.

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: Monitoring and reporting of the actual operational energy performance of major developments for at least five years.*

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.'

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 NOx 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.

GLA Energy Assessment Guidance (2022)

3.9 The GLA Energy Assessment Guidance published June 2022 provides advice on how the energy statement can demonstrate compliance with the London Plan Policy SI2. It further clarifies the reporting format and confirms the targets for major development. The following key points, relevant to the development at West , have been taken from the document:

- > The requirements for the reduction in regulated CO₂ emissions of 10% for residential development to be achieved at the *Be Lean* stage is applicable to major development, defined as that exceeding 10 dwellings.
- > There is a requirement to report energy use intensity (EUI), energy demands and improvements in carbon emissions.
- > A guidance is given on how to model baseline emissions for major refurbishments, however the requirements for minor refurbishments should be determined on local level and assessed by each borough based on the specifics of the site.

‘Be Seen’ Energy Monitoring Guidance (September 2021)

3.10 Major developments are required to monitor and report on energy performance to the Mayor for at least five years via an online portal to enable the GLA to identify good practice and report on the operational performance of new development in London.

3.11 The document is aimed at those involved in the planning, design, construction, delivery and operation of development. It includes a reporting template which applicants will be expected to use.

It applies to major developments and sets out what each responsible party needs to do to comply with the policy from the inception stage of a development to full occupancy.

- 3.12** The 'Be Seen' policy is designed help verify the London Plan policies and to ensure compliance with London's net zero-carbon standard is achieved.

Local Policy: London Borough of Hillingdon

- 3.13** LB of Hillingdon's Local Plan was issued in two parts. Part 1: Strategic Policies was adopted in 2012 and Part 2: Development Management Policies was adopted in 2020. The key policies from these documents pertinent to this Energy Statement are:
- > Policy EM1 Climate Change requires that climate change mitigation is addressed at every stage of the development process by encouraging sustainable transport, promoting the use of decentralised energy, encouraging renewable energy, managing flood risk and surface water drainage, and promoting the use of living walls and roofs.
 - > Policy DMEI 2: Reducing Carbon Emissions requires all major development proposed to minimise carbon dioxide emissions and be accompanied by an energy assessment.
 - > Policy DMEI 3 Decentralised Energy requires all major developments to be able to connect to a Decentralised Energy Network.

Summary of Requirements

- 3.14** The majority of the development will be assessed as new build under Part L of the Building Regulations (2021). The two Grade II listed buildings, which are proposed to be upgraded and converted to houses, will be assessed against the requirements of Part L (2021) relating to retained upgraded elements. These buildings are not required to meet the TER (Target Emission Rate), TPER (Target Primary Energy Rate) and TFEE (Target Fabric Energy Efficiency) targets. As listed buildings, they do not need to comply fully with the energy efficiency requirements of Part L 2021 (Part L 2021, paragraph 0.8)
- 3.15** The 10% carbon emissions reduction target from the Be Lean measures will be applied to the new part of the development. The refurbished buildings will be improved as far as practically possible, taking into account their listed status.
- 3.16** The site-wide 35% carbon emissions reduction target will include the refurbished buildings, however the results for both parts of the development (new and refurbished) will also be reported separately as per the Energy Assessment Guidance requirement.

- 3.17** Should the development fall under the Future Homes Standard (FHS) there is the possibility that the proposed heating strategy may not be compliant. This is because the FHS will uplift the performance of the baseline heating strategy, making the CO₂ savings targets harder to achieve. The compliance under FHS will largely depend on the efficiency of the final heat pump systems selected for the dwellings. Alternative options have been considered and are discussed in the Be Green section of this report. There will be no change to the Fabric Energy Efficiency (FEE) requirement, as the same notional fabric specification is being used. Given the new regulations will come into force on 24th March 2027, with a 12-month transitional period following this, it is assumed that commencement of construction will start prior to the cut off date. For this reason, the proposed strategy is based on Part L (2021) and Part O (2021) requirements.

4. BUILDING REGULATIONS BASELINE

Methodology

- 4.1** This statement first establishes a baseline assessment of the energy demands and associated CO₂ emissions for the development.
- 4.2** The report will then follow the London Plan Energy Hierarchy approach of *Be Lean*, *Be Clean* and *Be Green* to enable the maximum feasible reductions in Regulated CO₂ emissions over the baseline.

Standard Assessment Procedure (SAP)

- 4.3** The Standard Assessment Procedure (SAP), which forms the basis for demonstrating dwelling's compliance with Part L of the Building Regulations 2021 for new build residential buildings, has been used for the development to estimate the savings achieved through the energy efficiency features proposed and to predict the annual building regulated energy consumption and CO₂ emissions of the dwellings. An accredited Design SAP 10 software has been used to support the calculations.
- 4.4** The energy consumption and CO₂ emissions of the unregulated elements (cooking and appliances) have been estimated based on the methodology developed in Passivhaus Planning Package (PHPP).

Baseline Scenario

- 4.5** The GLA guidance on preparing energy assessments clarifies the calculation methodology for new developments to ensure the consistency of the calculations across all boroughs.
- 4.6** The energy assessment must first establish the regulated CO₂ emissions assuming the development complies with Part L 2021 of the Building Regulations. When determining this baseline, it should be

assumed that the heating would be provided by gas boilers and that any active cooling would be provided by electrically powered equipment, in line with SAP 10 calculation methodology for notional dwelling. All controls should align with the Part L notional building assumptions. This is to demonstrate the CO₂ emissions savings achieved through incorporation of passive design and efficient building fabric. This is to demonstrate the CO₂ emissions savings achieved through incorporation of passive design and efficient building fabric.

- 4.7** Very limited information has been provided for the Grade II listed buildings. It has been confirmed that some improvements had already been made to the fabric to make the buildings suitable for hotel use. A more intrusive survey of the building elements will be carried out post-planning. We have assumed that the Part L threshold U-values for retained elements are applicable to the existing walls and roof.
- 4.8** The retained and refurbished Grade II listed buildings will be assessed using SAP 10 software, however their compliance with Part L of the Building Regulations will not be determined by the same compliance criteria as applicable for new dwellings. A baseline scenario will use the current status of the buildings and, where the survey data is incomplete, the threshold U-values of thermal elements, taken from the Approved Document (AD) Part L 2021, will be used (please refer to AD Part L, Table 4.3 and Appendix A for details). This is to best reflect the actual performance of the existing buildings, and proposed improvements, without penalising the listed status of the dwellings by setting up unrealistically high baseline.
- 4.9** Any improvements to the building fabric will inform the Be Lean scenario for the refurbished buildings. The GLA baseline fabric requirements for refurbishments will not be used as they have been deemed too onerous to meet and improve on in listed buildings. The GLA suggested values are applicable to referable developments. The guidance states that for smaller refurbishments, local boroughs should establish suitable approach to establish CO₂ improvements in existing building stock.

Unit Selection

- 4.10** A representative sample of eight units across the development has been selected and assessed for energy calculations purposes. This accounts for various unit types, floor levels, occupancies and exposed façade directions.
- 4.11** The selected dwellings have been modelled based on the latest set of architectural drawings from Aros Architects, dated February 2026.

Baseline Results

- 4.12** Tables 1, 2 and 3 below shows the estimated baseline regulated and unregulated CO₂ emissions for the new dwellings, refurbished buildings and entire proposed development respectively.

Table 1: Regulated and Unregulated Baseline CO₂ Emissions for the New Dwellings

New dwellings	Regulated CO ₂ (tonnes/year)	Unregulated CO ₂ (tonnes/year)
Baseline emissions	60.4	93.54

Table 2: Regulated and Unregulated Baseline CO₂ Emissions for the Refurbished Buildings

Refurbished dwellings	Regulated CO ₂ (tonnes/year)	Unregulated CO ₂ (tonnes/year)
Baseline emissions	11.3	5.10

Table 3: Regulated and Unregulated Baseline CO₂ Emissions for the Whole Development

Whole development	Regulated CO ₂ (tonnes/year)	Unregulated CO ₂ (tonnes/year)
Baseline emissions	71.7	97.7

5. ***BE LEAN***: ENERGY EFFICIENCY MEASURES

- 5.1** The first stage of the London Plan energy hierarchy is demand-reduction through energy efficiency measures. A number of measures are proposed in order to reduce energy demands across the development.
- 5.2** This section outlines the currently proposed strategies for achieving these targets. These measures, or alternatives, can be provided to achieve the policy requirements.

Building Envelope

- 5.3** A fabric strategy has been developed to ensure the building complies with the requirements of Part L 2021 and helps reduce the space heating demand of the dwellings. This has been set out below. Detailed building fabric specification will be developed post-planning to ensure all buildings meet the compliance criteria. The performance parameters listed in Table 4 might have to improve for specific dwellings once full modelling takes place at RIBA Stage 3.

Table 4: Proposed Specification

Element	New Buildings	Refurbished dwellings
External Wall	0.18 W/m ² K	0.30 W/m ² K if possible
Walls to unheated spaces	0.20 W/m ² K	n/a
Ground Floor	0.10 W/m ² K	0.70 W/m ² K should strive to improve to 0.25W/m ² K if possible.
Flat Roof	0.11 W/m ² K	n/a
Sloping Roofs	0.09 W/m ² K	0.35W/m ² K
Terraces	0.15 W/m ² K	n/a
Windows/Glazed doors	0.90 W/m ² K g-value 0.38	1.7W/m ² K; Draught-stripping and secondary glazing
Solid doors (External)	1.2 W/m ² K	3.00 W/m ² K
Solid doors (Corridor)	1.0 W/m ² K	n/a
Air Permeability (m ³ /hm ²)	3.0	No target given in Part L; it is assumed that internal linings will improve the building AP to 12 m ³ /hm ² (to be tested post construction)

Thermal Bridging

- 5.4** In well insulated buildings significant heat loss can occur through thermal bridges at the building junctions. This occurs when highly conductive elements in the construction enable a low resistance escape route for heat.
- 5.5** Chase New Homes are committed to developing building fabric where linear thermal transmission through thermal bridges is minimised as far as practicable.
- 5.6** Psi-values listed below were provided by the Applicant, based on achieved calculated psi-values for similar development. The selected junctions in new dwellings will be required to achieve the performance outlined below. The refurbished buildings will not target bespoke psi-values.

> Lintels (E2) – 0.017 W/mK,

- > Sills (E3) – 0.03 W/mK,
- > Jambs (E4) – 0.12 W/mK,
- > Ground Floor (E5) – 0.10 W/mK,
- > Party Floor (E7) – 0.12 W/mK,
- > Balcony (E23) – 0.20 W/mK,
- > Corner – normal (E16) – 0.127 W/mK,
- > Corner – inverted (E17) – 0.00 W/mK,
- > Party wall (E18) – 0.05 W/mK,
- > Party wall, ground floor (P1) – 0.10 W/mK,
- > Party wall, intermediate floor (P3) – 0.00 W/mK,
- > Eaves (E10) – 0.12 W/mK,
- > Gable (E12) – 0.12 W/mK,
- > Roof – flat (E14) – 0.16 W/mK
- > Roof – flat with parapet (E15) – 0.30 W/mK
- > Roof – party roof between dwellings (P4) – 0.06 W/mK

Air Tightness and Ventilation

- 5.7** As detailed in Table 4, the target air permeability for new dwellings will be 3 m³/m²hr @50Pa. The existing, refurbished Grade II listed buildings will be improved, where possible to avoid unwanted heat losses.
- 5.8** Mechanical ventilation units with heat recovery (MVHR, System 4) will be installed to all flats and new houses. The proposed units are expected to achieve a specific fan power of less than 0.7W/l/s and heat recovery efficiency of more than 88% with a function of a summer bypass.
- 5.9** The refurbished listed buildings will utilise natural ventilation with extract fans in all wet rooms.

Space Heating & Cooling

- 5.10** The space heating requirements will be reduced by the fabric and air tightness measures detailed above.
- 5.11** All dwellings are proposed to be connected to individual heat pumps providing space and water heating or heat pump hot water cylinders providing water heating only, supplemented by direct electric radiators. Heat pumps are a renewable technology, and rationale for selection of this system is covered within Section 6 and Section 7.
- 5.12** For the purpose of this energy statement, the baseline strategy involves the use of boilers, as required by the GLA guidance and described in Section 4 of this report.

Limiting the Risk of Summer Overheating

- 5.13** Minimising the risk of summer overheating is important to ensure that homes are adapted to climate change and remain comfortable to occupy in the future. It is important to ensure that the energy strategy presented does not cause an unacceptable risk of summer overheating within the dwellings.
- 5.14** All dwellings will utilise openable windows where possible. Windows will be inward opening maximising air flow within the rooms. All glazing in new dwellings will have optimised solar thermal transmittance value (g-value) of 0.38 to allow usable solar gains penetrate the spaces but limiting unwanted excessive solar heating during summer months.
- 5.15** External noise, air pollution and security have been taken into account when analysing overheating mitigation measures.
- 5.16** Mechanical ventilation with heat recovery and summer by-pass will be utilised in the dwellings that are affected by noise constraints and useability restrictions. The system selected will be equipped with air tempering (small cooling coil providing so-called 'peak lopping').
- 5.17** An Overheating Assessment has been completed by Hodkinson Consultancy (March 2026) which outlines a mitigation strategy for demonstrating compliance with both CIBSE TM59 and Approved Document O (AD-O) criteria.

Lighting & Systems' Controls and Metering

- 5.18** Energy efficient LED light fittings will be installed. All lights will be energy efficient and will exceed efficacy of 85 lamp lumens per circuit-watt.

- 5.19** Appropriate demand reducing light controls will be installed in communal areas. This will be achieved through the use of Passive Infrared sensors (PIRs) for occupancy sensing fitted in all communal corridors and staircases.
- 5.20** All external lighting will meet or exceed the requirements of Part L of the building regulations relating to fixed external lighting.
- 5.21** Every dwelling will be fitted with a smart metering device helping the tenants to control their energy use and associated cost. The meters fitted will help with energy use data collection to inform the Be Seen stage of energy hierarchy. Please refer to Section 8 for more details.

CO₂ Emissions Following *Be Lean* Measures

- 5.22** Table 5 shows the new build part of the development achieves a 11% reduction in CO₂ emissions site-wide through the application of energy efficiency measures. The refurbished dwellings will achieve an 19% energy efficiency improvement over the baseline scenario (Table 6). Overall carbon emissions reduction from the Be Lean measures for the whole development will reach 12% (Table 7).

Table 5: Reduction in Regulated CO₂ Emissions following Be Lean Measures – New Dwellings

New dwellings	Regulated CO ₂ (tonnes/year)	Reduction in Regulated CO ₂ (tonnes/year)	Reduction in Regulated CO ₂ (%)
Baseline	60.4	-	-
After <i>Be Lean</i> Measures	53.8	6.6	11%

Table 6: Reduction in Regulated CO₂ Emissions following Be Lean Measures – Refurbished dwellings

Refurbished dwellings	Regulated CO ₂ (tonnes/year)	Reduction in Regulated CO ₂	Reduction in Regulated CO ₂ (%)
Baseline	11.3	-	-
After <i>Be Lean</i> Measures	9.2	2.1	19%

Table 7: Reduction in Regulated CO₂ Emissions following Be Lean Measures – Whole development

Whole development	Regulated CO ₂ (kg/year)	Reduction in Regulated CO ₂	Reduction in Regulated CO ₂ (%)
Baseline	71.7	-	-
After <i>Be Lean</i> Measures	63.0	8.7	12%

5.23 The Be Lean Worksheets can be seen in Appendix B.

6. **BE CLEAN: DECENTRALISED ENERGY**

6.1 In line with the London Plan Policy SI3 Energy Infrastructure, the heating hierarchy has been considered:

- > 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, meet the development's electricity demand and provide demand response to the local electricity network);
- > use ultra-low NOx gas boilers.

6.2 Connection to a decentralised energy network is a recognised method of generating energy more efficiently. The London Plan Policy SI3 requires major development proposals to explore the opportunities to link into an existing or planned decentralised energy network. Where an existing decentralised energy network is not present, major developments should undertake a detailed investigation into the feasibility of establishing a district heating network with the proposed development as an anchor heat load or contribute towards such feasibility work.

6.3 The proposal is located over 4km from the nearest proposed district heat network in Uxbridge and Brunel University. As such, if a communal heating system was to be specified, it would have to be financially feasible on the basis of the system serving just the proposed development. The heat costs for the residents would have to be reasonable at the time of completion and prior to any connection to a larger heat network. As the development is relatively small, the development's heat network would not benefit from the economy of scale and therefore the system's running costs would be higher when compared to individual heating systems.

- 6.4** Therefore, without certainty on the provision of an external heat source via district heat network, the scheme is not able to proceed with a communal heating strategy, as it would run the risk of never being connected to any large network. This would result in high heat costs for residents in perpetuity.
- 6.5** Individual dwelling heating options therefore present a more appropriate alternative that provides certainty in relation to heating costs and carbon reductions.

7. *BE GREEN:* RENEWABLE ENERGY

- 7.1** The third step in the London Plan energy hierarchy requires that the clean generation of energy by renewable energy technologies be examined.
- 7.2** In line with the energy hierarchy an assessment of the feasibility of renewable energy technologies has been undertaken and presented in this section.
- 7.3** A feasibility study has been undertaken to establish the most technically and economically feasible renewable technology which provides the highest overall reduction in carbon dioxide emissions for the proposed development to help achieve the planning policy target.

Heat Pumps

- 7.4** Air Source Heat Pumps (ASHP) extract energy from air and therefore need external areas for condensers. This will be problematic for flats, as the blocks are located on a constrained site with limited external areas. The condensers could be located on flat roofs; this would, however, raise the buildings' height and necessitate large acoustic enclosures.
- 7.5** ASHP will be suitable for houses and will be fitted to the new houses and refurbished Grade II listed buildings. This system will be suitable for the retained buildings provided their thermal envelope is upgraded as discussed in Section 5. Heat will be distributed via low temperature radiators. The Grant Aeron3 6kW system has been used in the modelling of the new houses, the same or similar system will be used for the refurbished dwellings.
- 7.6** Exhaust air source heat pumps have been considered and should the FHS apply for this development and the proposed heating strategy no longer be compliant, then exhaust air source heat pumps are a viable alternative that will be considered. Current cupboard space designed within dwellings will suffice to accommodate the system, should it become available and commercially attractive.
- 7.7** Air source heat pump hot water cylinders are the preferred strategy for the new apartments within the development as they do not require external plant and are therefore suitable for blocks of flats

or houses with limited external areas. These systems will also benefit from the extra efficiency of not having heat losses associated with communal heating systems. Space heating would be provided via electric panel heaters.

- 7.8** For the purpose of the modelling, Haier Curv-360HP200M3 heat pump cylinders have been selected. Their coefficient of performance (COP) exceeds 3 and is therefore a very efficient solution for provision of hot water to the dwellings. Please refer to Appendix C for technical datasheet of the proposed system. This selection has been made upon consultation with the Applicant to inform the carbon emissions reduction achieved for the site. It should not limit the system specification at detailed design stage.
- 7.9** The appropriateness of this system will be reviewed at detailed design stage to assess its compliance with AD Part L applicable at the time of the Building Control submission.

Photovoltaics (PV) Panels

- 7.10** PV panels generate electricity from solar radiation. The generating potential of PV panels is not dependent on development demand, but only on available roof space for installation and ensuring that they are not over shaded.
- 7.11** PV panels are suitable for this development. Roofs of the apartment blocks and the houses are suitable for installation of PV panels.
- 7.12** An analysis of the available roofs, taking into account services termination, visual impact on listed buildings and safe access, confirms that the estimated PV system size is 37kWp. South, west and south-west facing sloping roofs were deemed suitable for PV.
- 7.13** Please refer to Figure 4 below for indicative layout of PV panels on roofs of all blocks.



Figure 4: Indicative location of the proposed PV system

CO₂ Emissions Following Be Green Measures

- 7.14** The estimated total carbon emissions reduction from the development after incorporation of PV panels and heat pumps is over 68%, as shown in the Table 10 below. Please refer to Appendix D for DER Worksheets and Appendix E for the GLA carbon emissions calculations spreadsheet. This exceeds the requirements of Part L of the Building Regulations and the minimum local planning policy.
- 7.15** These results provide a robust case for supporting the proposed heating strategy incorporating heat pumps for the development. This aligns with the London Plan policy strategy supporting clean, low emission fuels.

Table 8: Reduction in Regulated CO₂ Emissions following Be Green Measures – New Dwellings

New dwellings	Regulated CO ₂ (tonnes/year)	Reduction in Regulated CO ₂ (tonnes/year)	Reduction in Regulated CO ₂ (%)
Baseline	60.4	-	-
After <i>Be Lean</i> Measures	53.6	6.6	11%

New dwellings	Regulated CO ₂ (tonnes/year)	Reduction in Regulated CO ₂ (tonnes/year)	Reduction in Regulated CO ₂ (%)
After <i>Be Green</i> Measures (heat pumps + PV)	19.7	40.7	67%

Table 9: Reduction in Regulated CO₂ Emissions following *Be Green* Measures – Refurbished dwellings

Refurbished dwellings	Regulated CO ₂ (tonnes/year)	Reduction in Regulated CO ₂	Reduction in Regulated CO ₂ (%)
Baseline	11.3	-	-
After <i>Be Lean</i> Measures	9.2	2.1	19%
After <i>Be Green</i> Measures (heat pumps)	3.1	8.3	73%

Table 10: Reduction in Regulated CO₂ Emissions following *Be Green* Measures – Whole development

Whole development	Regulated CO ₂ (kg/year)	Reduction in Regulated CO ₂	Reduction in Regulated CO ₂ (%)
Baseline	71.7	-	-
After <i>Be Lean</i> Measures	63.0	8.7	12%
After <i>Be Green</i> Measures	22.8	49	68%

Other Technologies – Not Feasible

Solar Thermal

- 7.16** Solar thermal panels use the sun's energy to generate hot water. Solar thermal panels are generally installed on the roofs, with panels facing as close to south as possible and at 45 degrees angle to maximise their efficiency.
- 7.17** The benefits of solar thermal panels are constrained by the seasonal variation in solar radiation. This means that solar thermal panels can only deliver a maximum of 60% of the annual hot water demand. This would still require all of the proposed conventional fuel heating infrastructure to be in place to meet times when Domestic Hot Water (DHW) generation is not possible using this technology.

- 7.18** Visual impact of solar thermal panels would be higher than the impact of PV collectors due to higher inclination of the mounting system for maximum efficiency.
- 7.19** This technology would be in direct competition for roof space with photovoltaics which are better suited to this development.

Ground Source Heat Pump

- 7.20** Ground Source Heat Pump (GSHP) can provide significant reductions in energy. However, they are generally limited to sites with large amount of space and would require a central plant space for a development with blocks of flats. The proposed development is located on a brownfield site. This increases the complexity and subsequent costs for applying the technology. GSHP is therefore not considered as appropriate.

Wind Turbines

- 7.21** Urban rooftop wind turbines do not generally perform sufficiently well to warrant their installation, due to the low and turbulent wind conditions present. The rooftop for this application is considered to meet these unfavourable conditions and as a result remain technically unfeasible.
- 7.22** It has therefore been concluded that wind turbines are not a suitable technology for this site.

‘Zero Carbon’ Offset Payment

- 7.23** The on-site ‘zero carbon’ target shortfall for the development will be met through the payment towards Hillingdon Council’s carbon offsetting fund. The funds secured by the council will be ring-fenced to deliver carbon emissions savings off site through a variety of projects and will be secured through Section 106 legal agreements.
- 7.24** The council’s carbon offset cost is £95 for every tonne of CO₂ emitted per year over a period of 30 years (or £2,850 per tonne of annual residual CO₂ emissions).
- 7.25** The estimated offset payment will be in the region of £64,889, if the listed buildings are included in the calculation. Please refer to Table 11 for detailed calculations of the carbon shortfall and the ‘zero carbon’ offset payment.

Table 11: ‘Zero carbon’ offset payment calculations

Energy hierarchy	Regulated carbon dioxide (tonnes/year)
Baseline emissions	71.7

Energy hierarchy	Regulated carbon dioxide (tonnes/year)
Savings from 'Be Lean' measures - energy demand reduction	8.7
Savings from 'Be Clean'	0
Savings from 'Be Green'	40.3
Cumulative savings	49
Shortfall to 'zero carbon'	22.8
'Zero carbon' offset payment	22.2 x 30 years = 683
	683 x £95 = £64,889

8. **BE SEEN: ENERGY MONITORING**

- 8.1** To comply with London Plan Policy SI 2 an estimate of energy use and carbon emissions predicted for the development will be reported by the Client via the GLA web portal and will be further updated at each stage of the planning, design, as-built and in-use process. To support this process, Hodkinson will conduct required calculations and populate the Be Seen Planning spreadsheet ready for submission.
- 8.2** The 'Be Seen' Energy Monitoring Guidance sets out processes and responsibilities at each reporting stage to ensure the 'Be Seen' stage of the energy hierarchy is well understood and correctly applied to all major developments. The figure 5 below, extracted from the GLA guidance, summarises the tasks involved in energy and carbon reporting and shows the party most likely responsible for each task.

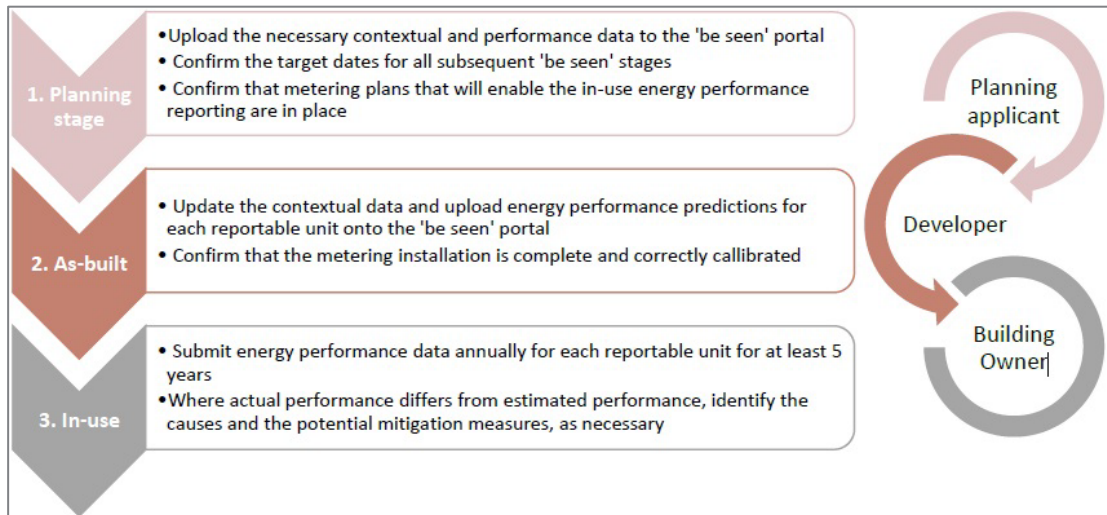


Figure 5: 'Be Seen' reporting stages, processes and responsibilities (source: 'Be Seen' Energy Reporting Guidance)

8.3 The Client will ensure that all involved parties are aware of their reporting responsibilities at subsequent monitoring stages and will provide estimates of each of the performance indicators listed in Table 12 below which will be reported to the GLA using the 'be seen' spreadsheet.

Table 12: 'Be Seen' reporting requirements at planning stage.

Planning stage Performance indicator group	Description
Contextual data	> Location Unique Property Reference Number (UPRN) or Address (if no UPRN available) > Site plan > Typology / Planning Use Class (all included) > GIA (m2) for each Typology / Use Class > Anticipated target dates for each 'be seen' reporting stage (i.e. 'as-built' and 'in-use')
Building energy use	> Grid electricity consumption (kWh) > Gas consumption (kWh)

Planning stage Performance indicator group	Description
	> Other fuels consumption (kWh) > District heating/cooling consumption(kWh) (if applicable)
Renewable energy	> Energy generation (kWh)
Carbon emissions	> Carbon emissions estimates (tonnes CO₂/m²) for residential and non-residential uses separately as well as the whole development > Carbon shortfall for the entire development (tonnes CO₂) > Estimated carbon offset amount (£)

9. SUMMARY

- 9.1** The Energy Statement supports a planning resubmission following the refusal of full planning permission in June 2023 and grant of Listed Building Consent in October 2023. The re-designed scheme takes into account the Council's comments received through the process of the pre-application engagement with the LPA.
- 9.2** No negative comments were received in relation to the energy strategy submitted for planning in 2023. This updated Energy Statement reflects the massing changes of the development and accounts for the industry updates in relation to available heating and ventilation systems.
- 9.3** The Energy Strategy for the development has been formulated following the London Plan Energy Hierarchy: *Be Lean*, *Be Clean* and *Be Green*. The overriding objective in the formulation of the strategy is to maximise the reductions in CO₂ emissions through the application of this hierarchy with a cost-effective and technically appropriate approach and to minimise the emission of other pollutants.
- 9.4** A range of *Be Lean* energy efficiency measures are proposed for the new dwellings which enable the proposed development to significantly reduce regulated CO₂ emissions by 11% over the

baseline through energy efficiency measures alone. These include very well insulated building fabric, efficient mechanical ventilation systems and low energy lighting throughout.

- 9.5** The refurbished buildings will be thermally upgraded as far as technically feasible, preserving their Grade II listed character. The external walls will be internally insulated, roof insulation will be upgraded, where space allows for it, and all windows will be fitted with secondary glazing panels. The proposed improvements will result in approximately 19% CO₂ emissions reduction over the baseline scenario.
- 9.6** The opportunity for the proposed development to link into an existing or planned decentralised energy network has been considered. The proposal is located approximately 4km away from the nearest planned district heat network. As the development is relatively small, the heat network serving only the development would not benefit from the economy of scale and therefore the system's running costs would be higher when compared to individual heating systems. A connection to district heating is concluded to be impractical and unfeasible.
- 9.7** A feasibility study has been undertaken to establish suitability of the new extension for integration of renewable technology on site. It has been concluded that the most feasible technologies for the development will be:
- > Individual monobloc air source heat pumps (ASHP) water cylinders fitted in new flats,
 - > Air source heat pumps (ASHP) fitted to the new houses and refurbished Grade II listed buildings,
 - > Photovoltaic panels (PV) mounted on flat roofs of the new buildings; total system size 37kWp.
- 9.8** A highly optimised energy strategy based on passive design, building fabric performance and building services systems and controls, and suitable Low and Zero Carbon systems will allow the scheme to achieve an improvement on total regulated carbon dioxide emissions over the existing scenario of over 68%, exceeding the Building Regulations Part L 2021 targets for compliance and London Plan carbon emissions reduction target of 35%.
- 9.9** The on-site 'zero carbon' target for the development will be met through payment towards Hillingdon Council's carbon offsetting fund. The funds secured by the council will be ring-fenced to deliver carbon emissions savings off site through a variety of projects and will be secured through Section 106 legal agreements.
- 9.10** The Client will commit to carrying out energy monitoring and reporting at each stage of the planning, construction and in-use processes to enable the GLA to record the estimated and actual energy uses in new developments, helping to achieve net zero-carbon buildings and providing a number of environmental and socio-economic benefits.

APPENDICES

Appendix A

Baseline specification for listed buildings

Appendix B

Be Lean SAP Worksheets

Appendix C

Hot water heat pump datasheet

Appendix D

Be Green SAP Worksheets

Appendix E

Sitewide GLA carbon emissions spreadsheet summary

Appendix A

Baseline specification for listed buildings

Appendix A

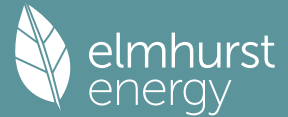
Baseline specification for listed buildings

Baseline specification for listed buildings			
Element	Surveyed Data	Assumed baseline specification [W/m ² K]	Notes
Walls	Solid walls of varying thickness; information provided by the architect	0.70	Part L 2021 limiting U-value selected as more appropriate than GLA suggested notional values. Age band-based specification in SAP Appendix S would indicate the existing wall's U-value to be in the region of 2.0 W/m ² K.
Roof	Sloping roofs with shallow rafters with thin insulation present in places	0.35	Part L 2021 limiting U-value selected as more appropriate than the GLA notional values due to limited insulation present and estimated U-values (based on age of the property and level of insulation present, the estimated U-value is 2.3W/m ² K).
Floor	Suspended timber and slab on ground in places	0.70	Part L 2021 limiting U-value selected as more appropriate than the GLA notional values due to varied and fully unknown scope for improvement.
Windows	Single glazed with timber frame	4.8	U-value based on age of the property and actual window construction. Scope for improvement minimal and therefore GLA notional value not realistic as a baseline.

Appendix B

Be Lean SAP Worksheets

Full SAP Calculation Printout



Plot Reference	B101 - Mid			Issued on Date	25/03/2026
Assessment Reference	1b2p-54-Mid	Plot Type Ref	2b4p-71-Mid		
Plot Address				SAP Version	10.2
SAP Rating	84 B	DER	13.21	TER	12.94
Environmental	90 B	% DER < TER			-2.09
CO ₂ Emissions (t/year)	0.85	DFEE	35.39	TFEE	34.56
Compliance Check	See BREL	% DFEE < TFEE			-2.39
% DPER < TPER	-10.36	DPER	75.64	TPER	68.54
Assessor Details	Miss Alicja Kreglewska			Assessor ID	L728-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	70.8600 (1b)	2.5000 (2b)	177.1500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.8600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	177.1500 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1388 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												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
Main dwelling							
Window			19.8400	0.8687	17.2355		(27)
Door			1.8400	1.0000	1.8400		(26)
External Wall 1	79.9100	19.8400	60.0700	0.1800	10.8126	70.0000	4204.9003 (29a)
Corridor Wall	4.1900	1.8400	2.3500	0.2000	0.4700	70.0000	164.5000 (29a)
Core/stair	12.3400		12.3400	0.2000	2.4680	9.0000	111.0600 (29a)
Total net area of external elements Aum(A, m ²)			96.4400				(31)
Fabric heat loss, W/K = Sum (A x k)					(26)...(30) + (32) =	32.8261	(33)
Main dwelling							
Party Floor 1			70.8600			80.0000	5668.8000 (32d)
Party Ceiling 1			70.8600			100.0000	7086.0000 (32b)
Internal Wall 1			129.2500			9.0000	1163.2500 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		18398.5103 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							259.6459 (35)
List of Thermal Bridges							

499.7107	510.2308	489.7832	472.2510	448.8998	429.8209	413.8275	414.9395	427.2302	444.9278	471.6667	489.6657	(73)
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Full SAP Calculation Printout



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			4.8900	11.2829	0.3800	0.7000	0.7700	10.1706 (75)
Southeast			8.7700	36.7938	0.3800	0.7000	0.7700	59.4825 (77)
Northwest			6.1800	11.2829	0.3800	0.7000	0.7700	12.8536 (81)
Solar gains	82.5068	148.1872	223.0699	310.4433	378.8006	389.7316	252.9982	69.7074 (83)
Total gains	582.2175	658.4180	712.8531	782.6943	827.7004	819.5525	680.2283	559.3731 (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	86.4017	86.6990	86.9982	88.5261	88.8382	90.4320	90.4320	90.7577	89.7877	88.8382	88.2163	87.6030
alpha	6.7601	6.7799	6.7999	6.9017	6.9225	7.0288	7.0288	7.0505	6.9858	6.9225	6.8811	6.8402
util living area	0.9883	0.9727	0.9353	0.8187	0.6349	0.4405	0.3172	0.3538	0.5720	0.8620	0.9705	0.9906 (86)
MIT	20.3588	20.5200	20.7119	20.9098	20.9851	20.9990	20.9999	20.9998	20.9943	20.8925	20.6097	20.3363 (87)
Th 2	20.2233	20.2258	20.2282	20.2406	20.2431	20.2555	20.2555	20.2579	20.2505	20.2431	20.2381	20.2332 (88)
util rest of house	0.9849	0.9653	0.9188	0.7837	0.5871	0.3897	0.2635	0.2968	0.5122	0.8252	0.9611	0.9878 (89)
MIT 2	19.4883	19.6911	19.9258	20.1579	20.2321	20.2549	20.2554	20.2579	20.2472	20.1470	19.8149	19.4679 (90)
Living area fraction									fLA = Living area / (4) =			0.4104 (91)
MIT	19.8455	20.0313	20.2484	20.4665	20.5411	20.5603	20.5610	20.5624	20.5538	20.4530	20.1411	19.8243 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.6955	19.8813	20.0984	20.3165	20.3911	20.4103	20.4110	20.4124	20.4038	20.3030	19.9911	19.6743 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9819	0.9613	0.9157	0.7874	0.5966	0.4003	0.2747	0.3087	0.5246	0.8283	0.9575	0.9853 (94)
Useful gains	571.6827	632.9385	652.7620	616.3033	493.8287	328.0460	215.3557	225.9029	356.8558	508.7545	547.5668	551.1252 (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	910.6521	883.1117	798.8354	659.0851	499.9832	328.3639	215.3735	225.9422	358.8116	558.1932	746.8269	902.7598 (97)
Space heating kWh	252.1932	168.1164	108.6786	30.8029	4.5790	0.0000	0.0000	0.0000	0.0000	36.7824	143.4673	261.6162 (98a)
Space heating requirement - total per year (kWh/year)												1006.2359
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	252.1932	168.1164	108.6786	30.8029	4.5790	0.0000	0.0000	0.0000	0.0000	36.7824	143.4673	261.6162 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1006.2359
Space heating per m2										(98c) / (4) =		14.2003 (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 %)												88.8000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	252.1932	168.1164	108.6786	30.8029	4.5790	0.0000	0.0000	0.0000	0.0000	36.7824	143.4673	261.6162 (98)
Space heating efficiency (main heating system 1)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000 (210)
Space heating fuel (main heating system)	284.0013	189.3203	122.3858	34.6880	5.1565	0.0000	0.0000	0.0000	0.0000	41.4216	161.5623	294.6128 (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	247.5953	218.9491	232.4150	203.7219	197.0971	177.1686	174.4612	181.5770	183.7933	205.4795	219.1698	244.7948 (64)
Efficiency of water heater (217)m	84.1011	83.4746	82.4629	80.8766	79.9841	79.8000	79.8000	79.8000	79.8000	81.0472	83.1334	79.8000 (216)
Fuel for water heating, kWh/month	294.4020	262.2943	281.8419	251.8923	246.4205	222.0159	218.6231	227.5401	230.3174	253.5308	263.6363	290.6988 (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	21.7592	19.6535	21.7592	21.0573	21.7592	21.0573	21.7592	21.7592	21.0573	21.7592	21.0573	21.7592 (231)
Lighting	20.4596	16.4134	14.7785	10.8273	8.3633	6.8329	7.6293	9.9169	12.8810	16.9006	19.0892	21.0282 (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)												

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(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												1133.1486	(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												3043.2132	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)													
mechanical ventilation fans (SFP = 0.7875)												170.1969	(230a)
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												256.1969	(231)
Electricity for lighting (calculated in Appendix L)												165.1203	(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												4597.6789	(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	1133.1486	0.2100	237.9612	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3043.2132	0.2100	639.0748	(264)
Space and water heating			877.0360	(265)
Pumps, fans and electric keep-hot	256.1969	0.1387	35.5377	(267)
Energy for lighting	165.1203	0.1443	23.8320	(268)
Total CO2, kg/year			936.4056	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			13.2100	(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	1133.1486	1.1300	1280.4579	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3043.2132	1.1300	3438.8309	(278)
Space and water heating			4719.2888	(279)
Pumps, fans and electric keep-hot	256.1969	1.5128	387.5746	(281)
Energy for lighting	165.1203	1.5338	253.2670	(282)
Total Primary energy kWh/year			5360.1305	(286)
Dwelling Primary energy Rate (DPER)			75.6400	(287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling	70.8600	2.5000	177.1500	(1b) - (3b)
Ground floor				(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.8600			(5)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)

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) = 0.1693 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4193 (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) =	0.3879 (21)

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Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
Effective ac	0.4946	0.4849	0.4752	0.4267	0.4170	0.3685	0.3685	0.3588	0.3879	0.4170	0.4364	0.4558	(22b)
	0.6223	0.6176	0.6129	0.5910	0.5869	0.5679	0.5679	0.5644	0.5752	0.5869	0.5952	0.6039	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			1.8400	1.0000	1.8400		(26)
TER Opening Type			15.8600	1.1450	18.1603		(27)
External Wall 1	79.9100	15.8600	64.0500	0.1800	11.5290		(29a)
Corridor Wall	4.1900	1.8400	2.3500	0.1800	0.4230		(29a)
Core/stair	12.3400		12.3400	0.1800	2.2212		(29a)
Total net area of external elements Aum(A, m2)			96.4400				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	34.1735	(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							259.6459 (35)

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

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	46.7000	0.0700	3.2690
E16 Corner (normal)	8.5500	0.0900	0.7695
E18 Party wall between dwellings	0.0000	0.0600	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	9.3800	0.0200	0.1876
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	0.0000	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	0.0000	-0.0900	-0.0000
E7 Party floor between dwellings (in blocks of flats)	11.6000	0.0700	0.8120
E25 Staggered party wall between dwellings	0.0000	0.0600	0.0000
E2 Other lintels (including other steel lintels)	11.2900	0.0500	0.5645
E3 Sill	10.3900	0.0500	0.5195
E4 Jamb	29.7400	0.0500	1.4870
E16 Corner (normal)	2.8500	0.0900	0.2565
E17 Corner (inverted - internal area greater than external area)	0.0000	-0.0900	-0.0000
E18 Party wall between dwellings	0.0000	0.0600	0.0000
E25 Staggered party wall between dwellings	0.0000	0.0600	0.0000
P1 Party wall - Ground floor	0.0000	0.0800	0.0000
E5 Ground floor (normal)	0.0000	0.1600	0.0000
E5 Ground floor (normal)	0.0000	0.1600	0.0000
E14 Flat roof	0.0000	0.0800	0.0000
E15 Flat roof with parapet	0.0000	0.5600	0.0000
P4 Party wall - Roof (insulation at ceiling level)	0.0000	0.1200	0.0000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			7.8656 (36)
Point Thermal Bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 42.0391 (37)

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

(38)m	Jan 36.3793	Feb 36.1017	Mar 35.8295	Apr 34.5514	May 34.3122	Jun 33.1990	Jul 33.1990	Aug 32.9928	Sep 33.6278	Oct 34.3122	Nov 34.7960	Dec 35.3018	(38)
Heat transfer coeff	78.4184	78.1408	77.8686	76.5905	76.3513	75.2381	75.2381	75.0319	75.6669	76.3513	76.8351	77.3409	(39)
Average = Sum(39)m / 12 =												76.5893	

HLP	Jan 1.1067	Feb 1.1027	Mar 1.0989	Apr 1.0809	May 1.0775	Jun 1.0618	Jul 1.0618	Aug 1.0589	Sep 1.0678	Oct 1.0775	Nov 1.0843	Dec 1.0915	(40)
HLP (average)												1.0809	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2668 (42)
Hot water usage for mixer showers	62.2268	61.2916	59.9290	57.3217	55.3976	53.2518	52.0322	53.3846	54.8671	57.1709	59.8342	61.9884	(42a)
Hot water usage for baths	26.8828	26.4835	25.9213	24.8847	24.1084	23.2477	22.7828	23.3411	23.9490	24.8700	25.9280	26.7919	(42b)
Hot water usage for other uses	37.8445	36.4684	35.0922	33.7160	32.3399	30.9637	30.9637	32.3399	33.7160	35.0922	36.4684	37.8445	(42c)
Average daily hot water use (litres/day)												116.6997	(43)

Daily hot water use	Jan 126.9541	Feb 124.2435	Mar 120.9425	Apr 115.9224	May 111.8459	Jun 107.4633	Jul 105.7787	Aug 109.0656	Sep 112.5321	Oct 117.1331	Nov 122.2305	Dec 126.6248	(44)
Energy conte	201.0643	176.9211	185.8840	158.6919	150.5661	132.1386	127.9302	135.0460	138.7633	158.9485	174.1398	198.2638	(45)
Energy content (annual)										Total = Sum(45)m =		1938.3577	

Distribution loss (46)m = 0.15 x (45)m	30.1596	26.5382	27.8826	23.8038	22.5849	19.8208	19.1895	20.2569	20.8145	23.8423	26.1210	29.7396	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)

a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
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If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
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Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
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Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
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Total heat required for water heating calculated for each month	247.6592	219.0069	232.4789	203.7838	197.1610	177.2305	174.5251	181.6409	183.8551	205.5434	219.2316	244.8587	(62)
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WWHRS	-28.4475	-25.1592	-26.3453	-21.8149	-20.3307	-17.3971	-16.3070	-17.3409	-17.9998	-21.2197	-24.0394	-27.9207	(63a)
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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)
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Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
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FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
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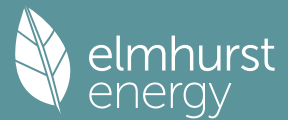
Output from w/h	219.2117	193.8477	206.1337	181.9689	176.8303	159.8334	158.2181	164.3000	165.8554	184.3237	195.1923	216.9380	(64)
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12Total per year (kWh/year)												2222.6529	(64)
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Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
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Heat gains from water heating, kWh/month	104.1298	92.4949	99.0824	88.8385	87.3391	80.0096	79.8127	82.1787	82.2123	90.1263	93.9750	103.1986	(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	113.3411	113.3411	113.3411	113.3411	113.3411	113.3411	113.3411	113.3411	113.3411	113.3411	113.3411	113.3411 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	100.5149	111.2843	100.5149	103.8654	100.5149	103.8654	100.5149	100.5149	103.8654	100.5149	103.8654	100.5149 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	199.2959	201.3639	196.1525	185.0579	171.0530	157.8903	149.0968	147.0288	152.2402	163.3348	177.3397	190.5024 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3341	34.3341	34.3341	34.3341	34.3341	34.3341	34.3341	34.3341	34.3341	34.3341	34.3341	34.3341 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729 (71)
Water heating gains (Table 5)	139.9594	137.6412	133.1752	123.3869	117.3913	111.1244	107.2752	110.4552	114.1837	121.1375	130.5208	138.7079 (72)
Total internal gains	499.7725	510.2917	489.8449	472.3125	448.9615	429.8824	413.8892	415.0012	427.2917	444.9895	471.7282	489.7275 (73)

6. Solar gains

[Jan]	Area m ²		Solar flux Table 6a W/m ²		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W	
Northeast	3.9100		11.2829		0.6300		0.7000		0.7700		13.4825 (75)	
Southeast	7.0100		36.7938		0.6300		0.7000		0.7700		78.8252 (77)	
Northwest	4.9400		11.2829		0.6300		0.7000		0.7700		17.0342 (81)	
Solar gains	109.3419	196.3860	295.6281	411.4264	502.0235	516.5120	490.4324	420.0729	335.2927	224.3078	132.8123	92.3794 (83)
Total gains	609.1143	706.6778	785.4730	883.7389	950.9850	946.3944	904.3216	835.0741	762.5844	669.2974	604.5405	582.1068 (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	65.1722	65.4037	65.6323	66.7276	66.9366	67.9270	67.9270	68.1136	67.5421	66.9366	66.5151	66.0802
alpha	5.3448	5.3602	5.3755	5.4485	5.4624	5.5285	5.5285	5.5409	5.5028	5.4624	5.4343	5.4053
util living area	0.9910	0.9796	0.9520	0.8643	0.7015	0.5028	0.3652	0.4115	0.6553	0.9076	0.9798	0.9928 (86)
MIT	19.9556	20.1624	20.4351	20.7578	20.9361	20.9915	20.9988	20.9977	20.9667	20.7225	20.2935	19.9298 (87)
Th 2	19.9954	19.9986	20.0017	20.0165	20.0193	20.0322	20.0322	20.0346	20.0272	20.0193	20.0137	20.0078 (88)
util rest of house	0.9881	0.9733	0.9375	0.8288	0.6415	0.4295	0.2854	0.3261	0.5746	0.8739	0.9724	0.9904 (89)
MIT 2	18.8015	19.0639	19.4030	19.7895	19.9713	20.0279	20.0318	20.0338	20.0075	19.7631	19.2430	18.7781 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.2751	19.5147	19.8265	20.1869	20.3673	20.4233	20.4287	20.4294	20.4012	20.1568	19.6741	19.2508 (92)
Temperature adjustment												
adjusted MIT	19.2751	19.5147	19.8265	20.1869	20.3673	20.4233	20.4287	20.4294	20.4012	20.1568	19.6741	19.2508 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9854	0.9695	0.9345	0.8355	0.6636	0.4594	0.3181	0.3612	0.6067	0.8793	0.9692	0.9881 (94)
Useful gains	600.1984	685.0975	734.0304	738.3299	631.0376	434.7826	287.7084	301.6411	462.6399	588.5216	585.9231	575.1526 (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	1174.3255	1142.0045	1037.7194	864.4693	661.7562	438.1353	288.0603	302.3345	476.7885	729.6773	966.1323	1164.0385 (97)
Space heating kWh	427.1506	307.0415	225.9446	90.8203	22.8547	0.0000	0.0000	0.0000	0.0000	105.0199	273.7506	438.1311 (98a)
Space heating requirement - total per year (kWh/year)												1890.7133
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	427.1506	307.0415	225.9446	90.8203	22.8547	0.0000	0.0000	0.0000	0.0000	105.0199	273.7506	438.1311 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1890.7133
Space heating per m ²												(98c) / (4) = 26.6824 (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	427.1506	307.0415	225.9446	90.8203	22.8547	0.0000	0.0000	0.0000	0.0000	105.0199	273.7506	438.1311 (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)	462.7850	332.6560	244.7937	98.3969	24.7613	0.0000	0.0000	0.0000	0.0000	113.7810	296.5878	474.6816 (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

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Water heating requirement	219.2117	193.8477	206.1337	181.9689	176.8303	159.8334	158.2181	164.3000	165.8554	184.3237	195.1923	216.9380 (64)
Efficiency of water heater	(217)m	85.5286	85.0862	84.2660	82.5867	80.7365	79.8000	79.8000	79.8000	82.8477	84.8183	79.8000 (216)
Fuel for water heating, kWh/month		256.3023	227.8250	244.6225	220.3367	219.0213	200.2924	198.2683	205.8897	207.8388	222.4851	85.6028 (217)
Space cooling fuel requirement												253.4241 (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	20.8850	16.7547	15.0858	11.0525	8.5373	6.9750	7.7880	10.1231	13.1489	17.2521	19.4862	21.4655 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-18.9809	-28.1193	-42.4506	-50.2107	-56.3260	-53.3769	-52.7264	-48.6903	-41.9562	-33.2350	-21.3450	-16.2554 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-6.9573	-14.9466	-30.2941	-46.3720	-62.1757	-62.7862	-62.0471	-52.1395	-37.7008	-21.6580	-9.3791	-5.4788 (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												2048.4434 (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												2686.4362 (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)												168.5540 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-875.6083 (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												4113.8253 (238)

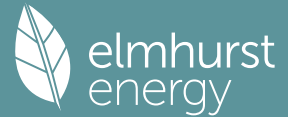
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2048.4434	0.2100	430.1731 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2686.4362	0.2100	564.1516 (264)
Space and water heating			994.3247 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	168.5540	0.1443	24.3275 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-463.6728	0.1336	-61.9256
PV Unit electricity exported	-411.9354	0.1253	-51.6335
Total			-113.5591 (269)
Total CO2, kg/year			917.0224 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.9400 (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	2048.4434	1.1300	2314.7411 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2686.4362	1.1300	3035.6729 (278)
Space and water heating			5350.4140 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	168.5540	1.5338	258.5337 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-463.6728	1.4935	-692.5122
PV Unit electricity exported	-411.9354	0.4601	-189.5196
Total			-882.0318 (283)
Total Primary energy kWh/year			4857.0167 (286)
Target Primary Energy Rate (TPER)			68.5400 (287)

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Plot Reference	Be Lean_Copy				Issued on Date	25/03/2026	
Assessment Reference	Be Lean_Copy			Plot Type Ref			
Plot Address					SAP Version	10.2	
SAP Rating	73 C		DER	28.08		TER	7.52
Environmental	70 C		% DER < TER				-273.40
CO ₂ Emissions (t/year)	4.8		DFEE	97.62		TFEE	36.34
Compliance Check	See BREL		% DFEE < TFEE				-168.61
% DPER < TPER	-284.44		DPER	152.81		TPER	39.75
Assessor Details	Miss Alicja Kreglewska				Assessor ID	L728-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	109.1700 (1b)	x 2.0200 (2b)	= 220.5234 (1b) - (3b)
First floor	87.9800 (1c)	x 2.0200 (2c)	= 177.7196 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	197.1500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 398.2430 (5)

2. Ventilation rate

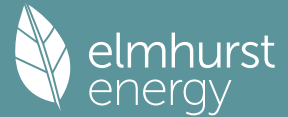
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.0753 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8253 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.8253 (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	1.0523	1.0317	1.0110	0.9079	0.8872	0.7841	0.7841	0.7634	0.8253	0.8872	0.9285	0.9698 (22b)
Effective ac	1.0523	1.0317	1.0110	0.9121	0.8936	0.8074	0.8074	0.7914	0.8406	0.8936	0.9311	0.9702 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Main dwelling												
Window			21.6300	1.5918	34.4298		(27)					
Door			3.8800	3.0000	11.6400		(26)					
Heatloss Floor 1			109.1700	0.7000	76.4190		(28a)					
External Wall 1	197.1800	25.5100	171.6700	0.3000	51.5010		(29a)					
External Roof 1	67.9800		67.9800	0.3500	23.7930		(30)					
Ground Floor Roof	24.5900		24.5900	0.3500	8.6065		(30)					
Flat Side Roof	7.5000		7.5000	0.3500	2.6250		(30)					
Sloped Side Roof	16.2100		16.2100	0.3500	5.6735		(30)					
Total net area of external elements Aum(A, m2)			422.6300				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	214.6878		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Default value 0.200 * total exposed area)							84.5260 (36)					
Point Thermal bridges						(36a) =	0.0000					
Total fabric heat loss						(33) + (36) + (36a) =	299.2138 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 138.2931	Feb 135.5814	Mar 132.8698	Apr 119.8695	May 117.4357	Jun 106.1058	Jul 106.1058	Aug 104.0077	Sep 110.4699	Oct 117.4357	Nov 122.3592	Dec 127.5066 (38)

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Heat transfer coeff
437.5068 434.7952 432.0836 419.0832 416.6494 405.3196 405.3196 403.2215 409.6837 416.6494 421.5730 426.7204 (39)
Average = Sum(39)m / 12 = 419.0505

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.2192	2.2054	2.1916	2.1257	2.1134	2.0559	2.0559	2.0453	2.0780	2.1134	2.1383	2.1644	(40)
HLP (average)												2.1255	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9982 (42)
Hot water usage for mixer showers 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (42a)
Hot water usage for baths 90.4577 89.1143 87.2225 83.7343 81.1224 78.2262 76.6618 78.5404 80.5858 83.6849 87.2449 90.1519 (42b)
Hot water usage for other uses 47.7207 45.9854 44.2501 42.5148 40.7795 39.0442 39.0442 40.7795 42.5148 44.2501 45.9854 47.7207 (42c)
Average daily hot water use (litres/day) 127.2510 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	138.1784	135.0997	131.4726	126.2491	121.9019	117.2704	115.7060	119.3199	123.1007	127.9350	133.2303	137.8726	(44)
Energy conte	218.8409	192.3802	202.0685	172.8287	164.1034	144.1976	139.9364	147.7430	151.7954	173.6066	189.8110	215.8752	(45)
Energy content (annual)										Total =	Sum(45)m =	2113.1869	
Distribution loss (46)m = 0.15 x (45)m	32.8261	28.8570	30.3103	25.9243	24.6155	21.6296	20.9905	22.1614	22.7693	26.0410	28.4716	32.3813	(46)
Water storage loss (or HIU loss):													
Store volume												180.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.7800	(49)
Enter (49) or (54) in (55)												1.2558	(55)
Total storage loss	38.9298	35.1624	38.9298	37.6740	38.9298	37.6740	38.9298	38.9298	37.6740	38.9298	37.6740	38.9298	(56)
If cylinder contains dedicated solar storage	38.9298	35.1624	38.9298	37.6740	38.9298	37.6740	38.9298	38.9298	37.6740	38.9298	37.6740	38.9298	(57)
Primary loss	54.8576	49.5488	54.8576	53.0880	54.8576	22.5120	23.2624	23.2624	22.5120	54.8576	53.0880	54.8576	(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	312.6283	277.0914	295.8559	263.5907	257.8908	204.3836	202.1286	209.9352	211.9814	267.3940	280.5730	309.6626	(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	312.6283	277.0914	295.8559	263.5907	257.8908	204.3836	202.1286	209.9352	211.9814	267.3940	280.5730	309.6626	(64)
12Total per year (kWh/year)										Total per year (kWh/year) =	Sum(64)m =	3093.1155	(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	116.6507	103.6055	111.0738	99.9359	98.4505	65.9553	65.1388	67.7345	68.4816	101.6103	105.5826	115.6646	(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	149.9105	149.9105	149.9105	149.9105	149.9105	149.9105	149.9105	149.9105	149.9105	149.9105	149.9105	149.9105	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	210.3089	232.8420	210.3089	217.3192	210.3089	217.3192	210.3089	210.3089	217.3192	210.3089	217.3192	210.3089	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	368.3286	372.1507	362.5192	342.0147	316.1315	291.8050	275.5533	271.7312	281.3628	301.8672	327.7504	352.0770	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.9911	37.9911	37.9911	37.9911	37.9911	37.9911	37.9911	37.9911	37.9911	37.9911	37.9911	37.9911	(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)	-119.9284	-119.9284	-119.9284	-119.9284	-119.9284	-119.9284	-119.9284	-119.9284	-119.9284	-119.9284	-119.9284	-119.9284	(71)
Water heating gains (Table 5)	156.7885	154.1748	149.2928	138.7999	132.3259	91.6046	87.5521	91.0409	95.1133	136.5729	146.6424	155.4632	(72)
Total internal gains	806.3992	830.1407	793.0940	769.1070	729.7395	668.7019	641.3875	641.0542	661.7684	719.7222	762.6852	788.8222	(73)

6. Solar gains

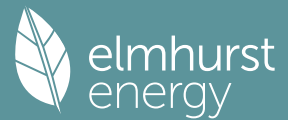
[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W							
North	4.2300	10.6334	0.7600	0.7000	0.7700	16.5828	(74)						
East	4.8500	19.6403	0.7600	0.7000	0.7700	35.1183	(76)						
South	8.1300	46.7521	0.7600	0.7000	0.7700	140.1316	(78)						
West	4.4200	19.6403	0.7600	0.7000	0.7700	32.0048	(80)						
Solar gains	223.8375	392.4970	562.4355	732.2852	847.3350	851.7464	816.8909	730.3655	621.6311	441.0670	270.2554	190.1096	(83)
Total gains	1030.2367	1222.6377	1355.5296	1501.3922	1577.0744	1520.4483	1458.2784	1371.4197	1283.3995	1160.7892	1032.9406	978.9318	(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	31.2932	31.4883	31.6859	32.6689	32.8597	33.7782	33.7782	33.9540	33.4184	32.8597	32.4759	32.0842	
alpha	3.0862	3.0992	3.1124	3.1779	3.1906	3.2519	3.2519	3.2636	3.2279	3.1906	3.1651	3.1389	
util living area	0.9980	0.9963	0.9933	0.9852	0.9655	0.9188	0.8352	0.8656	0.9557	0.9890	0.9966	0.9983	(86)

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MIT	18.1427	18.3630	18.7520	19.3417	19.9120	20.4413	20.7361	20.6879	20.2557	19.5267	18.7742	18.1585 (87)
Th 2	19.1912	19.1999	19.2086	19.2508	19.2588	19.2963	19.2963	19.3033	19.2818	19.2588	19.2427	19.2260 (88)
util rest of house												
	0.9972	0.9948	0.9903	0.9773	0.9419	0.8425	0.6454	0.7017	0.9116	0.9816	0.9950	0.9977 (89)
MIT 2	16.6937	16.9190	17.3125	17.9255	18.4891	19.0058	19.2255	19.2059	18.8386	18.1171	17.3575	16.7315 (90)
Living area fraction									fLA = Living area / (4) =			0.0992 (91)
MIT	16.8375	17.0623	17.4553	18.0660	18.6303	19.1482	19.3754	19.3530	18.9792	18.2570	17.4981	16.8731 (92)
Temperature adjustment												0.0000
adjusted MIT	16.8375	17.0623	17.4553	18.0660	18.6303	19.1482	19.3754	19.3530	18.9792	18.2570	17.4981	16.8731 (93)

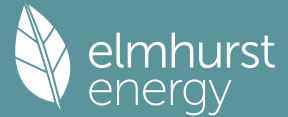
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9953	0.9918	0.9854	0.9686	0.9284	0.8325	0.6579	0.7088	0.8988	0.9744	0.9921	0.9962	(94)
Useful gains	1025.4320	1212.5667	1335.6760	1454.2595	1464.2152	1265.7931	959.4741	972.0754	1153.5427	1131.0243	1024.7830	975.1783	(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													
	5485.2400	5288.1022	4733.6194	3841.3371	2887.4961	1843.4753	1124.9273	1190.6996	1998.9133	3190.2671	4383.5375	5407.8740	(97)
Space heating kWh													
	3318.0972	2738.7598	2528.0699	1718.6959	1058.9209	0.0000	0.0000	0.0000	0.0000	1532.0766	2418.3033	3297.9256	(98a)
Space heating requirement - total per year (kWh/year)												18610.8492	
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													
	3318.0972	2738.7598	2528.0699	1718.6959	1058.9209	0.0000	0.0000	0.0000	0.0000	1532.0766	2418.3033	3297.9256	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												18610.8492	
Space heating per m2												(98c) / (4) =	94.3994 (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 %)													83.8000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	3318.0972	2738.7598	2528.0699	1718.6959	1058.9209	0.0000	0.0000	0.0000	0.0000	1532.0766	2418.3033	3297.9256 (98)	
Space heating efficiency (main heating system 1)													
	83.8000	83.8000	83.8000	83.8000	83.8000	0.0000	0.0000	0.0000	0.0000	83.8000	83.8000	83.8000 (210)	
Space heating fuel (main heating system)													
	3959.5432	3268.2098	3016.7898	2050.9498	1263.6288	0.0000	0.0000	0.0000	0.0000	1828.2537	2885.8035	3935.4720 (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													
	312.6283	277.0914	295.8559	263.5907	257.8908	204.3836	202.1286	209.9352	211.9814	267.3940	280.5730	309.6626 (64)	
Efficiency of water heater (217)m													
	82.9459	82.8893	82.7630	82.4879	81.8810	74.8000	74.8000	74.8000	74.8000	82.3363	82.7709	82.9486 (217)	
Fuel for water heating, kWh/month													
	376.9061	334.2910	357.4736	319.5506	314.9581	273.2402	270.2254	280.6620	283.3976	324.7582	338.9753	373.3187 (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													
	44.7103	35.8683	32.2954	23.6610	18.2764	14.9320	16.6724	21.6714	28.1490	36.9330	41.7157	45.9529 (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													22208.6506 (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													3847.7568 (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)													360.8376 (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													26503.2450 (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	22208.6506	0.2100	4663.8166	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3847.7568	0.2100	808.0289	(264)
Space and water heating			5471.8455	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	360.8376	0.1443	52.0800	(268)
Total CO2, kg/year			5535.8548	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			28.0800	(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	22208.6506	1.1300	25095.7751	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3847.7568	1.1300	4347.9652	(278)
Space and water heating			29443.7403	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	360.8376	1.5338	553.4648	(282)
Total Primary energy kWh/year			30127.3059	(286)
Dwelling Primary energy Rate (DPER)			152.8100	(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)	
Main dwelling				
Ground floor	109.1700 (1b)	x 2.0200 (2b)	= 220.5234 (1b) - (3b)	
First floor	87.9800 (1c)	x 2.0200 (2c)	= 177.7196 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	197.1500		(4)	
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e) ... (3n) =	398.2430 (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) =	0.1004 (8)
Pressure test	Yes		
Pressure Test Method	Blower Door		
Measured/design AP50	5.0000 (17)		
Infiltration rate	0.3504 (18)		
Number of sides sheltered	0 (19)		
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)	
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3504 (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	0.4468	0.4381	0.4293	0.3855	0.3767	0.3329	0.3329	0.3242	0.3504	0.3767	0.3942	0.4118	(22b)
Effective ac	0.5998	0.5959	0.5921	0.5743	0.5710	0.5554	0.5554	0.5525	0.5614	0.5710	0.5777	0.5848	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			3.8800	1.0000	3.8800			(26)
TER Opening Type			21.6300	1.1450	24.7672			(27)
Heatloss Floor 1			109.1700	0.1300	14.1921			(28a)
External Wall 1	197.1800	25.5100	171.6700	0.1800	30.9006			(29a)
External Roof 1	67.9800		67.9800	0.1100	7.4778			(30)
Ground Floor Roof	24.5900		24.5900	0.1100	2.7049			(30)
Flat Side Roof	7.5000		7.5000	0.1100	0.8250			(30)
Sloped Side Roof	16.2100		16.2100	0.1100	1.7831			(30)
Total net area of external elements Aum(A, m2)			422.6300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		86.5307			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (User defined value 0.050 * total exposed area)							21.1315	(36)
Point Thermal bridges						(36a) =	0.0000	

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Total fabric heat loss (33) + (36) + (36a) = 107.6622 (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	78.2886	78.3191	77.8198	75.4745	75.0357	72.9931	72.9931	72.6148	73.7799	75.0357	75.9234	76.8515 (38)
Average = Sum(39)m / 12 =	186.4907	185.9813	185.4820	183.1367	182.6979	180.6553	180.6553	180.2770	181.4421	182.6979	183.5856	184.5136 (39)
												183.1346
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9459	0.9433	0.9408	0.9289	0.9267	0.9163	0.9163	0.9144	0.9203	0.9267	0.9312	0.9359 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	0.9289
												31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9982 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42b)
Hot water usage for other uses	85.9348	84.6586	82.8613	79.5476	77.0663	74.3149	72.8287	74.6134	76.5566	79.5006	82.8826	85.6443 (42b)
Average daily hot water use (litres/day)	45.3347	43.6861	42.0376	40.3891	38.7405	37.0920	37.0920	38.7405	40.3891	42.0376	43.6861	45.3347 (42c)
												120.8885 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	131.2695	128.3447	124.8990	119.9367	115.8068	111.4069	109.9207	113.3539	116.9456	121.5382	126.5688	130.9790 (44)
Distribution loss (46)m = 0.15 x (45)m	207.8988	182.7612	191.9650	164.1873	155.8982	136.9878	132.9396	140.3558	144.2057	164.9262	180.3204	205.0815 (45)
Water storage loss (or HIU loss):	Total = Sum(45)m =											2007.5275
Store volume	31.1848	27.4142	28.7948	24.6281	23.3847	20.5482	19.9409	21.0534	21.6308	24.7389	27.0481	30.7622 (46)
a) If manufacturer declared loss factor is known (kWh/day):												180.0000 (47)
Temperature factor from Table 2b												1.5520 (48)
Enter (49) or (54) in (55)												0.5400 (49)
Total storage loss												0.8381 (55)
If cylinder contains dedicated solar storage	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (56)
Primary loss	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (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	257.1415	227.2384	241.2077	211.8415	205.1409	184.6420	182.1823	189.5985	191.8598	214.1689	227.9746	254.3241 (62)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
Solar input	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
Output from w/h	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)	257.1415	227.2384	241.2077	211.8415	205.1409	184.6420	182.1823	189.5985	191.8598	214.1689	227.9746	254.3241 (64)
Electric shower(s)	Total per year (kWh/year) = Sum(64)m =											2587.3202 (64)
												2587 (64a)
	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	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											0.0000 (64a)
	108.5205	96.3499	103.2225	92.7156	91.2303	83.6718	83.5966	86.0625	86.0717	94.2321	98.0799	107.5837 (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	149.9105	149.9105	149.9105	149.9105	149.9105	149.9105	149.9105	149.9105	149.9105	149.9105	149.9105	149.9105 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	210.3089	232.8420	210.3089	217.3192	210.3089	217.3192	210.3089	210.3089	217.3192	210.3089	217.3192	210.3089 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	368.3286	372.1507	362.5192	342.0147	316.1315	291.8050	275.5533	271.7312	281.3628	301.8672	327.7504	352.0770 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.9911	37.9911	37.9911	37.9911	37.9911	37.9911	37.9911	37.9911	37.9911	37.9911	37.9911	37.9911 (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)	-119.9284	-119.9284	-119.9284	-119.9284	-119.9284	-119.9284	-119.9284	-119.9284	-119.9284	-119.9284	-119.9284	-119.9284 (71)
Water heating gains (Table 5)	145.8609	143.3778	138.7399	128.7717	122.6214	116.2108	112.3610	115.6753	119.5441	126.6561	136.2221	144.6018 (72)
Total internal gains	795.4716	819.3437	782.5412	759.0788	720.0349	693.3081	666.1963	665.6886	686.1992	709.8054	752.2649	777.9608 (73)

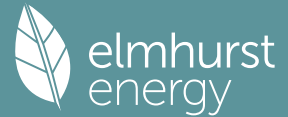
6. Solar gains

[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	
North						4.2300	10.6334	0.6300	0.7000			0.7700	13.7462 (74)
East						4.8500	19.6403	0.6300	0.7000			0.7700	29.1113 (76)
South						8.1300	46.7521	0.6300	0.7000			0.7700	116.1618 (78)
West						4.4200	19.6403	0.6300	0.7000			0.7700	26.5303 (80)
Solar gains	185.5495	325.3594	466.2295	607.0259	702.3961	706.0529	677.1595	605.4345	515.2995	365.6213	224.0275	157.5909	(83)
Total gains	981.0211	1144.7031	1248.7706	1366.1047	1422.4310	1399.3610	1343.3559	1271.1231	1201.4987	1075.4267	976.2924	935.5517	(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	

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tau	73.4137	73.6148	73.8129	74.7582	74.9378	75.7851	75.7851	75.9441	75.4564	74.9378	74.5754	74.2003
alpha	5.8942	5.9077	5.9209	5.9839	5.9959	6.0523	6.0523	6.0629	6.0304	5.9959	5.9717	5.9467
util living area	0.9992	0.9979	0.9943	0.9780	0.9212	0.7651	0.5814	0.6345	0.8748	0.9854	0.9980	0.9994 (86)
MIT	19.7948	19.9536	20.1816	20.5015	20.7796	20.9514	20.9921	20.9871	20.8860	20.5237	20.1067	19.7752 (87)
Th 2	20.1286	20.1308	20.1329	20.1430	20.1449	20.1536	20.1536	20.1553	20.1503	20.1449	20.1411	20.1371 (88)
util rest of house	0.9990	0.9972	0.9922	0.9694	0.8894	0.6870	0.4750	0.5271	0.8163	0.9781	0.9972	0.9992 (89)
MIT 2	18.6997	18.9047	19.1975	19.6088	19.9429	20.1231	20.1508	20.1501	20.0651	19.6416	19.1088	18.6809 (90)
Living area fraction									FLA = Living area / (4) =			
MIT	18.8084	19.0088	19.2951	19.6974	20.0259	20.2053	20.2343	20.2332	20.1465	19.7292	19.2078	18.7894 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8084	19.0088	19.2951	19.6974	20.0259	20.2053	20.2343	20.2332	20.1465	19.7292	19.2078	18.7894 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9984	0.9958	0.9893	0.9634	0.8841	0.6922	0.4854	0.5374	0.8160	0.9732	0.9959	0.9988 (94)
Useful gains	979.4380	1139.8851	1235.4012	1316.1369	1257.6331	968.6186	652.1186	683.0922	980.4099	1046.5862	972.2563	934.4131 (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	2705.6779	2623.9680	2373.2650	1977.3995	1521.1268	1012.6223	656.5537	691.0341	1097.0914	1667.8775	2222.8116	2691.9486 (97)
Space heating kWh	1284.3225	997.3037	846.5707	476.1091	196.0393	0.0000	0.0000	0.0000	0.0000	462.2407	900.3998	1307.6064 (98a)
Space heating requirement - total per year (kWh/year)												6470.5923
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	1284.3225	997.3037	846.5707	476.1091	196.0393	0.0000	0.0000	0.0000	0.0000	462.2407	900.3998	1307.6064 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6470.5923
Space heating per m2										(98c) / (4) =		32.8207 (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	1284.3225	997.3037	846.5707	476.1091	196.0393	0.0000	0.0000	0.0000	0.0000	462.2407	900.3998	1307.6064 (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)	1391.4654	1080.5024	917.1947	515.8278	212.3936	0.0000	0.0000	0.0000	0.0000	500.8025	975.5144	1416.6917 (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	257.1415	227.2384	241.2077	211.8415	205.1409	184.6420	182.1823	189.5985	191.8598	214.1689	227.9746	254.3241 (64)
Efficiency of water heater (217)m	87.1602	86.9796	86.6334	85.8196	83.9581	79.8000	79.8000	79.8000	79.8000	85.7383	86.8217	79.8000 (216)
Fuel for water heating, kWh/month	295.0218	261.2548	278.4234	246.8452	244.3372	231.3809	228.2986	237.5921	240.4259	249.7937	262.5781	291.6605 (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	43.6980	35.0562	31.5642	23.1253	17.8626	14.5939	16.2949	21.1807	27.5117	36.0968	40.7713	44.9125 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-88.9317	-119.1480	-162.7181	-173.3551	-179.0022	-164.0769	-161.8271	-156.4539	-146.1070	-131.3576	-95.4364	-77.6189 (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	-70.9147	-146.2492	-285.5765	-421.8429	-551.2735	-551.7871	-545.4731	-464.9178	-344.7852	-206.9249	-93.9033	-56.3196 (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												7010.3925 (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												3067.6121 (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)												352.6682 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-5396.0008 (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												5120.6721 (238)

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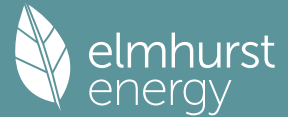
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	7010.3925	0.2100	1472.1824 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3067.6121	0.2100	644.1985 (264)
Space and water heating			2116.3810 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	352.6682	0.1443	50.9009 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1656.0329	0.1357	-224.8008
PV Unit electricity exported	-3739.9679	0.1264	-472.6757
Total			-697.4765 (269)
Total CO2, kg/year			1481.7346 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			7.5200 (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	7010.3925	1.1300	7921.7435 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3067.6121	1.1300	3466.4017 (278)
Space and water heating			11388.1453 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	352.6682	1.5338	540.9342 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1656.0329	1.5018	-2486.9648
PV Unit electricity exported	-3739.9679	0.4639	-1735.1237
Total			-4222.0884 (283)
Total Primary energy kWh/year			7837.0919 (286)
Target Primary Energy Rate (TPER)			39.7500 (287)

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Plot Reference	C102 - Mid			Issued on Date	25/03/2026
Assessment Reference	1b2p-54-Mid	Plot Type Ref	1b2p-54-Mid		
Plot Address				SAP Version	10.2
SAP Rating	84 B	DER	14.83	TER	13.80
Environmental	89 B	% DER < TER			-7.46
CO ₂ Emissions (t/year)	0.75	DFEE	37.02	TFEE	35.57
Compliance Check	See BREL	% DFEE < TFEE			-4.07
% DPER < TPER	-16.18	DPER	84.65	TPER	72.86
Assessor Details	Miss Alicja Kreglewska			Assessor ID	L728-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	55.8600 (1b)	2.5000 (2b)	139.6500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.8600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	139.6500 (5)

2. Ventilation rate

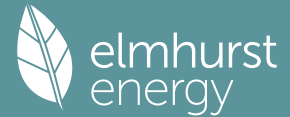
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1388 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												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
Main dwelling							
Window			14.2400	0.8687	12.3707		(27)
Door			1.8400	1.0000	1.8400		(26)
External Wall 1	54.8600	14.2400	40.6200	0.1800	7.3116	70.0000	2843.4000 (29a)
Corridor Wall	4.2800	1.8400	2.4400	0.2000	0.4880	70.0000	170.8000 (29a)
Core/stair	16.2500		16.2500	0.2000	3.2500	9.0000	146.2500 (29a)
Total net area of external elements Aum(A, m ²)			75.3900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.2603		(33)
Main dwelling							
Party Wall 1			24.8500	0.0000	0.0000	140.0000	3479.0000 (32)
Party Floor 1			55.8600			80.0000	4468.8000 (32d)
Party Ceiling 1			55.8600			100.0000	5586.0000 (32b)
Internal Wall 1			75.3000			9.0000	677.7000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	17371.9500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							310.9909 (35)

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List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	28.4600	0.0600	1.7076
E16 Corner (normal)	8.5500	0.1270	1.0859
E18 Party wall between dwellings	2.8500	0.0250	0.0713
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	10.0400	0.1000	1.0040
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	17.4400	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	2.8500	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	14.4000	0.1000	1.4400
E25 Staggered party wall between dwellings	0.0000	0.1200	0.0000
E2 Other lintels (including other steel lintels)	8.5500	0.0170	0.1454
E3 Sill	7.6500	0.0300	0.2295
E4 Jamb	26.1400	0.1200	3.1368
E16 Corner (normal)	2.8500	0.1300	0.3705
E17 Corner (inverted - internal area greater than external area)	0.0000	0.0000	0.0000
E18 Party wall between dwellings	0.0000	0.0900	0.0000
E25 Staggered party wall between dwellings	2.8500	0.0900	0.2565
P1 Party wall - Ground floor	0.0000	0.0500	0.0000
E5 Ground floor (normal)	0.0000	0.1000	0.0000
E5 Ground floor (normal)	0.0000	0.2300	0.0000
E14 Flat roof	0.0000	0.1600	0.0000
E15 Flat roof with parapet	0.0000	0.3000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	0.0000	0.0300	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.4474 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 34.7076 (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
12.5307	12.3708	12.2110	11.4117	11.2518	10.4525	10.4525	10.2927	10.7723	11.2518	11.5715	11.8912	(38)
Heat transfer coeff	47.2383	47.0784	46.9186	46.1193	45.9594	45.1601	45.1601	45.0003	45.4799	45.9594	46.2791	46.5988 (39)
Average = Sum(39)m / 12 =												46.0793

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.8457	0.8428	0.8399	0.8256	0.8228	0.8085	0.8085	0.8056	0.8142	0.8228	0.8285	0.8342 (40)
HLP (average)												0.8249
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

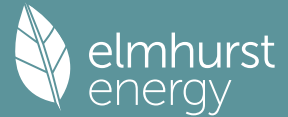
4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.8625 (42)
Hot water usage for mixer showers	55.4477	54.6144	53.4002	51.0770	49.3625	47.4505	46.3637	47.5688	48.8897	50.9426	53.3158	55.2353 (42a)
Hot water usage for baths	23.9676	23.6116	23.1103	22.1861	21.4941	20.7267	20.3122	20.8100	21.3519	22.1730	23.1163	23.8865 (42b)
Hot water usage for other uses	33.7040	32.4784	31.2528	30.0272	28.8016	27.5760	27.5760	28.8016	30.0272	31.2528	32.4784	33.7040 (42c)
Average daily hot water use (litres/day)												103.9826 (43)
Daily hot water use	113.1192	110.7044	107.7633	103.2903	99.6581	95.7532	94.2519	97.1803	100.2688	104.3684	108.9104	112.8258 (44)
Energy content (annual)	179.1532	157.6416	165.6282	141.3992	134.1590	117.7397	113.9895	120.3295	123.6415	141.6270	155.1628	176.6579 (45)
Distribution loss (46)m = 0.15 x (45)m	26.8730	23.6462	24.8442	21.2099	20.1238	17.6610	17.0984	18.0494	18.5462	21.2440	23.2744	26.4987 (46)
Water storage loss (or HIU loss):												150.0000 (47)
Store volume												1.3900 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.7506 (55)
Enter (49) or (54) in (55)												
Total storage loss	23.2686	21.0168	23.2686	22.5180	23.2686	22.5180	23.2686	23.2686	22.5180	23.2686	22.5180	23.2686 (56)
If cylinder contains dedicated solar storage	23.2686	21.0168	23.2686	22.5180	23.2686	22.5180	23.2686	23.2686	22.5180	23.2686	22.5180	23.2686 (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	225.6842	199.6696	212.1592	186.4292	180.6900	162.7697	160.5205	166.8605	168.6715	188.1580	200.1928	223.1889 (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	225.6842	199.6696	212.1592	186.4292	180.6900	162.7697	160.5205	166.8605	168.6715	188.1580	200.1928	223.1889 (64)
12Total per year (kWh/year)												2274.9940 (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	96.7932	86.0382	92.2962	83.0392	81.8327	75.1725	75.1263	77.2344	77.1348	84.3158	87.6156	95.9635 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	81.9116	90.6879	81.9116	84.6420	81.9116	84.6420	81.9116	81.9116	84.6420	81.9116	84.6420	81.9116 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	162.3990	164.0842	159.8375	150.7970	139.3849	128.6591	121.4936	119.8084	124.0551	133.0956	144.5077	155.2335 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125 (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)	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004 (71)
Water heating gains (Table 5)	130.0984	128.0331	124.0540	115.3323	109.9901	104.4062	100.9762	103.8096	107.1317	113.3276	121.6884	128.9833 (72)
Total internal gains	428.3467	436.7428	419.7408	404.7089	385.2243	368.6449	355.3191	356.4673	366.7664	382.2726	404.7758	420.0661 (73)

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6. Solar gains

[Jan]	Area m2				Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W		
North	7.3700				10.6334	0.3800	0.7000	0.7700	14.4462 (74)			
East	4.0300				19.6403	0.3800	0.7000	0.7700	14.5904 (76)			
West	2.8400				19.6403	0.3800	0.7000	0.7700	10.2821 (80)			
Solar gains	39.3187	76.2633	127.0410	192.2161	244.7275	255.2779	241.0341	200.3881	149.5968	90.5973	48.8343	32.4970 (83)
Total gains	467.6654	513.0061	546.7819	596.9250	629.9517	623.9228	596.3532	556.8554	516.3632	472.8699	453.6101	452.5630 (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	102.1532	102.5001	102.8493	104.6318	104.9957	106.8540	106.8540	107.2336	106.1028	104.9957	104.2703	103.5550
alpha	7.8102	7.8333	7.8566	7.9755	7.9997	8.1236	8.1236	8.1489	8.0735	7.9997	7.9514	7.9037
util living area	0.9931	0.9843	0.9588	0.8564	0.6684	0.4628	0.3332	0.3717	0.6034	0.8936	0.9808	0.9944 (86)
MIT	20.4526	20.5729	20.7364	20.9207	20.9892	20.9995	21.0000	20.9999	20.9962	20.9062	20.6644	20.4374 (87)
Th 2	20.2139	20.2164	20.2189	20.2312	20.2337	20.2460	20.2460	20.2485	20.2411	20.2337	20.2287	20.2238 (88)
util rest of house	0.9906	0.9789	0.9453	0.8213	0.6172	0.4085	0.2761	0.3110	0.5391	0.8575	0.9732	0.9924 (89)
MIT 2	19.5894	19.7423	19.9441	20.1610	20.2263	20.2458	20.2460	20.2485	20.2391	20.1527	19.8681	19.5784 (90)
Living area fraction	19.9828	20.1209	20.3053	20.5073	20.5740	20.5893	20.5896	20.5910	20.5842	20.4961	20.2310	19.9699 (92)
Temperature adjustment	19.8328	19.9709	20.1553	20.3573	20.4240	20.4393	20.4396	20.4410	20.4342	20.3461	20.0810	-0.1500
adjusted MIT												19.8199 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9890	0.9768	0.9441	0.8274	0.6301	0.4224	0.2908	0.3265	0.5557	0.8633	0.9715	0.9910 (94)
Useful gains	462.5375	501.1266	516.1955	493.9230	396.9563	263.5647	173.3938	181.8316	286.9268	408.2430	440.6625	448.5015 (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	733.7434	709.5140	640.6848	528.4007	400.9508	263.7042	173.3991	181.8450	288.0777	447.9246	600.7510	727.8701 (97)
Space heating kWh	201.7772	140.0363	92.6200	24.8239	2.9719	0.0000	0.0000	0.0000	0.0000	29.5231	115.2637	207.8502 (98a)
Space heating requirement - total per year (kWh/year)												814.8664
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	201.7772	140.0363	92.6200	24.8239	2.9719	0.0000	0.0000	0.0000	0.0000	29.5231	115.2637	207.8502 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												814.8664
Space heating per m2										(98c) / (4) =		14.5877 (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 %)												88.8000 (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
	201.7772	140.0363	92.6200	24.8239	2.9719	0.0000	0.0000	0.0000	0.0000	29.5231	115.2637	207.8502 (98)
Space heating efficiency (main heating system 1)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000 (210)
Space heating fuel (main heating system)	227.2266	157.6986	104.3019	27.9549	3.3467	0.0000	0.0000	0.0000	0.0000	33.2468	129.8015	234.0655 (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	225.6842	199.6696	212.1592	186.4292	180.6900	162.7697	160.5205	166.8605	168.6715	188.1580	200.1928	223.1889 (64)
Efficiency of water heater	83.8096	83.2794	82.3359	80.7618	79.9311	79.8000	79.8000	79.8000	79.8000	80.9122	82.8688	79.8000 (216)
Fuel for water heating, kWh/month	269.2821	239.7587	257.6751	230.8382	226.0572	203.9721	201.1535	209.0984	211.3678	232.5458	241.5780	266.0164 (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	18.6993	16.8897	18.6993	18.0961	18.6993	18.0961	18.6993	18.6993	18.0961	18.6993	18.0961	18.6993 (231)
Lighting	16.6717	13.3747	12.0424	8.8228	6.8150	5.5679	6.2169	8.0809	10.4963	13.7717	15.5551	17.1351 (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)

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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												917.6424	(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												2789.3432	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)													
mechanical ventilation fans (SFP = 0.7875)												134.1687	(230a)
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												220.1687	(231)
Electricity for lighting (calculated in Appendix L)												134.5506	(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												4061.7049	(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	917.6424	0.2100	192.7049	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2789.3432	0.2100	585.7621	(264)
Space and water heating			778.4670	(265)
Pumps, fans and electric keep-hot	220.1687	0.1387	30.5401	(267)
Energy for lighting	134.5506	0.1443	19.4198	(268)
Total CO2, kg/year			828.4269	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			14.8300	(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	917.6424	1.1300	1036.9359	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2789.3432	1.1300	3151.9579	(278)
Space and water heating			4188.8938	(279)
Pumps, fans and electric keep-hot	220.1687	1.5128	333.0713	(281)
Energy for lighting	134.5506	1.5338	206.3781	(282)
Total Primary energy kWh/year			4728.3432	(286)
Dwelling Primary energy Rate (DPER)			84.6500	(287)

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

1. Overall dwelling characteristics

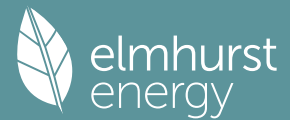
	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	55.8600	2.5000	139.6500	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.8600			(4)
Dwelling volume			139.6500	(5)

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) =	0.1432 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3932	(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) =	0.3637 (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	0.4637	0.4547	0.4456	0.4001	0.3910	0.3455	0.3455	0.3364	0.3637	0.3910	0.4092	0.4274	(22b)
	0.6075	0.6034	0.5993	0.5800	0.5764	0.5597	0.5597	0.5566	0.5661	0.5764	0.5837	0.5913	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			12.1300	1.1450	13.8893			(27)
External Wall 1	54.8600	12.1300	42.7300	0.1800	7.6914			(29a)
Corridor Wall	4.2800	1.8400	2.4400	0.1800	0.4392			(29a)
Core/stair	16.2500		16.2500	0.1800	2.9250			(29a)
Total net area of external elements Aum(A, m2)			75.3900					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	26.7849		(33)
Main dwelling								
Party Wall 1			24.8500	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							310.9909	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	28.4600	0.0700	1.9922	
E16 Corner (normal)	8.5500	0.0900	0.7695	
E18 Party wall between dwellings	2.8500	0.0600	0.1710	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	10.0400	0.0200	0.2008	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	17.4400	0.0000	0.0000	
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0900	-0.2565	
E7 Party floor between dwellings (in blocks of flats)	14.4000	0.0700	1.0080	
E25 Staggered party wall between dwellings	0.0000	0.0600	0.0000	
E2 Other lintels (including other steel lintels)	8.5500	0.0500	0.4275	
E3 Sill	7.6500	0.0500	0.3825	
E4 Jamb	26.1400	0.0500	1.3070	
E16 Corner (normal)	2.8500	0.0900	0.2565	
E17 Corner (inverted - internal area greater than external area)	0.0000	-0.0900	-0.0000	
E18 Party wall between dwellings	0.0000	0.0600	0.0000	
E25 Staggered party wall between dwellings	2.8500	0.0600	0.1710	
P1 Party wall - Ground floor	0.0000	0.0800	0.0000	
E5 Ground floor (normal)	0.0000	0.1600	0.0000	
E5 Ground floor (normal)	0.0000	0.1600	0.0000	
E14 Flat roof	0.0000	0.0800	0.0000	
E15 Flat roof with parapet	0.0000	0.5600	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	0.0000	0.1200	0.0000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				6.4295 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	33.2144 (37)

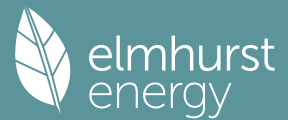
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	27.9978	27.8053	27.6167	26.7308	26.5650	25.7934	25.7934	25.6505	26.0906	26.5650	26.9004	27.2509	(38)
Average = Sum(39)m / 12 =	61.2122	61.0198	60.8311	59.9452	59.7794	59.0078	59.0078	58.8649	59.3050	59.7794	60.1148	60.4653	(39)
												59.9444	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0958	1.0924	1.0890	1.0731	1.0702	1.0564	1.0564	1.0538	1.0617	1.0702	1.0762	1.0824	(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													1.8625	(42)
Hot water usage for mixer showers														
Hot water usage for baths	55.4477	54.6144	53.4002	51.0770	49.3625	47.4505	46.3637	47.5688	48.8897	50.9426	53.3158	55.2353	(42a)	
Hot water usage for other uses	23.9676	23.6116	23.1103	22.1861	21.4941	20.7267	20.3122	20.8100	21.3519	22.1730	23.1163	23.8865	(42b)	
Average daily hot water use (litres/day)	33.7040	32.4784	31.2528	30.0272	28.8016	27.5760	27.5760	28.8016	30.0272	31.2528	32.4784	33.7040	(42c)	
												103.9826	(43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Energy content (annual)	113.1192	110.7044	107.7633	103.2903	99.6581	95.7532	94.2519	97.1803	100.2688	104.3684	108.9104	112.8258	(44)	
Distribution loss (46)m = 0.15 x (45)m	179.1532	157.6416	165.6282	141.3992	134.1590	117.7397	113.9895	120.3295	123.6415	141.6270	155.1628	176.6579	(45)	
Water storage loss (or HIU loss):	26.8730	23.6462	24.8442	21.2099	20.1238	17.6610	17.0984	18.0494	18.5462	21.2440	23.2744	26.4987	(46)	
Store volume												150.0000	(47)	
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)	
Temperature factor from Table 2b												0.5400	(49)	
Enter (49) or (54) in (55)												0.7527	(55)	
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)	
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)	
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)	
Total heat required for water heating calculated for each month	225.7481	199.7273	212.2231	186.4910	180.7539	162.8315	160.5844	166.9244	168.7333	188.2219	200.2547	223.2528	(62)	
WWHRS	-25.3484	-22.4183	-23.4752	-19.4384	-18.1159	-15.5019	-14.5305	-15.4518	-16.0388	-18.9080	-21.4205	-24.8790	(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	200.3997	177.3090	188.7479	167.0527	162.6380	147.3297	146.0539	151.4727	152.6945	169.3139	178.8342	198.3738	(64)	
12Total per year (kWh/year)												2040.2200	(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)	

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Heat gains from water heating, kWh/month
96.8444 86.0844 92.3473 83.0887 81.8838 75.2219 75.1774 77.2855 77.1843 84.3669 87.6651 96.0147 (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	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	81.9800	90.7635	81.9800	84.7126	81.9800	84.7126	81.9800	81.9800	84.7126	81.9800	84.7126	81.9800	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	162.3990	164.0842	159.8375	150.7970	139.3849	128.6591	121.4936	119.8084	124.0551	133.0956	144.5077	155.2335	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	(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)	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	(71)
Water heating gains (Table 5)	130.1671	128.1018	124.1227	115.4010	110.0589	104.4749	101.0449	103.8783	107.2004	113.3964	121.7571	129.0520	(72)
Total internal gains	428.4837	436.8871	419.8779	404.8482	385.3613	368.7843	355.4562	356.6044	366.9057	382.4096	404.9151	420.2031	(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		
North				6.2800	10.6334	0.6300	0.7000		0.7700		20.4081	(74)	
East				3.4300	19.6403	0.6300	0.7000		0.7700		20.5880	(76)	
West				2.4200	19.6403	0.6300	0.7000		0.7700		14.5256	(80)	
Solar gains	55.5217	107.6906	179.3942	271.4318	345.5893	360.4906	340.3752	282.9734	211.2462	127.9316	68.9586	45.8889	(83)
Total gains	484.0054	544.5777	599.2721	676.2800	730.9507	729.2749	695.8313	639.5778	578.1519	510.3412	473.8737	466.0920	(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	78.8330	79.0816	79.3268	80.4992	80.7224	81.7780	81.7780	81.9765	81.3682	80.7224	80.2722	79.8068		
alpha	6.2555	6.2721	6.2885	6.3666	6.3815	6.4519	6.4519	6.4651	6.4245	6.3815	6.3515	6.3205		
util living area	0.9951	0.9888	0.9700	0.8926	0.7240	0.5142	0.3727	0.4224	0.6835	0.9337	0.9880	0.9961	(86)	
MIT	20.1230	20.2795	20.5116	20.8019	20.9564	20.9957	20.9995	20.9990	20.9771	20.7636	20.4022	20.1034	(87)	
Th 2	20.0043	20.0071	20.0098	20.0228	20.0253	20.0366	20.0366	20.0387	20.0323	20.0253	20.0203	20.0152	(88)	
util rest of house	0.9932	0.9846	0.9587	0.8580	0.6610	0.4387	0.2914	0.3347	0.5985	0.9033	0.9826	0.9945	(89)	
MIT 2	19.0039	19.2039	19.4945	19.8422	19.9949	20.0348	20.0365	20.0385	20.0201	19.8112	19.3709	18.9874	(90)	
Living area fraction									fLA = Living area / (4) =			0.4558	(91)	
MIT	19.5140	19.6941	19.9581	20.2796	20.4332	20.4727	20.4755	20.4763	20.4563	20.2453	19.8409	19.4961	(92)	
Temperature adjustment												0.0000		
adjusted MIT	19.5140	19.6941	19.9581	20.2796	20.4332	20.4727	20.4755	20.4763	20.4563	20.2453	19.8409	19.4961	(93)	

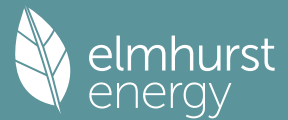
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains	480.0960	535.2669	574.0996	586.9834	503.0611	345.0359	228.5651	239.6849	368.1878	465.0234	465.0543	463.0312	(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	931.2794	902.7348	818.6711	682.1517	522.0636	346.5376	228.6821	239.9500	376.9589	576.5892	765.9190	924.8819	(97)	
Space heating kWh	335.6804	246.9384	181.9612	68.5212	14.1379	0.0000	0.0000	0.0000	0.0000	83.0049	216.6226	343.6169	(98a)	
Space heating requirement - total per year (kWh/year)												1490.4836		
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	335.6804	246.9384	181.9612	68.5212	14.1379	0.0000	0.0000	0.0000	0.0000	83.0049	216.6226	343.6169	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												1490.4836		
Space heating per m2										(98c) / (4) =		26.6825	(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)	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)	363.6841	267.5389	197.1411	74.2375	15.3173	0.0000	0.0000	0.0000	0.0000	89.9295	234.6940	372.2827	(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)														

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	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	200.3997	177.3090	188.7479	167.0527	162.6380	147.3297	146.0539	151.4727	152.6945	169.3139	178.8342	198.3738	(64)
Efficiency of water heater	85.2076	84.8028	83.9777	82.2240	80.4521	79.8000	79.8000	79.8000	79.8000	82.5524	84.4908	85.2797	(217)
Fuel for water heating, kWh/month	235.1900	209.0840	224.7595	203.1679	202.1551	184.6237	183.0249	189.8154	191.3465	205.0986	211.6612	232.6155	(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	17.0338	13.6652	12.3040	9.0144	6.9630	5.6888	6.3519	8.2564	10.7243	14.0708	15.8929	17.5072	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.1601	-27.9689	-41.6212	-48.5206	-53.8407	-50.8353	-50.2360	-46.6838	-40.6564	-32.7655	-21.4096	-16.4569	(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	-8.1033	-17.2971	-34.8397	-52.9962	-70.7149	-71.2622	-70.4009	-59.2971	-43.0700	-24.9319	-10.8841	-6.3876	(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												1614.8252	(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												2472.5422	(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)												137.4727	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-920.3402	(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												3390.4999	(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	1614.8252	0.2100	339.1133	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2472.5422	0.2100	519.2339	(264)
Space and water heating			858.3472	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	137.4727	0.1443	19.8416	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-450.1551	0.1338	-60.2481	
PV Unit electricity exported	-470.1850	0.1255	-59.0237	
Total			-119.2718	(269)
Total CO2, kg/year			770.8462	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.8000	(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	1614.8252	1.1300	1824.7524	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2472.5422	1.1300	2793.9727	(278)
Space and water heating			4618.7252	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	137.4727	1.5338	210.8601	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-450.1551	1.4946	-672.8029	
PV Unit electricity exported	-470.1850	0.4608	-216.6498	
Total			-889.4527	(283)
Total Primary energy kWh/year			4070.2334	(286)
Target Primary Energy Rate (TPER)			72.8600	(287)

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Plot Reference	C202 - Top			Issued on Date	25/03/2026
Assessment Reference	1b2p-54-Top	Plot Type Ref	1b2p-54-Top		
Plot Address				SAP Version	10.2
SAP Rating	83 B	DER	16.66	TER	16.29
Environmental	88 B	% DER < TER			-2.27
CO ₂ Emissions (t/year)	0.84	DFEE	44.66	TFEE	46.60
Compliance Check	See BREL	% DFEE < TFEE			4.15
% DPER < TPER	-9.52	DPER	94.48	TPER	86.26
Assessor Details	Miss Alicja Kreglewska			Assessor ID	L728-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	55.8600 (1b)	2.5000 (2b)	139.6500 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.8600		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	139.6500 (5)

2. Ventilation rate

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

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.0000	(17)
Infiltration rate	0.1500	(18)
Number of sides sheltered	1	(19)

Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1388 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												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
Main dwelling							
Window			14.2400	0.8687	12.3707		(27)
Door			1.8400	1.0000	1.8400		(26)
External Wall 1	54.8600	14.2400	40.6200	0.1800	7.3116	70.0000	2843.4000 (29a)
Corridor Wall	4.2800	1.8400	2.4400	0.2000	0.4880	70.0000	170.8000 (29a)
Core/stair	16.2500		16.2500	0.2000	3.2500	9.0000	146.2500 (29a)
External Roof 1	55.8600		55.8600	0.0900	5.0274	9.0000	502.7400 (30)
Total net area of external elements Aum (A, m ²)			131.2500				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	30.2877	(33)
Main dwelling							
Party Wall 1			24.8500	0.0000	0.0000	140.0000	3479.0000 (32)
Party Floor 1			55.8600			80.0000	4468.8000 (32d)
Internal Wall 1			75.3000			9.0000	677.7000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	12288.6900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							219.9909 (35)

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List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	14.2300	0.0600	0.8538
E16 Corner (normal)	8.5500	0.1270	1.0859
E18 Party wall between dwellings	2.8500	0.0250	0.0713
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.0200	0.1000	0.5020
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.7200	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	2.8500	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	7.2000	0.1000	0.7200
E25 Staggered party wall between dwellings	0.0000	0.1200	0.0000
E2 Other lintels (including other steel lintels)	8.5500	0.0170	0.1454
E3 Sill	7.6500	0.0300	0.2295
E4 Jamb	26.1400	0.1200	3.1368
E16 Corner (normal)	2.8500	0.1300	0.3705
E17 Corner (inverted - internal area greater than external area)	0.0000	0.0000	0.0000
E18 Party wall between dwellings	0.0000	0.0900	0.0000
E25 Staggered party wall between dwellings	2.8500	0.0900	0.2565
P1 Party wall - Ground floor	0.0000	0.0500	0.0000
E5 Ground floor (normal)	0.0000	0.1000	0.0000
E5 Ground floor (normal)	0.0000	0.2300	0.0000
E14 Flat roof	2.5100	0.1600	0.4016
E15 Flat roof with parapet	8.5100	0.3000	2.5530
P4 Party wall - Roof (insulation at ceiling level)	8.7200	0.0300	0.2616
E12 Gable (insulation at ceiling level)	10.8400	0.1200	1.3008
E10 Eaves (insulation at ceiling level)	4.6800	0.0900	0.4212
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			12.3098 (36)
Point Thermal bridges			0.0000 (36a) =
Total fabric heat loss			42.5974 (37) (33) + (36) + (36a) =

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	12.5307	12.3708	12.2110	11.4117	11.2518	10.4525	10.4525	10.2927	10.7723	11.2518	11.5715	11.8912 (38)
Average = Sum(39)m / 12 =	55.1281	54.9682	54.8084	54.0091	53.8492	53.0499	53.0499	52.8901	53.3697	53.8492	54.1689	54.4886 (39)
												53.9691
HLP	0.9869	0.9840	0.9812	0.9669	0.9640	0.9497	0.9497	0.9468	0.9554	0.9640	0.9697	0.9755 (40)
HLP (average)												0.9661
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

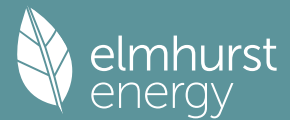
4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.8625 (42)
Hot water usage for mixer showers	55.4477	54.6144	53.4002	51.0770	49.3625	47.4505	46.3637	47.5688	48.8897	50.9426	53.3158	55.2353 (42a)
Hot water usage for baths	23.9676	23.6116	23.1103	22.1861	21.4941	20.7267	20.3122	20.8100	21.3519	22.1730	23.1163	23.8865 (42b)
Hot water usage for other uses	33.7040	32.4784	31.2528	30.0272	28.8016	27.5760	27.5760	28.8016	30.0272	31.2528	32.4784	33.7040 (42c)
Average daily hot water use (litres/day)												103.9826 (43)
Daily hot water use	113.1192	110.7044	107.7633	103.2903	99.6581	95.7532	94.2519	97.1803	100.2688	104.3684	108.9104	112.8258 (44)
Energy content (annual)	179.1532	157.6416	165.6282	141.3992	134.1590	117.7397	113.9895	120.3295	123.6415	141.6270	155.1628	176.6579 (45)
Distribution loss (46)m = 0.15 x (45)m	26.8730	23.6462	24.8442	21.2099	20.1238	17.6610	17.0984	18.0494	18.5462	21.2440	23.2744	26.4987 (46)
Water storage loss (or HIU loss):												150.0000 (47)
Store volume												1.3900 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.7506 (55)
Enter (49) or (54) in (55)												
Total storage loss	23.2686	21.0168	23.2686	22.5180	23.2686	22.5180	23.2686	23.2686	22.5180	23.2686	22.5180	23.2686 (56)
If cylinder contains dedicated solar storage	23.2686	21.0168	23.2686	22.5180	23.2686	22.5180	23.2686	23.2686	22.5180	23.2686	22.5180	23.2686 (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	225.6842	199.6696	212.1592	186.4292	180.6900	162.7697	160.5205	166.8605	168.6715	188.1580	200.1928	223.1889 (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	225.6842	199.6696	212.1592	186.4292	180.6900	162.7697	160.5205	166.8605	168.6715	188.1580	200.1928	223.1889 (64)
12Total per year (kWh/year)												2274.9940 (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	96.7932	86.0382	92.2962	83.0392	81.8327	75.1725	75.1263	77.2344	77.1348	84.3158	87.6156	95.9635 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	81.9116	90.6879	81.9116	84.6420	81.9116	81.9116	81.9116	81.9116	84.6420	81.9116	84.6420	81.9116 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	162.3990	164.0842	159.8375	150.7970	139.3849	128.6591	121.4936	119.8084	124.0551	133.0956	144.5077	155.2335 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125 (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)	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004 (71)
Water heating gains (Table 5)	130.0984	128.0331	124.0540	115.3323	109.9901	104.4062	100.9762	103.8096	107.1317	113.3276	121.6884	128.9833 (72)
Total internal gains	428.3467	436.7428	419.7408	404.7089	385.2243	368.6449	355.3191	356.4673	366.7664	382.2726	404.7758	420.0661 (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
North			7.3700		10.6334		0.3800		0.7000		0.7700		14.4462 (74)
East			4.0300		19.6403		0.3800		0.7000		0.7700		14.5904 (76)
West			2.8400		19.6403		0.3800		0.7000		0.7700		10.2821 (80)
Solar gains	39.3187	76.2633	127.0410	192.2161	244.7275	255.2779	241.0341	200.3881	149.5968	90.5973	48.8343	32.4970	(83)
Total gains	467.6654	513.0061	546.7819	596.9250	629.9517	623.9228	596.3532	556.8554	516.3632	472.8699	453.6101	452.5630	(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	61.9199	62.1000	62.2811	63.2028	63.3904	64.3455	64.3455	64.5400	63.9600	63.3904	63.0163	62.6465	
alpha	5.1280	5.1400	5.1521	5.2135	5.2260	5.2897	5.2897	5.3027	5.2640	5.2260	5.2011	5.1764	
util living area	0.9845	0.9736	0.9495	0.8745	0.7304	0.5340	0.3897	0.4338	0.6739	0.9013	0.9702	0.9866	(86)
MIT	19.9911	20.1543	20.3952	20.7106	20.9103	20.9860	20.9978	20.9962	20.9553	20.7052	20.3117	19.9697	(87)
Th 2	20.0943	20.0967	20.0991	20.1110	20.1134	20.1255	20.1255	20.1279	20.1207	20.1134	20.1086	20.1038	(88)
util rest of house	0.9805	0.9669	0.9366	0.8450	0.6778	0.4652	0.3131	0.3531	0.6019	0.8710	0.9614	0.9831	(89)
MIT 2	18.9348	19.1416	19.4422	19.8254	20.0398	20.1173	20.1247	20.1264	20.0908	19.8296	19.3505	18.9149	(90)
Living area fraction	19.4163	19.6032	19.8766	20.2289	20.4365	20.5132	20.5226	20.5229	20.4848	20.2287	19.7886	19.3957	(91)
MIT	19.2663	19.4532	19.7266	20.0789	20.2865	20.3632	20.3726	20.3729	20.3348	20.0787	19.6386	19.2457	(93)
Temperature adjustment												-0.1500	
adjusted MIT													

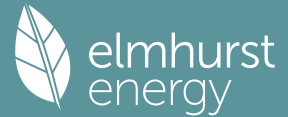
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9757	0.9609	0.9302	0.8438	0.6886	0.4842	0.3349	0.3760	0.6202	0.8697	0.9557	0.9788	(94)
Useful gains	456.2919	492.9393	508.6268	503.6844	433.7743	302.1158	199.7247	209.3778	320.2450	411.2341	433.5081	442.9597	(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	825.0606	799.9615	724.9257	603.7598	462.3788	305.7397	200.1378	210.1246	332.7512	510.4198	679.2040	819.8175	(97)
Space heating kWh	274.3639	206.3189	160.9263	72.0543	21.2818	0.0000	0.0000	0.0000	0.0000	73.7942	176.9010	280.3822	(98a)
Space heating requirement - total per year (kWh/year)												1266.0226	
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	274.3639	206.3189	160.9263	72.0543	21.2818	0.0000	0.0000	0.0000	0.0000	73.7942	176.9010	280.3822	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1266.0226	
Space heating per m2										(98c) / (4) =		22.6642	(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 %)													88.8000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	274.3639	206.3189	160.9263	72.0543	21.2818	0.0000	0.0000	0.0000	0.0000	73.7942	176.9010	280.3822	(98)
Space heating efficiency (main heating system 1)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000	(210)
Space heating fuel (main heating system)	308.9683	232.3411	181.2234	81.1422	23.9660	0.0000	0.0000	0.0000	0.0000	83.1016	199.2128	315.7457	(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	225.6842	199.6696	212.1592	186.4292	180.6900	162.7697	160.5205	166.8605	168.6715	188.1580	200.1928	223.1889	(64)
Efficiency of water heater	84.4989	84.1333	83.4481	82.1201	80.6614	79.8000	79.8000	79.8000	79.8000	82.1454	83.7835	79.8000	(216)
Fuel for water heating, kWh/month	267.0854	237.3252	254.2409	227.0202	224.0104	203.9721	201.1535	209.0984	211.3678	229.0548	238.9405	263.9023	(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	18.6993	16.8897	18.6993	18.0961	18.6993	18.0961	18.6993	18.6993	18.0961	18.6993	18.0961	18.6993	(231)
Lighting	16.6717	13.3747	12.0424	8.8228	6.8150	5.5679	6.2169	8.0809	10.4963	13.7717	15.5551	17.1351	(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)

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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	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												1425.7012	(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												2767.1716	(219)	
Space cooling fuel												0.0000	(221)	
Electricity for pumps and fans:														
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)														
mechanical ventilation fans (SFP = 0.7875)												134.1687	(230a)	
central heating pump												41.0000	(230c)	
main heating flue fan												45.0000	(230e)	
Total electricity for the above, kWh/year												220.1687	(231)	
Electricity for lighting (calculated in Appendix L)												134.5506	(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												4547.5920	(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	1425.7012	0.2100	299.3972	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2767.1716	0.2100	581.1060	(264)
Space and water heating			880.5033	(265)
Pumps, fans and electric keep-hot	220.1687	0.1387	30.5401	(267)
Energy for lighting	134.5506	0.1443	19.4198	(268)
Total CO2, kg/year			930.4632	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			16.6600	(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	1425.7012	1.1300	1611.0423	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2767.1716	1.1300	3126.9039	(278)
Space and water heating			4737.9462	(279)
Pumps, fans and electric keep-hot	220.1687	1.5128	333.0713	(281)
Energy for lighting	134.5506	1.5338	206.3781	(282)
Total Primary energy kWh/year			5277.3956	(286)
Dwelling Primary energy Rate (DPER)			94.4800	(287)

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

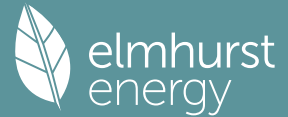
1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)	
Main dwelling	55.8600	2.5000	139.6500	(1b) - (3b)
Ground floor				(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.8600			
Dwelling volume			139.6500	(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	20.0000 / (5) =	0.1432 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3932	(18)
Number of sides sheltered	1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)

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Infiltration rate adjusted to include shelter factor

(21) = (18) x (20) = 0.3637 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Effective ac	0.4637	0.4547	0.4456	0.4001	0.3910	0.3455	0.3455	0.3364	0.3637	0.3910	0.4092	0.4274	(22b)
	0.6075	0.6034	0.5993	0.5800	0.5764	0.5597	0.5597	0.5566	0.5661	0.5764	0.5837	0.5913	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			12.1300	1.1450	13.8893			(27)
External Wall 1	54.8600	12.1300	42.7300	0.1800	7.6914			(29a)
Corridor Wall	4.2800	1.8400	2.4400	0.1800	0.4392			(29a)
Core/stair	16.2500		16.2500	0.1800	2.9250			(29a)
External Roof 1	55.8600		55.8600	0.1100	6.1446			(30)
Total net area of external elements Aum(A, m2)			131.2500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.9295			(33)
Main dwelling								
Party Wall 1			24.8500	0.0000	0.0000			(32)

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

219.9909 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	14.2300	0.0700	0.9961	
E16 Corner (normal)	8.5500	0.0900	0.7695	
E18 Party wall between dwellings	2.8500	0.0600	0.1710	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.0200	0.0200	0.1004	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.7200	0.0000	0.0000	
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0900	-0.2565	
E7 Party floor between dwellings (in blocks of flats)	7.2000	0.0700	0.5040	
E25 Staggered party wall between dwellings	0.0000	0.0600	0.0000	
E2 Other lintels (including other steel lintels)	8.5500	0.0500	0.4275	
E3 Sill	7.6500	0.0500	0.3825	
E4 Jamb	26.1400	0.0500	1.3070	
E16 Corner (normal)	2.8500	0.0900	0.2565	
E17 Corner (inverted - internal area greater than external area)	0.0000	-0.0900	-0.0000	
E18 Party wall between dwellings	0.0000	0.0600	0.0000	
E25 Staggered party wall between dwellings	2.8500	0.0600	0.1710	
P1 Party wall - Ground floor	0.0000	0.0800	0.0000	
E5 Ground floor (normal)	0.0000	0.1600	0.0000	
E5 Ground floor (normal)	0.0000	0.1600	0.0000	
E14 Flat roof	2.5100	0.0800	0.2008	
E15 Flat roof with parapet	8.5100	0.5600	4.7656	
P4 Party wall - Roof (insulation at ceiling level)	8.7200	0.1200	1.0464	
E12 Gable (insulation at ceiling level)	10.8400	0.0600	0.6504	
E10 Eaves (insulation at ceiling level)	4.6800	0.0600	0.2808	

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

11.7730 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 44.7025 (37)

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

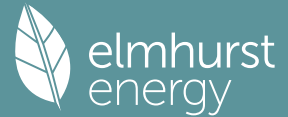
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	27.9978	27.8053	27.6167	26.7308	26.5650	25.7934	25.7934	25.6505	26.0906	26.5650	26.9004	27.2509	(38)
Average = Sum(39)m / 12 =	72.7003	72.5079	72.3192	71.4333	71.2675	70.4959	70.4959	70.3530	70.7931	71.2675	71.6029	71.9534	(39)
												71.4325	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.3015	1.2980	1.2947	1.2788	1.2758	1.2620	1.2620	1.2595	1.2673	1.2758	1.2818	1.2881	(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													1.8625 (42)
Hot water usage for mixer showers													
Hot water usage for baths	55.4477	54.6144	53.4002	51.0770	49.3625	47.4505	46.3637	47.5688	48.8897	50.9426	53.3158	55.2353	(42a)
Hot water usage for other uses	23.9676	23.6116	23.1103	22.1861	21.4941	20.7267	20.3122	20.8100	21.3519	22.1730	23.1163	23.8865	(42b)
Average daily hot water use (litres/day)	33.7040	32.4784	31.2528	30.0272	28.8016	27.5760	27.5760	28.8016	30.0272	31.2528	32.4784	33.7040	(42c)
												103.9826	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	113.1192	110.7044	107.7633	103.2903	99.6581	95.7532	94.2519	97.1803	100.2688	104.3684	108.9104	112.8258	(44)
Energy content (annual)	179.1532	157.6416	165.6282	141.3992	134.1590	117.7397	113.9895	120.3295	123.6415	141.6270	155.1628	176.6579	(45)
Distribution loss (46)m = 0.15 x (45)m	26.8730	23.6462	24.8442	21.2099	20.1238	17.6610	17.0984	18.0494	18.5462	21.2440	23.2744	26.4987	(46)
Water storage loss (or HIU loss):													
Store volume													150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.3938 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	225.7481	199.7273	212.2231	186.4910	180.7539	162.8315	160.5844	166.9244	168.7333	188.2219	200.2547	223.2528	(62)
WWHRS	-25.3484	-22.4183	-23.4752	-19.4384	-18.1159	-15.5019	-14.5305	-15.4518	-16.0388	-18.9080	-21.4205	-24.8790	(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	200.3997	177.3090	188.7479	167.0527	162.6380	147.3297	146.0539	151.4727	152.6945	169.3139	178.8342	198.3738	(64)

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12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =										2040.2200 (64)
Electric shower(s)	2040 (64)										
	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	96.8444	86.0844	92.3473	83.0887	81.8838	75.2219	75.1774	77.2855	77.1843	84.3669	87.6651
											96.0147 (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	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	81.9800	90.7635	81.9800	84.7126	81.9800	84.7126	81.9800	81.9800	84.7126	81.9800	84.7126	81.9800	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	162.3990	164.0842	159.8375	150.7970	139.3849	128.6591	121.4936	119.8084	124.0551	133.0956	144.5077	155.2335	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	(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)	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	(71)
Water heating gains (Table 5)	130.1671	128.1018	124.1227	115.4010	110.0589	104.4749	101.0449	103.8783	107.2004	113.3964	121.7571	129.0520	(72)
Total internal gains	428.4837	436.8871	419.8779	404.8482	385.3613	368.7843	355.4562	356.6044	366.9057	382.4096	404.9151	420.2031	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF		Access factor Table 6d		Gains W
North				6.2800	10.6334	0.6300		0.7000		0.7700		20.4081 (74)
East				3.4300	19.6403	0.6300		0.7000		0.7700		20.5880 (76)
West				2.4200	19.6403	0.6300		0.7000		0.7700		14.5256 (80)
Solar gains	55.5217	107.6906	179.3942	271.4318	345.5893	360.4906	340.3752	282.9734	211.2462	127.9316	68.9586	45.8889 (83)
Total gains	484.0054	544.5777	599.2721	676.2800	730.9507	729.2749	695.8313	639.5778	578.1519	510.3412	473.8737	466.0920 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	46.9534	47.0780	47.2008	47.7862	47.8973	48.4216	48.4216	48.5199	48.2183	47.8973	47.6730	47.4408
alpha	4.1302	4.1385	4.1467	4.1857	4.1932	4.2281	4.2281	4.2347	4.2146	4.1932	4.1782	4.1627
util living area	0.9864	0.9768	0.9554	0.8918	0.7660	0.5849	0.4375	0.4916	0.7347	0.9239	0.9759	0.9883 (86)
MIT	19.4843	19.6917	20.0191	20.4601	20.7873	20.9490	20.9881	20.9809	20.8681	20.4423	19.8995	19.4566 (87)
Th 2	19.8397	19.8424	19.8450	19.8575	19.8598	19.8707	19.8707	19.8727	19.8665	19.8598	19.8551	19.8502 (88)
util rest of house	0.9825	0.9703	0.9425	0.8612	0.7059	0.4946	0.3293	0.3780	0.6489	0.8953	0.9679	0.9849 (89)
MIT 2	18.1125	18.3760	18.7868	19.3263	19.6859	19.8418	19.8669	19.8659	19.7786	19.3211	18.6502	18.0845 (90)
Living area fraction	18.7377	18.9757	19.3485	19.8430	20.1879	20.3465	20.3779	20.3741	20.2752	19.8322	19.2196	18.7099 (92)
MIT	18.7377	18.9757	19.3485	19.8430	20.1879	20.3465	20.3779	20.3741	20.2752	19.8322	19.2196	18.7099 (93)
Temperature adjustment												0.0000
adjusted MIT	18.7377	18.9757	19.3485	19.8430	20.1879	20.3465	20.3779	20.3741	20.2752	19.8322	19.2196	18.7099 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	473.1391	524.9245	560.7197	582.1206	529.5337	389.3824	263.4744	274.7937	394.3830	456.4872	455.9194	456.9617	(95)
Ext temp.	4.3000	4.9400	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	1049.6282	1020.5960	929.1917	781.6975	604.9090	405.1031	266.3271	279.5893	437.1614	657.9534	867.7962	1044.0360	(97)
Space heating kWh	428.9079	333.0912	274.1432	143.6953	56.0792	0.0000	0.0000	0.0000	0.0000	149.8909	296.5513	436.7832	(98a)
Space heating requirement - total per year (kWh/year)												2119.1423	
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	428.9079	333.0912	274.1432	143.6953	56.0792	0.0000	0.0000	0.0000	0.0000	149.8909	296.5513	436.7832	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2119.1423	
Space heating per m2												37.9367	(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	428.9079	333.0912	274.1432	143.6953	56.0792	0.0000	0.0000	0.0000	0.0000	149.8909	296.5513	436.7832	(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)	464.6890	360.8789	297.0132	155.6829	60.7575	0.0000	0.0000	0.0000	0.0000	162.3953	321.2907	473.2213	(211)

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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	200.3997	177.3090	188.7479	167.0527	162.6380	147.3297	146.0539	151.4727	152.6945	169.3139	178.8342	198.3738	(64)
Efficiency of water heater	85.7213	85.4520	84.8958	83.7239	81.9291	79.8000	79.8000	79.8000	79.8000	83.7876	85.1858	85.7785	(216)
Fuel for water heating, kWh/month	233.7805	207.4954	222.3289	199.5282	198.5108	184.6237	183.0249	189.8154	191.3465	202.0750	209.9343	231.2628	(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	17.0338	13.6652	12.3040	9.0144	6.9630	5.6888	6.3519	8.2564	10.7243	14.0708	15.8929	17.5072	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.1601	-27.9689	-41.6212	-48.5206	-53.8407	-50.8353	-50.2360	-46.6838	-40.6564	-32.7655	-21.4096	-16.4569	(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	-8.1033	-17.2971	-34.8397	-52.9962	-70.7149	-71.2622	-70.4009	-59.2971	-43.0700	-24.9319	-10.8841	-6.3876	(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												2295.9288	(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												2453.7262	(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)												137.4727	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-920.3402	(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												4052.7875	(238)

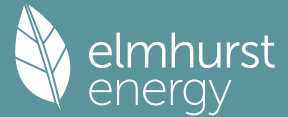
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2295.9288	0.2100	482.1450 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2453.7262	0.2100	515.2825 (264)
Space and water heating			997.4275 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	137.4727	0.1443	19.8416 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-450.1551	0.1338	-60.2481
PV Unit electricity exported	-470.1850	0.1255	-59.0237
Total			-119.2718 (269)
Total CO2, kg/year			909.9266 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.2900 (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	2295.9288	1.1300	2594.3995 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2453.7262	1.1300	2772.7106 (278)
Space and water heating			5367.1101 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	137.4727	1.5338	210.8601 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-450.1551	1.4946	-672.8029
PV Unit electricity exported	-470.1850	0.4608	-216.6498
Total			-889.4527 (283)
Total Primary energy kWh/year			4818.6184 (286)
Target Primary Energy Rate (TPER)			86.2600 (287)

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Plot Reference	D1 - semi				Issued on Date	25/03/2026	
Assessment Reference	D1 - semi			Plot Type Ref	D1 - semi		
Plot Address					SAP Version	10.2	
SAP Rating	84 B	DER	14.06	TER	11.94		
Environmental	88 B	% DER < TER				-17.76	
CO ₂ Emissions (t/year)	1.15	DFEE	44.09	TFEE	43.10		
Compliance Check	See BREL	% DFEE < TFEE				-2.28	
% DPER < TPER	-28.20	DPER	80.01	TPER	62.41		
Assessor Details	Miss Alicja Kreglewska				Assessor ID	L728-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	45.9700 (1b)	x 2.5000 (2b)	= 114.9250 (1b) - (3b)
First floor	46.0100 (1c)	x 2.5000 (2c)	= 115.0250 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.9800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	229.9500 (5)

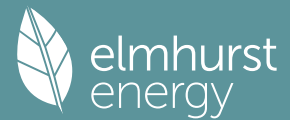
2. Ventilation rate

	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) =	79.2000 (23c)
Effective ac	0.2809 0.2774 0.2740 0.2566 0.2532 0.2358 0.2358 0.2323 0.2427 0.2532 0.2601 0.2670 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			21.7000	0.8687	18.8514		(27)
Door			2.4200	1.2000	2.9040		(26)
Ground floor			45.9700	0.1000	4.5970	110.0000	5056.7000 (28a)
External Wall 1	135.3800	24.1200	111.2600	0.1800	20.0268	70.0000	7788.2000 (29a)
Plane roof	46.0100		46.0100	0.0900	4.1409	9.0000	414.0900 (30)
Total net area of external elements Aum (A, m ²)			227.3600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		50.5201		(33)
Main dwelling							
Party Wall			24.0500	0.0000	0.0000	140.0000	3367.0000 (32)
Internal Wall 1			183.0500			9.0000	1647.4500 (32c)
Internal Floor 1			46.0100			18.0000	828.1800 (32d)
Internal Ceiling 1			45.9700			9.0000	413.7300 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	19515.3500 (34)

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

212.1695 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	0.0000	0.0600	0.0000
E7 Party floor between dwellings (in blocks of flats)	17.1000	0.1270	2.1717
E16 Corner (normal)	0.0000	0.0250	0.0000
E18 Party wall between dwellings	0.0000	0.1000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	0.0000	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	0.0000	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	0.0000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	0.0000	0.1000	0.0000
E25 Staggered party wall between dwellings	11.4000	0.1200	1.3680
E2 Other lintels (including other steel lintels)	13.2900	0.0170	0.2259
E3 Sill	12.2800	0.0300	0.3684
E4 Jamb	38.0000	0.1200	4.5600
E16 Corner (normal)	0.0000	0.1300	0.0000
E17 Corner (inverted - internal area greater than external area)	0.0000	0.0000	0.0000
E18 Party wall between dwellings	0.0000	0.0900	0.0000
E25 Staggered party wall between dwellings	0.0000	0.0900	0.0000
P1 Party wall - Ground floor	4.2400	0.0500	0.2120
E5 Ground floor (normal)	23.7600	0.1000	2.3760
E5 Ground floor (normal)	0.0000	0.2300	0.0000
E14 Flat roof	0.0000	0.1600	0.0000
E15 Flat roof with parapet	0.0000	0.3000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	4.2000	0.0300	0.1260
E6 Intermediate floor within a dwelling	23.7400	0.1400	3.3236
E10 Eaves (insulation at ceiling level)	17.7000	0.1200	2.1240
P2 Party wall - Intermediate floor within a dwelling	4.2000	0.0000	0.0000
E12 Gable (insulation at ceiling level)	6.5300	0.1200	0.7836

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

Point Thermal Bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 68.1593 (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	21.3161	21.0529	20.7897	19.4736	19.2104	17.8943	17.8943	17.6311	18.4207	19.2104	19.7368	20.2633	(38)
Heat transfer coeff	89.4754	89.2122	88.9490	87.6329	87.3697	86.0536	86.0536	85.7903	86.5800	87.3697	87.8961	88.4225	(39)
Average = Sum(39)m / 12 =												87.5671	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9728	0.9699	0.9670	0.9527	0.9499	0.9356	0.9356	0.9327	0.9413	0.9499	0.9556	0.9613	(40)
HLP (average)												0.9520	
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy

2.6519 (42)

Hot water usage for mixer showers

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	68.6828	67.6506	66.1465	63.2688	61.1451	58.7767	57.4305	58.9232	60.5595	63.1024	66.0420	68.4196	(42a)
Hot water usage for baths	29.6591	29.2186	28.5983	27.4546	26.5982	25.6486	25.1357	25.7516	26.4223	27.4384	28.6057	29.5588	(42b)
Hot water usage for other uses	41.7877	40.2682	38.7486	37.2291	35.7095	34.1900	34.1900	35.7095	37.2291	38.7486	40.2682	41.7877	(42c)
Average daily hot water use (litres/day)												128.8107	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	140.1296	137.1374	133.4935	127.9525	123.4528	118.6153	116.7562	120.3844	124.2109	129.2894	134.9158	139.7662	(44)
Energy conte	221.9310	195.2818	205.1745	175.1605	166.1912	145.8513	141.2065	149.0610	153.1644	175.4445	192.2123	218.8401	(45)
Energy content (annual)										Total = Sum(45)m =		2139.5191	

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

Distribution loss	33.2897	29.2923	30.7762	26.2741	24.9287	21.8777	21.1810	22.3592	22.9747	26.3167	28.8318	32.8260	(46)
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Water storage loss (or HIU loss):

Store volume

150.0000 (47)

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

1.3900 (48)

Temperature factor from Table 2b

0.5400 (49)

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

0.7506 (55)

Total storage loss

	23.2686	21.0168	23.2686	22.5180	23.2686	22.5180	23.2686	23.2686	22.5180	23.2686	22.5180	23.2686	(56)
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If cylinder contains dedicated solar storage

	23.2686	21.0168	23.2686	22.5180	23.2686	22.5180	23.2686	23.2686	22.5180	23.2686	22.5180	23.2686	(57)
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Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
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Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
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Total heat required for water heating calculated for each month

	268.4620	237.3098	251.7055	220.1905	212.7222	190.8813	187.7375	195.5920	198.1944	221.9755	237.2423	265.3711	(62)
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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)
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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)
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Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
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FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
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Output from w/h	268.4620	237.3098	251.7055	220.1905	212.7222	190.8813	187.7375	195.5920	198.1944	221.9755	237.2423	265.3711	(64)
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Total per year (kWh/year) = Sum(64)m = 2687.3841 (64)

2687 (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)
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Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

	111.0169	98.5536	105.4453	94.2649	92.4834	84.5196	84.1760	86.7876	86.9512	95.5601	99.9346	109.9891	(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	132.5932	132.5932	132.5932	132.5932	132.5932	132.5932	132.5932	132.5932	132.5932	132.5932	132.5932	132.5932	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	122.4010	135.5154	122.4010	126.4810	122.4010	126.4810	122.4010	122.4010	126.4810	122.4010	126.4810	122.4010	(67)
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Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	242.6736	245.1918	238.8460	225.3367	208.2835	192.2559	181.5485	179.0303	185.3761	198.8855	215.9386	231.9662	(68)
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Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	36.2593	36.2593	36.2593	36.2593	36.2593	36.2593	36.2593	36.2593	36.2593	36.2593	36.2593	36.2593	(69)
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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)
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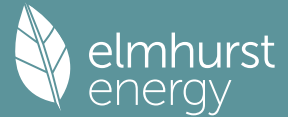
Losses e.g. evaporation (negative values) (Table 5)

	-106.0745	-106.0745	-106.0745	-106.0745	-106.0745	-106.0745	-106.0745	-106.0745	-106.0745	-106.0745	-106.0745	-106.0745	(71)
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Water heating gains (Table 5)

	149.2162	146.6571	141.7276	130.9234	124.3056	117.3883	113.1397	116.6500	120.7655	128.4410	138.7980	147.8348	(72)
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Total internal gains
580.0687 593.1423 568.7525 548.5190 520.7680 498.9031 479.8672 480.8592 495.4005 515.5054 546.9956 567.9800 (73)

6. Solar gains

[Jan]	Area m2				Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W
East	14.6300				19.6403	0.3800		0.7000	0.7700	52.9671 (76)
West	7.0700				19.6403	0.3800		0.7000	0.7700	25.5966 (80)
Solar gains	78.5637	153.6873	253.1010	369.1328	452.3861	463.0976	378.7161	294.3670	182.3629	64.6070 (83)
Total gains	658.6324	746.8295	821.8536	917.6518	973.1541	962.0008	859.5753	789.7675	697.8682	632.5869 (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	60.5857	60.7644	60.9443	61.8595	62.0459	62.9948	62.9948	63.1881	62.6118	62.0459	61.6743	61.3071
alpha	5.0390	5.0510	5.0630	5.1240	5.1364	5.1997	5.1997	5.2125	5.1741	5.1364	5.1116	5.0871
util living area	0.9909	0.9820	0.9604	0.8907	0.7534	0.5586	0.4088	0.4548	0.7035	0.9254	0.9816	0.9925 (86)
MIT	19.8435	20.0335	20.3114	20.6647	20.8905	20.9815	20.9969	20.9948	20.9422	20.6371	20.1881	19.8185 (87)
Th 2	20.1061	20.1085	20.1109	20.1229	20.1253	20.1374	20.1374	20.1398	20.1325	20.1253	20.1205	20.1157 (88)
util rest of house	0.9885	0.9774	0.9500	0.8643	0.7028	0.4888	0.3299	0.3719	0.6327	0.9011	0.9760	0.9905 (89)
MIT 2	18.7603	19.0024	19.3519	19.7857	20.0329	20.1262	20.1362	20.1377	20.0925	19.7649	19.2091	18.7356 (90)
Living area fraction									fLA = Living area / (4) =			0.2847 (91)
MIT	19.0688	19.2960	19.6251	20.0360	20.2771	20.3697	20.3813	20.3817	20.3344	20.0132	19.4878	19.0440 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.9188	19.1460	19.4751	19.8860	20.1271	20.2197	20.2313	20.2317	20.1844	19.8632	19.3378	18.8940 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9841	0.9707	0.9408	0.8561	0.7029	0.4956	0.3386	0.3809	0.6372	0.8923	0.9693	0.9866 (94)
Useful gains	648.1614	724.9507	773.2396	785.5936	684.0763	476.7687	311.7365	327.3696	503.2748	622.6821	625.1853	624.1407 (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	1308.0195	1270.9171	1154.1250	962.7335	736.2713	483.5944	312.4865	328.7269	526.7880	809.3247	1075.6576	1299.2768 (97)
Space heating kWh	490.9344	366.8894	283.3788	127.5407	38.8331	0.0000	0.0000	0.0000	0.0000	138.8621	324.3400	502.3013 (98a)
Space heating requirement - total per year (kWh/year)												2273.0798
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	490.9344	366.8894	283.3788	127.5407	38.8331	0.0000	0.0000	0.0000	0.0000	138.8621	324.3400	502.3013 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2273.0798
Space heating per m2										(98c) / (4) =		24.7128 (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 %)												88.8000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	490.9344	366.8894	283.3788	127.5407	38.8331	0.0000	0.0000	0.0000	0.0000	138.8621	324.3400	502.3013 (98)
Space heating efficiency (main heating system 1)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000 (210)
Space heating fuel (main heating system)	552.8541	413.1638	319.1202	143.6269	43.7310	0.0000	0.0000	0.0000	0.0000	156.3762	365.2477	565.6546 (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	268.4620	237.3098	251.7055	220.1905	212.7222	190.8813	187.7375	195.5920	198.1944	221.9755	237.2423	265.3711 (64)
Efficiency of water heater	85.3952	85.0333	84.3262	82.8810	81.0684	79.8000	79.8000	79.8000	79.8000	83.0388	84.7615	79.8000 (216)
Fuel for water heating, kWh/month	314.3759	279.0788	298.4901	265.6707	262.3985	239.1997	235.2600	245.1028	248.3639	267.3154	279.8938	310.4921 (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	27.5567	24.8899	27.5567	26.6678	27.5567	26.6678	27.5567	27.5567	26.6678	27.5567	26.6678	27.5567 (231)
Lighting	24.9127	19.9859	17.9951	13.1840	10.1837	8.3201	9.2899	12.0753	15.6847	20.5791	23.2441	25.6051 (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)

elmhurst
energy

2. Ventilation rate			
		m3 per hour	
Number of open chimneys	0 * 90 =	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)
		Air changes per hour	
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1305 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000 (17)	
Infiltration rate		0.3805 (18)	

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Number of sides sheltered

1 (19)

Shelter factor

$$(20) = 1 - [0.075 \times (19)] = 0.9250 \quad (20)$$

Infiltration rate adjusted to include shelter factor

$$(21) = (18) \times (20) = 0.3519 \quad (21)$$

	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	0.4487	0.4399	0.4311	0.3871	0.3783	0.3343	0.3343	0.3255	0.3519	0.3783	0.3959	0.4135	(22b)
	0.6007	0.5968	0.5929	0.5749	0.5716	0.5559	0.5559	0.5530	0.5619	0.5716	0.5784	0.5855	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			2.4200	1.0000	2.4200			(26)
TER Opening Type			20.5800	1.1450	23.5649			(27)
Ground floor			45.9700	0.1300	5.9761			(28a)
External Wall 1	135.3800	23.0000	112.3800	0.1800	20.2284			(29a)
Plane roof	46.0100		46.0100	0.1100	5.0611			(30)
Total net area of external elements Aum(A, m2)			227.3600					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	57.2505		(33)
Main dwelling								
Party Wall			24.0500	0.0000	0.0000			(32)

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

212.1695 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	0.0000	0.0700	0.0000	
E16 Corner (normal)	17.1000	0.0900	1.5390	
E18 Party wall between dwellings	0.0000	0.0600	0.0000	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	0.0000	0.0200	0.0000	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	0.0000	0.0000	0.0000	
E17 Corner (inverted - internal area greater than external area)	0.0000	-0.0900	-0.0000	
E7 Party floor between dwellings (in blocks of flats)	0.0000	0.0700	0.0000	
E25 Staggered party wall between dwellings	11.4000	0.0600	0.6840	
E2 Other lintels (including other steel lintels)	13.2900	0.0500	0.6645	
E3 Sill	12.2800	0.0500	0.6140	
E4 Jamb	38.0000	0.0500	1.9000	
E16 Corner (normal)	0.0000	0.0900	0.0000	
E17 Corner (inverted - internal area greater than external area)	0.0000	-0.0900	-0.0000	
E18 Party wall between dwellings	0.0000	0.0600	0.0000	
E25 Staggered party wall between dwellings	0.0000	0.0600	0.0000	
P1 Party wall - Ground floor	4.2400	0.0800	0.3392	
E5 Ground floor (normal)	23.7600	0.1600	3.8016	
E5 Ground floor (normal)	0.0000	0.1600	0.0000	
E14 Flat roof	0.0000	0.0800	0.0000	
E15 Flat roof with parapet	0.0000	0.5600	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	4.2000	0.1200	0.5040	
E6 Intermediate floor within a dwelling	23.7400	0.0000	0.0000	
E10 Eaves (insulation at ceiling level)	17.7000	0.0600	1.0620	
P2 Party wall - Intermediate floor within a dwelling	4.2000	0.0000	0.0000	
E12 Gable (insulation at ceiling level)	6.5300	0.0600	0.3918	

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

Point Thermal bridges

(36a) = 11.5001 (36)

Total fabric heat loss

$$(33) + (36) + (36a) = 68.7506 \quad (37)$$

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

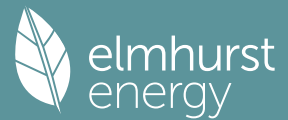
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	45.5809	45.2843	44.9935	43.6278	43.3723	42.1828	42.1828	41.9625	42.6410	43.3723	43.8892	44.4296	(38)
Average = Sum(39)m / 12 =	114.3315	114.0349	113.7441	112.3784	112.1229	110.9334	110.9334	110.7131	111.3916	112.1229	112.6398	113.1802	(39)
												112.3772	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2430	1.2398	1.2366	1.2218	1.2190	1.2061	1.2061	1.2037	1.2110	1.2190	1.2246	1.2305	(40)
HLP (average)												1.2218	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6519 (42)
Hot water usage for mixer showers	68.6828	67.6506	66.1465	63.2688	61.1451	58.7767	57.4305	58.9232	60.5595	63.1024	66.0420	68.4196 (42a)	
Hot water usage for baths	29.6591	29.2186	28.5983	27.4546	26.5982	25.6486	25.1357	25.7516	26.4223	27.4384	28.6057	29.5588 (42b)	
Hot water usage for other uses	41.7877	40.2682	38.7486	37.2291	35.7095	34.1900	34.1900	35.7095	37.2291	38.7486	40.2682	41.7877 (42c)	
Average daily hot water use (litres/day)												128.8107 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	140.1296	137.1374	133.4935	127.9525	123.4528	118.6153	116.7562	120.3844	124.2109	129.2894	134.9158	139.7662 (44)	
Energy content (annual)	221.9310	195.2818	205.1745	175.1605	166.1912	145.8513	141.2065	149.0610	153.1644	175.4445	192.2123	218.8401 (45)	
Distribution loss (46)m = 0.15 x (45)m	33.2897	29.2923	30.7762	26.2741	24.9287	21.8777	21.1810	22.3592	22.9747	26.3167	28.8318	32.8260 (46)	
Water storage loss (or HIU loss):													
Store volume												150.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)	
Temperature factor from Table 2b												0.5400 (49)	
Enter (49) or (54) in (55)												0.7527 (55)	
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)	
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)	
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)	
Total heat required for water heating calculated for each month	268.5259	237.3675	251.7694	220.2524	212.7861	190.9432	187.8014	195.6559	198.2562	222.0394	237.3041	265.4350 (62)	
WWHRS	-31.3989	-27.7694	-29.0786	-24.0782	-22.4400	-19.2021	-17.9989	-19.1400	-19.8672	-23.4213	-26.5334	-30.8174 (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)	

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Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (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	237.1270	209.5981	222.6908	196.1742	190.3461	171.7411	169.8025	176.5159	178.3890	198.6181	210.7707	234.6175 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =											2396.3910 (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	111.0680	98.5998	105.4964	94.3143	92.5345	84.5690	84.2271	86.8387	87.0006	95.6112	99.9841	110.0402 (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	132.5932	132.5932	132.5932	132.5932	132.5932	132.5932	132.5932	132.5932	132.5932	132.5932	132.5932	132.5932	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	122.3931	135.5067	122.3931	126.4729	122.3931	126.4729	122.3931	122.3931	126.4729	122.3931	126.4729	122.3931	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	242.6736	245.1918	238.8460	225.3367	208.2835	192.2559	181.5485	179.0303	185.3761	198.8855	215.9386	231.9662	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.2593	36.2593	36.2593	36.2593	36.2593	36.2593	36.2593	36.2593	36.2593	36.2593	36.2593	36.2593	(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)	-106.0745	-106.0745	-106.0745	-106.0745	-106.0745	-106.0745	-106.0745	-106.0745	-106.0745	-106.0745	-106.0745	-106.0745	(71)
Water heating gains (Table 5)	149.2849	146.7259	141.7963	130.9921	124.3743	117.4570	113.2084	116.7187	120.8342	128.5097	138.8667	147.9035	(72)
Total internal gains	580.1296	593.2023	568.8134	548.5797	520.8289	498.9638	479.9280	480.9201	495.4612	515.5663	547.0562	568.0408	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East					13.8700	19.6403		0.6300	0.7000	0.7700	83.2522 (76)	
West					6.7100	19.6403		0.6300	0.7000	0.7700	40.2756 (80)	
Solar gains	123.5277	241.6465	397.9573	580.3970	711.2983	728.1404	693.2194	595.4652	462.8408	286.7339	154.0246	101.5832 (83)
Total gains	703.6574	834.8488	966.7707	1128.9767	1232.1272	1227.1042	1173.1474	1076.3853	958.3020	802.3002	701.0808	669.6241 (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	47.4141	47.5375	47.6590	48.2382	48.3481	48.8665	48.8665	48.9638	48.6655	48.3481	48.1262	47.8965
alpha	4.1609	4.1692	4.1773	4.2159	4.2232	4.2578	4.2578	4.2643	4.2444	4.2232	4.2084	4.1931
util living area	0.9900	0.9792	0.9526	0.8752	0.7358	0.5534	0.4102	0.4627	0.7112	0.9251	0.9809	0.9918 (86)
MIT	19.4249	19.6764	20.0528	20.5152	20.8223	20.9596	20.9910	20.9853	20.8862	20.4467	19.8554	19.3889 (87)
Th 2	19.8858	19.8883	19.8908	19.9026	19.9048	19.9152	19.9152	19.9171	19.9112	19.9048	19.9004	19.8957 (88)
util rest of house	0.9872	0.9736	0.9396	0.8431	0.6763	0.4692	0.3119	0.3587	0.6279	0.8979	0.9747	0.9895 (89)
MIT 2	18.0737	18.3933	18.8649	19.4263	19.7596	19.8920	19.9121	19.9116	19.8348	19.3641	18.6315	18.0346 (90)
Living area fraction	fLA = Living area / (4) =											0.2847 (91)
MIT	18.4584	18.7587	19.2031	19.7363	20.0622	20.1960	20.2193	20.2173	20.1342	19.6724	18.9800	18.4202 (92)
Temperature adjustment												0.0000
adjusted MIT	18.4584	18.7587	19.2031	19.7363	20.0622	20.1960	20.2193	20.2173	20.1342	19.6724	18.9800	18.4202 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	691.0661	806.2623	898.5419	945.6050	844.5542	603.4436	398.7441	417.8246	619.3983	714.7419	678.3179	659.6270	(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	1618.7552	1580.3717	1444.9032	1217.7714	937.5938	620.7794	401.5022	422.6246	672.1535	1017.2186	1338.1606	1609.4493	(97)
Space heating kWh	690.2007	520.2015	406.4928	195.9598	69.2214	0.0000	0.0000	0.0000	0.0000	225.0427	475.0868	706.6678	(98a)
Space heating requirement - total per year (kWh/year)												3288.8735	
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	690.2007	520.2015	406.4928	195.9598	69.2214	0.0000	0.0000	0.0000	0.0000	225.0427	475.0868	706.6678	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3288.8735	
Space heating per m2												(98c) / (4) =	35.7564 (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	690.2007	520.2015	406.4928	195.9598	69.2214	0.0000	0.0000	0.0000	0.0000	225.0427	475.0868	706.6678	(98)
Space heating efficiency (main heating system 1)													

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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)	747.7798	563.5986	440.4039	212.3074	74.9961	0.0000	0.0000	0.0000	0.0000	243.8166	514.7203	765.6206	(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 requirement	237.1270	209.5981	222.6908	196.1742	190.3461	171.7411	169.8025	176.5159	178.3890	198.6181	210.7707	234.6175	(64)
Efficiency of water heater (217)m	86.3108	86.0139	85.3914	84.0573	82.0168	79.8000	79.8000	79.8000	79.8000	84.3406	85.8254	79.8000	(216)
Fuel for water heating, kWh/month	274.7361	243.6792	260.7884	233.3814	232.0819	215.2144	212.7851	221.1979	223.5451	235.4953	245.5808	86.3720	(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	(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	25.4309	20.4016	18.3694	13.4582	10.3955	8.4932	9.4831	12.3265	16.0109	21.0072	23.7276	26.1377	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-42.3676	-59.4079	-84.9381	-94.9701	-101.9482	-94.9683	-93.7550	-88.7032	-79.7624	-67.6354	-46.4473	-36.6640	(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)	-24.9415	-52.3473	-103.8327	-155.6597	-205.5609	-206.4722	-204.0795	-172.9480	-126.9456	-74.8108	-33.2811	-19.7357	(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												3563.2433	(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												2870.1217	(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)												205.2418	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2272.1825	(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												4452.4243	(238)

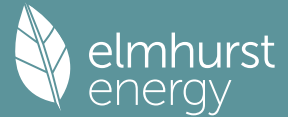
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3563.2433	0.2100	748.2811	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2870.1217	0.2100	602.7256	(264)
Space and water heating			1351.0066	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	205.2418	0.1443	29.6227	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-891.5676	0.1347	-120.1016	
PV Unit electricity exported	-1380.6149	0.1259	-173.8844	
Total			-293.9860	(269)
Total CO2, kg/year			1098.5727	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.9400	(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	3563.2433	1.1300	4026.4649	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2870.1217	1.1300	3243.2376	(278)
Space and water heating			7269.7024	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	205.2418	1.5338	314.8067	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-891.5676	1.4979	-1335.4487	
PV Unit electricity exported	-1380.6149	0.4623	-638.2782	
Total			-1973.7269	(283)
Total Primary energy kWh/year			5740.8830	(286)
Target Primary Energy Rate (TPER)			62.4100	(287)

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Plot Reference	H02 - terrace			Issued on Date	25/03/2026
Assessment Reference	H02 - terrace	Plot Type Ref	H02 - terrace		
Plot Address				SAP Version	10.2
SAP Rating	86 B	DER	10.54	TER	9.78
Environmental	91 B	% DER < TER			-7.77
CO ₂ Emissions (t/year)	0.96	DFEE	31.89	TFEE	34.92
Compliance Check	See BREL	% DFEE < TFEE			8.68
% DPER < TPER	-19.44	DPER	60.79	TPER	50.90
Assessor Details	Miss Alicja Kreglewska			Assessor ID	L728-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	51.5600 (1b)	x 2.5000 (2b)	= 128.9000 (1b) - (3b)
First floor	49.6200 (1c)	x 2.5000 (2c)	= 124.0500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	101.1800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 252.9500 (5)

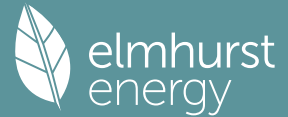
2. Ventilation rate

	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 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	0.1626 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) =	80.1000 (23c)
Effective ac	0.2621 0.2589 0.2557 0.2397 0.2366 0.2206 0.2206 0.2174 0.2270 0.2366 0.2429 0.2493 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			17.1000	0.8687	14.8552		(27)
Door			2.4200	1.2000	2.9040		(26)
Ground floor			51.5600	0.1000	5.1560	110.0000	5671.6000 (28a)
External Wall 1	65.0100	19.5200	45.4900	0.1800	8.1882	70.0000	3184.3000 (29a)
Plane roof	37.7500		37.7500	0.0900	3.3975	9.0000	339.7500 (30)
Flat roof	11.8700		11.8700	0.1100	1.3057	9.0000	106.8300 (30)
Total net area of external elements A _{um} (A _m , m ²)			166.1900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		35.8066		(33)
Main dwelling							
Party Wall			104.4500	0.0000	0.0000	140.0000	14623.0000 (32)
Internal Wall 1			162.8500			9.0000	1465.6501 (32c)
Internal Floor 1			49.6200			18.0000	893.1600 (32d)
Internal Ceiling 1			49.6200			9.0000	446.5800 (32e)

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Heat capacity $C_m = \text{Sum}(A \times k)$
Thermal mass parameter (TMP) = C_m / TFA in $\text{kJ/m}^2\text{K}$
List of Thermal Bridges

(28)...(30) + (32) + (32a)...(32e) = 26730.8701 (34)
264.1912 (35)

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	0.0000	0.0600	0.0000
E16 Corner (normal)	2.8500	0.1270	0.3619
E18 Party wall between dwellings	19.9500	0.0250	0.4988
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	0.0000	0.1000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	0.0000	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	2.8500	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	0.0000	0.1000	0.0000
E25 Staggered party wall between dwellings	2.8500	0.1200	0.3420
E2 Other lintels (including other steel lintels)	9.9700	0.0170	0.1695
E3 Sill	8.9600	0.0300	0.2688
E4 Jamb	29.4000	0.1200	3.5280
E16 Corner (normal)	0.0000	0.1300	0.0000
E17 Corner (inverted - internal area greater than external area)	0.0000	0.0000	0.0000
E18 Party wall between dwellings	0.0000	0.0900	0.0000
E25 Staggered party wall between dwellings	0.0000	0.0900	0.0000
P1 Party wall - Ground floor	18.6400	0.0500	0.9320
E5 Ground floor (normal)	11.1200	0.1000	1.1120
E5 Ground floor (normal)	0.0000	0.2300	0.0000
E14 Flat roof	0.0000	0.1600	0.0000
E15 Flat roof with parapet	5.0200	0.3000	1.5060
P4 Party wall - Roof (insulation at ceiling level)	18.0100	0.0300	0.5403
E6 Intermediate floor within a dwelling	11.6900	0.1400	1.6366
E10 Eaves (insulation at ceiling level)	5.9400	0.1200	0.7128
P2 Party wall - Intermediate floor within a dwelling	18.0100	0.0000	0.0000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			11.6087 (36)
Point Thermal bridges			0.0000
Total fabric heat loss			(33) + (36) + (36a) = 47.4153 (37)

Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)\text{m} \times (5)$	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	21.8753	21.6092	21.3431	20.0128	19.7467	18.4163	18.4163	18.1503	18.9485	19.7467	20.2788	20.8110	(38)
Heat transfer coeff	69.2906	69.0245	68.7584	67.4281	67.1620	65.8316	65.8316	65.5656	66.3638	67.1620	67.6941	68.2263	(39)
Average = Sum(39)m / 12 =												67.3616	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.6848	0.6822	0.6796	0.6664	0.6638	0.6506	0.6506	0.6480	0.6559	0.6638	0.6690	0.6743	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

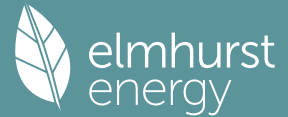
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.7502 (42)
Hot water usage for mixer showers	70.3313	69.2744	67.7342	64.7874	62.6127	60.1875	58.8090	60.3375	62.0130	64.6170	67.6271	70.0619	(42a)
Hot water usage for baths	30.3680	29.9170	29.2819	28.1108	27.2340	26.2617	25.7365	26.3672	27.0539	28.0943	29.2894	30.2653	(42b)
Hot water usage for other uses	42.7946	41.2385	39.6823	38.1261	36.5700	35.0138	35.0138	36.5700	38.1261	39.6823	41.2385	42.7946	(42c)
Average daily hot water use (litres/day)												131.9033	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	143.4940	140.4299	136.6984	131.0244	126.4166	121.4630	119.5593	123.2746	127.1930	132.3935	138.1550	143.1218	(44)
Energy content (annual)	227.2594	199.9702	210.1003	179.3658	170.1811	149.3529	144.5966	152.6398	156.8417	179.6568	196.8271	224.0942	(45)
Distribution loss (46)m = $0.15 \times (45)\text{m}$	34.0889	29.9955	31.5151	26.9049	25.5272	22.4029	21.6895	22.8960	23.5263	26.9485	29.5241	33.6141	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3900	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7506	(55)
Total storage loss	23.2686	21.0168	23.2686	22.5180	23.2686	22.5180	23.2686	23.2686	22.5180	23.2686	22.5180	23.2686	(56)
If cylinder contains dedicated solar storage	23.2686	21.0168	23.2686	22.5180	23.2686	22.5180	23.2686	23.2686	22.5180	23.2686	22.5180	23.2686	(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	273.7904	241.9982	256.6313	224.3958	216.7121	194.3829	191.1276	199.1708	201.8717	226.1878	241.8571	270.6252	(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	273.7904	241.9982	256.6313	224.3958	216.7121	194.3829	191.1276	199.1708	201.8717	226.1878	241.8571	270.6252	(64)
12Total per year (kWh/year)												2738.7509	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month	112.7885	100.1125	107.0832	95.6631	93.8100	85.6838	85.3032	87.9775	88.1739	96.9607	101.4690	111.7361	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	137.5092	137.5092	137.5092	137.5092	137.5092	137.5092	137.5092	137.5092	137.5092	137.5092	137.5092	137.5092	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	134.4715	148.8791	134.4715	138.9539	134.4715	138.9539	134.4715	134.4715	138.9539	134.4715	138.9539	134.4715	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	258.2214	260.9009	254.1486	239.7737	221.6280	204.5735	193.1801	190.5006	197.2529	211.6278	229.7736	246.8280	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.7509	36.7509	36.7509	36.7509	36.7509	36.7509	36.7509	36.7509	36.7509	36.7509	36.7509	36.7509	(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)	-110.0074	-110.0074	-110.0074	-110.0074	-110.0074	-110.0074	-110.0074	-110.0074	-110.0074	-110.0074	-110.0074	-110.0074	(71)
Water heating gains (Table 5)	151.5975	148.9769	143.9290	132.8654	126.0887	119.0053	114.6548	118.2494	122.4637	130.3235	140.9292	150.1830	(72)

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Total internal gains
611.5431 626.0098 599.8018 578.8458 549.4409 526.7855 506.5591 507.4742 522.9232 543.6755 576.9094 598.7352 (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	
East	10.9700		19.6403		0.3800		0.7000		0.7700		39.7163 (76)	
West	6.1300		19.6403		0.3800		0.7000		0.7700		22.1933 (80)	
Solar gains	61.9096	121.1084	199.4483	290.8834	356.4885	364.9295	347.4277	298.4353	231.9666	143.7053	77.1940	50.9115 (83)
Total gains	673.4528	747.1182	799.2501	869.7292	905.9295	891.7149	853.9869	805.9094	754.8898	687.3808	654.1034	649.6467 (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	107.1609	107.5740	107.9903	110.1209	110.5572	112.7914	112.7914	113.2491	111.8869	110.5572	109.6881	108.8326
alpha	8.1441	8.1716	8.1994	8.3414	8.3705	8.5194	8.5194	8.5499	8.4591	8.3705	8.3125	8.2555
util living area	0.9949	0.9869	0.9628	0.8623	0.6796	0.4721	0.3392	0.3742	0.6031	0.9003	0.9846	0.9960 (86)
MIT	20.4625	20.5871	20.7487	20.9270	20.9901	20.9996	21.0000	21.0000	20.9971	20.9118	20.6714	20.4481 (87)
Th 2	20.3543	20.3566	20.3589	20.3706	20.3729	20.3846	20.3846	20.3870	20.3800	20.3729	20.3683	20.3636 (88)
util rest of house	0.9933	0.9830	0.9524	0.8337	0.6372	0.4269	0.2917	0.3244	0.5505	0.8715	0.9795	0.9948 (89)
MIT 2	19.7263	19.8857	20.0872	20.3019	20.3655	20.3844	20.3846	20.3870	20.3782	20.2915	20.0025	19.7159 (90)
Living area fraction	19.9797	20.1271	20.3149	20.5170	20.5804	20.5961	20.5964	20.5979	20.5912	20.5049	20.2327	0.3441 (91)
MIT	19.9797	20.1271	20.3149	20.5170	20.5804	20.5961	20.5964	20.5979	20.5912	20.5049	20.2327	19.9679 (92)
Temperature adjustment	19.8297	19.9771	20.1649	20.3670	20.4304	20.4461	20.4464	20.4479	20.4412	20.3549	20.0827	-0.1500
adjusted MIT	19.8297	19.9771	20.1649	20.3670	20.4304	20.4461	20.4464	20.4479	20.4412	20.3549	20.0827	19.8179 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9917	0.9803	0.9488	0.8335	0.6412	0.4314	0.2965	0.3293	0.5557	0.8706	0.9765	0.9934 (94)
Useful gains	667.8317	732.3634	758.3195	724.9606	580.8387	384.6894	253.2090	265.3908	419.4908	598.4444	638.7624	645.3365 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	14.0000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1076.0599	1040.6867	939.5749	773.2000	586.3544	384.8597	253.2146	265.4042	420.8243	655.1616	878.8544	1065.5483 (97)
Space heating kWh	303.7218	207.1932	134.8541	34.7324	4.1037	0.0000	0.0000	0.0000	0.0000	42.1976	172.8662	312.6376 (98a)
Space heating requirement - total per year (kWh/year)												1212.3066
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	303.7218	207.1932	134.8541	34.7324	4.1037	0.0000	0.0000	0.0000	0.0000	42.1976	172.8662	312.6376 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1212.3066
Space heating per m2										(98c) / (4) =		11.9817 (99)

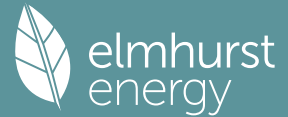
9a. Energy requirements - Individual heating systems, including micro-CHP

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 %)												88.8000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	303.7218	207.1932	134.8541	34.7324	4.1037	0.0000	0.0000	0.0000	0.0000	42.1976	172.8662	312.6376 (98)
Space heating efficiency (main heating system 1)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000 (210)
Space heating fuel (main heating system)	342.0290	233.3257	151.8627	39.1130	4.6213	0.0000	0.0000	0.0000	0.0000	47.5198	194.6692	352.0694 (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	273.7904	241.9982	256.6313	224.3958	216.7121	194.3829	191.1276	199.1708	201.8717	226.1878	241.8571	270.6252 (64)
Efficiency of water heater	84.2930	83.7135	82.6868	80.8990	79.9506	79.8000	79.8000	79.8000	79.8000	81.0922	83.3199	79.8000 (216)
Fuel for water heating, kWh/month	324.8080	289.0790	310.3656	277.3777	271.0575	243.5876	239.5083	249.5874	252.9721	278.9266	290.2753	320.7058 (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	27.2891	24.6482	27.2891	26.4088	27.2891	26.4088	27.2891	27.2891	26.4088	27.2891	26.4088	27.2891 (231)
Lighting	27.3694	21.9568	19.7696	14.4841	11.1879	9.1406	10.2060	13.2661	17.2314	22.6085	25.5363	28.1301 (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)

elmhurst
energy

2. Ventilation rate			
			m3 per hour
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
			Air changes per hour
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1581 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			5.0000 (17)
Infiltration rate			0.4081 (18)

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Number of sides sheltered

2 (19)

Shelter factor

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

Infiltration rate adjusted to include shelter factor

$$(21) = (18) \times (20) = 0.3469 \quad (21)$$

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	0.4423	0.4336	0.4250	0.3816	0.3729	0.3296	0.3296	0.3209	0.3469	0.3729	0.3903	0.4076	(22b)
Effective ac	0.5978	0.5940	0.5903	0.5728	0.5695	0.5543	0.5543	0.5515	0.5602	0.5695	0.5762	0.5831	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			2.4200	1.0000	2.4200		(26)
TER Opening Type			17.1000	1.1450	19.5802		(27)
Ground floor			51.5600	0.1300	6.7028		(28a)
External Wall 1	65.0100	19.5200	45.4900	0.1800	8.1882		(29a)
Plane roof	37.7500		37.7500	0.1100	4.1525		(30)
Flat roof	11.8700		11.8700	0.1100	1.3057		(30)
Total net area of external elements Aum(A, m2)			166.1900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.3494		(33)
Main dwelling							
Party Wall			104.4500	0.0000	0.0000		(32)

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

264.1912 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	0.0000	0.0700	0.0000
E7 Party floor between dwellings (in blocks of flats)	2.8500	0.0900	0.2565
E16 Corner (normal)	19.9500	0.0600	1.1970
E18 Party wall between dwellings	0.0000	0.0200	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	0.0000	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	0.0000	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0900	-0.2565
E7 Party floor between dwellings (in blocks of flats)	0.0000	0.0700	0.0000
E25 Staggered party wall between dwellings	2.8500	0.0600	0.1710
E2 Other lintels (including other steel lintels)	9.9700	0.0500	0.4985
E3 Sill	8.9600	0.0500	0.4480
E4 Jamb	29.4000	0.0500	1.4700
E16 Corner (normal)	0.0000	0.0900	0.0000
E17 Corner (inverted - internal area greater than external area)	0.0000	-0.0900	-0.0000
E18 Party wall between dwellings	0.0000	0.0600	0.0000
E25 Staggered party wall between dwellings	0.0000	0.0600	0.0000
P1 Party wall - Ground floor	18.6400	0.0800	1.4912
E5 Ground floor (normal)	11.1200	0.1600	1.7792
E5 Ground floor (normal)	0.0000	0.1600	0.0000
E14 Flat roof	0.0000	0.0800	0.0000
E15 Flat roof with parapet	5.0200	0.5600	2.8112
P4 Party wall - Roof (insulation at ceiling level)	18.0100	0.1200	2.1612
E6 Intermediate floor within a dwelling	11.6900	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	5.9400	0.0600	0.3564
P2 Party wall - Intermediate floor within a dwelling	18.0100	0.0000	0.0000

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

12.3837 (36)

Point Thermal bridges

$$(36a) = 0.0000$$

Total fabric heat loss

$$(33) + (36) + (36a) = 54.7331 \quad (37)$$

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

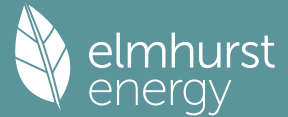
(38)m	Jan 49.9022	Feb 49.5852	Mar 49.2744	Apr 47.8146	May 47.5414	Jun 46.2700	Jul 46.2700	Aug 46.0345	Sep 46.7597	Oct 47.5414	Nov 48.0940	Dec 48.6716	(38)
Heat transfer coeff	104.6353	104.3182	104.0074	102.5476	102.2745	101.0030	101.0030	100.7676	101.4928	102.2745	102.8270	103.4047	(39)
Average = Sum(39)m / 12 =												102.5463	

HLP	Jan 1.0341	Feb 1.0310	Mar 1.0279	Apr 1.0135	May 1.0108	Jun 0.9983	Jul 0.9983	Aug 0.9959	Sep 1.0031	Oct 1.0108	Nov 1.0163	Dec 1.0220	(40)
HLP (average)												1.0135	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.7502 (42)
Hot water usage for mixer showers													
70.3313	69.2744	67.7342	64.7874	62.6127	60.1875	58.8090	60.3375	62.0130	64.6170	67.6271	70.0619	70.0619	(42a)
Hot water usage for baths													
30.3680	29.9170	29.2819	28.1108	27.2340	26.2617	25.7365	26.3672	27.0539	28.0943	29.2894	30.2653	30.2653	(42b)
Hot water usage for other uses													
42.7946	41.2385	39.6823	38.1261	36.5700	35.0138	35.0138	36.5700	38.1261	39.6823	41.2385	42.7946	42.7946	(42c)
Average daily hot water use (litres/day)												131.9033	(43)
Daily hot water use	Jan 143.4940	Feb 140.4299	Mar 136.6984	Apr 131.0244	May 126.4166	Jun 121.4630	Jul 119.5593	Aug 123.2746	Sep 127.1930	Oct 132.3935	Nov 138.1550	Dec 143.1218	(44)
Energy conte	227.2594	199.9702	210.1003	179.3658	170.1811	149.3529	144.5966	152.6398	156.8417	179.6568	196.8271	224.0942	(45)
Energy content (annual)										Total = Sum(45)m =		2190.8859	
Distribution loss (46)m = 0.15 x (45)m													
34.0889	29.9955	31.5151	26.9049	25.5272	22.4029	21.6895	22.8960	23.5263	26.9485	29.5241	33.6141	33.6141	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
273.8543	242.0560	256.6952	224.4576	216.7760	194.4447	191.1915	199.2347	201.9336	226.2517	241.9189	270.6891	270.6891	(62)
WWHRS	-32.1526	-28.4360	-29.7765	-24.6561	-22.9786	-19.6630	-18.4309	-19.5994	-20.3441	-23.9834	-27.1703	-31.5571	(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)

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Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (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	241.7017	213.6200	226.9187	199.8015	193.7973	174.7817	172.7606	179.6352	181.5895	202.2682	214.7486	239.1320 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =											2440.7552 (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	112.8397	100.1587	107.1343	95.7126	93.8611	85.7333	85.3543	88.0286	88.2234	97.0118	101.5185	111.7872 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	137.5092	137.5092	137.5092	137.5092	137.5092	137.5092	137.5092	137.5092	137.5092	137.5092	137.5092	137.5092	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	134.4715	148.8791	134.4715	138.9539	134.4715	138.9539	134.4715	134.4715	138.9539	134.4715	138.9539	134.4715	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	258.2214	260.9009	254.1486	239.7737	221.6280	204.5735	193.1801	190.5006	197.2529	211.6278	229.7736	246.8280	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.7509	36.7509	36.7509	36.7509	36.7509	36.7509	36.7509	36.7509	36.7509	36.7509	36.7509	36.7509	(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)	-110.0074	-110.0074	-110.0074	-110.0074	-110.0074	-110.0074	-110.0074	-110.0074	-110.0074	-110.0074	-110.0074	-110.0074	(71)
Water heating gains (Table 5)	151.6662	149.0457	143.9977	132.9342	126.1574	119.0740	114.7235	118.3181	122.5324	130.3922	140.9979	150.2517	(72)
Total internal gains	611.6119	626.0785	599.8705	578.9145	549.5096	526.8542	506.6278	507.5429	522.9920	543.7442	576.9781	598.8039	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W	
East					10.9700	19.6403	0.6300	0.7000			0.7700	65.8454 (76)	
West					6.1300	19.6403	0.6300	0.7000			0.7700	36.7942 (80)	
Solar gains	102.6397	200.7850	330.6642	482.2541	591.0205	605.0146	575.9986	494.7743	384.5762	238.2483	127.9796	84.4059 (83)	
Total gains	714.2515	826.8635	930.5348	1061.1686	1140.5301	1131.8688	1082.6265	1002.3172	907.5682	781.9925	704.9577	683.2098 (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	70.9631	71.1788	71.3915	72.4077	72.6011	73.5150	73.5150	73.6868	73.1603	72.6011	72.2110	71.8076
alpha	5.7309	5.7453	5.7594	5.8272	5.8401	5.9010	5.9010	5.9125	5.8774	5.8401	5.8141	5.7872
util living area	0.9965	0.9913	0.9753	0.9113	0.7665	0.5619	0.4092	0.4598	0.7255	0.9500	0.9916	0.9973 (86)
MIT	19.9282	20.1096	20.3778	20.7156	20.9201	20.9892	20.9986	20.9973	20.9564	20.6667	20.2419	19.9050 (87)
Th 2	20.0550	20.0576	20.0601	20.0721	20.0743	20.0848	20.0848	20.0867	20.0808	20.0743	20.0698	20.0651 (88)
util rest of house	0.9953	0.9883	0.9670	0.8841	0.7101	0.4857	0.3248	0.3700	0.6466	0.9283	0.9883	0.9963 (89)
MIT 2	18.8099	19.0425	19.3814	19.7956	20.0122	20.0792	20.0844	20.0858	20.0538	19.7502	19.2213	18.7877 (90)
Living area fraction	fLA = Living area / (4) =											0.3441 (91)
MIT	19.1947	19.4097	19.7243	20.1122	20.3246	20.3923	20.3990	20.3995	20.3644	20.0656	19.5725	19.1722 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1947	19.4097	19.7243	20.1122	20.3246	20.3923	20.3990	20.3995	20.3644	20.0656	19.5725	19.1722 (93)

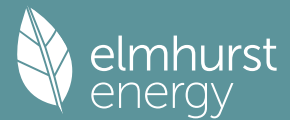
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	709.8058	815.0325	896.3955	939.6172	828.2222	579.2291	383.1644	401.9154	610.0604	725.7166	695.0024	679.8415	(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	1558.5144	1513.6300	1375.4279	1149.7853	882.0780	585.0443	383.7089	403.0203	635.7952	968.0881	1282.5096	1548.1953	(97)
Space heating kWh	631.4391	469.4575	356.4001	151.3210	40.0687	0.0000	0.0000	0.0000	0.0000	180.3244	423.0052	646.0552	(98a)
Space heating requirement - total per year (kWh/year)												2898.0711	
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	631.4391	469.4575	356.4001	151.3210	40.0687	0.0000	0.0000	0.0000	0.0000	180.3244	423.0052	646.0552	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2898.0711	
Space heating per m2												(98c) / (4) =	28.6427 (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	631.4391	469.4575	356.4001	151.3210	40.0687	0.0000	0.0000	0.0000	0.0000	180.3244	423.0052	646.0552	(98)
Space heating efficiency (main heating system 1)													

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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)	684.1161	508.6213	386.1323	163.9447	43.4114	0.0000	0.0000	0.0000	0.0000	195.3677	458.2938	699.9514	(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 requirement	241.7017	213.6200	226.9187	199.8015	193.7973	174.7817	172.7606	179.6352	181.5895	202.2682	214.7486	239.1320	(64)
Efficiency of water heater (217)m	86.1116	85.7747	85.0678	83.4448	81.2102	79.8000	79.8000	79.8000	79.8000	83.8032	85.5511	79.8000	(216)
Fuel for water heating, kWh/month	280.6843	249.0478	266.7505	239.4416	238.6367	219.0247	216.4920	225.1068	227.5558	241.3610	251.0181	277.4975	(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	27.9405	22.4149	20.1822	14.7863	11.4214	9.3314	10.4190	13.5430	17.5910	23.0803	26.0691	28.7171	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-46.9064	-65.4547	-93.1245	-103.5804	-110.7202	-102.9552	-101.6313	-96.3872	-87.0329	-74.2667	-51.3077	-40.6287	(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)	-28.5876	-59.8900	-118.6010	-177.5262	-234.1824	-235.1409	-232.4201	-197.0810	-144.8110	-85.5011	-38.1157	-22.6293	(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												3139.8387	(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												2932.6170	(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)												225.4960	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2548.4822	(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												3835.4695	(238)

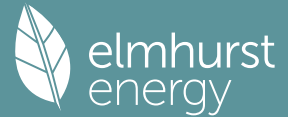
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	3139.8387	0.2100	659.3661	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2932.6170	0.2100	615.8496	(264)
Space and water heating			1275.2157	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	225.4960	0.1443	32.5460	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-973.9959	0.1348	-131.3129	
PV Unit electricity exported	-1574.4863	0.1260	-198.3725	
Total			-329.6854	(269)
Total CO2, kg/year			990.0056	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.7800	(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	3139.8387	1.1300	3548.0178	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2932.6170	1.1300	3313.8572	(278)
Space and water heating			6861.8750	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	225.4960	1.5338	345.8733	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-973.9959	1.4983	-1459.3189	
PV Unit electricity exported	-1574.4863	0.4625	-728.1697	
Total			-2187.4887	(283)
Total Primary energy kWh/year			5150.3604	(286)
Target Primary Energy Rate (TPER)			50.9000	(287)

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Plot Reference	K107 - Mid				Issued on Date	25/03/2026	
Assessment Reference	2b4p-72-Mid			Plot Type Ref	2b4p-72-Mid		
Plot Address					SAP Version	10.2	
SAP Rating	86 B		DER	10.88		TER	10.32
Environmental	91 B		% DER < TER				-5.43
CO ₂ Emissions (t/year)	0.74		DFEE	23.19		TFEE	23.12
Compliance Check	See BREL		% DFEE < TFEE				-0.29
% DPER < TPER	-15.77		DPER	63.04		TPER	54.45
Assessor Details	Miss Alicja Kreglewska				Assessor ID	L728-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	72.1700 (1b)	2.5000 (2b)	180.4250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.1700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	180.4250 (5)

2. Ventilation rate

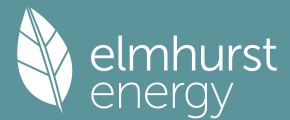
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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
Main dwelling							
Window			16.0000	0.8687	13.8996		(27)
Door			1.8400	1.0000	1.8400		(26)
External Wall 1	51.2700	16.0000	35.2700	0.1800	6.3486	70.0000	2468.9000 (29a)
Corridor Wall	4.3900	1.8400	2.5500	0.2000	0.5100	70.0000	178.5000 (29a)
Total net area of external elements Aum(A, m ²)			55.6600				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 22.5982		(33)
Main dwelling							
Party Wall 1			60.7300	0.0000	0.0000	140.0000	8502.2000 (32)
Party Floor 1			72.1700			80.0000	5773.6000 (32d)
Party Ceiling 1			72.1700			100.0000	7217.0000 (32b)
Internal Wall 1			122.5000			9.0000	1102.5000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	25242.7000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							349.7672 (35)
List of Thermal Bridges							

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K1 Element	Length	Psi-value	Total									
E7 Party floor between dwellings (in blocks of flats)	27.2400	0.0600	1.6344									
E16 Corner (normal)	5.7000	0.1270	0.7239									
E18 Party wall between dwellings	5.7000	0.0250	0.1425									
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	8.7400	0.1000	0.8740									
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	42.6200	0.0000	0.0000									
E17 Corner (inverted - internal area greater than external area)	2.8500	0.0000	0.0000									
E7 Party floor between dwellings (in blocks of flats)	3.0800	0.1000	0.3080									
E25 Staggered party wall between dwellings	0.0000	0.1200	0.0000									
E2 Other lintels (including other steel lintels)	8.9700	0.0170	0.1525									
E3 Sill	8.0700	0.0300	0.2421									
E4 Jamb	23.2800	0.1200	2.7936									
E16 Corner (normal)	0.0000	0.1300	0.0000									
E17 Corner (inverted - internal area greater than external area)	0.0000	0.0000	0.0000									
E18 Party wall between dwellings	0.0000	0.0900	0.0000									
E25 Staggered party wall between dwellings	5.7000	0.0900	0.5130									
P1 Party wall - Ground floor	0.0000	0.0500	0.0000									
E5 Ground floor (normal)	0.0000	0.1000	0.0000									
E5 Ground floor (normal)	0.0000	0.2300	0.0000									
E14 Flat roof	0.0000	0.1600	0.0000									
E15 Flat roof with parapet	0.0000	0.3000	0.0000									
P4 Party wall - Roof (insulation at ceiling level)	0.0000	0.0300	0.0000									
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			7.3840 (36)									
Point Thermal bridges			(36a) = 0.0000									
Total fabric heat loss		(33) + (36) + (36a) =	29.9822 (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	15.3353	15.1456	14.9558	14.0068	13.8171	12.8681	12.8681	12.6784	13.2477	13.8171	14.1966	14.5762 (38)
Average = Sum(39)m / 12 =	45.3175	45.1278	44.9380	43.9890	43.7993	42.8503	42.8503	42.6606	43.2299	43.7993	44.1788	44.5584 (39)
												43.9416
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.6279	0.6253	0.6227	0.6095	0.6069	0.5937	0.5937	0.5911	0.5990	0.6069	0.6121	0.6174 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31
												0.6089
												31

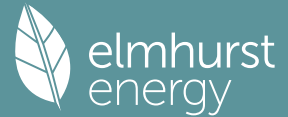
4. Water heating energy requirements (kWh/year)												

Assumed occupancy												2.2976 (42)
Hot water usage for mixer showers												
	62.7434	61.8005	60.4265	57.7976	55.8575	53.6940	52.4642	53.8278	55.3226	57.6456	60.3310	62.5030 (42a)
Hot water usage for baths												
	27.1049	26.7024	26.1355	25.0903	24.3077	23.4399	22.9711	23.5340	24.1469	25.0755	26.1422	27.0133 (42b)
Hot water usage for other uses												
	38.1601	36.7724	35.3848	33.9971	32.6095	31.2219	31.2219	32.6095	33.9971	35.3848	36.7724	38.1601 (42c)
Average daily hot water use (litres/day)												117.6689 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	128.0084	125.2753	121.9468	116.8851	112.7747	108.3557	106.6572	109.9713	113.4666	118.1059	123.2456	127.6764 (44)
Energy conte	202.7341	178.3904	187.4277	160.0098	151.8164	133.2360	128.9926	136.1675	139.9157	160.2686	175.5860	199.9104 (45)
Energy content (annual)										Total = Sum(45)m =		1954.4552
Distribution loss (46)m = 0.15 x (45)m												
	30.4101	26.7586	28.1142	24.0015	22.7725	19.9854	19.3489	20.4251	20.9874	24.0403	26.3379	29.9866 (46)
Water storage loss (or HIU loss):												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3900 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7506 (55)
Total storage loss												
	23.2686	21.0168	23.2686	22.5180	23.2686	22.5180	23.2686	23.2686	22.5180	23.2686	22.5180	23.2686 (56)
If cylinder contains dedicated solar storage												
	23.2686	21.0168	23.2686	22.5180	23.2686	22.5180	23.2686	23.2686	22.5180	23.2686	22.5180	23.2686 (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												
	249.2651	220.4184	233.9587	205.0398	198.3474	178.2660	175.5236	182.6985	184.9457	206.7996	220.6160	246.4414 (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												
	249.2651	220.4184	233.9587	205.0398	198.3474	178.2660	175.5236	182.6985	184.9457	206.7996	220.6160	246.4414 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2502.3202 (64)
Electric shower(s)												2502 (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												
	104.6339	92.9372	99.5445	89.2273	87.7038	80.3250	80.1148	82.5005	82.5460	90.5141	94.4063	103.6950 (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	114.8817	114.8817	114.8817	114.8817	114.8817	114.8817	114.8817	114.8817	114.8817	114.8817	114.8817	114.8817 (66)
	102.0539	112.9883	102.0539	105.4557	102.0539	105.4557	102.0539	102.0539	105.4557	102.0539	105.4557	102.0539 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	202.3078	204.4071	199.1169	187.8546	173.6380	160.2765	151.3501	149.2508	154.5410	165.8033	180.0198	193.3814 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4882	34.4882	34.4882	34.4882	34.4882	34.4882	34.4882	34.4882	34.4882	34.4882	34.4882	34.4882 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
	-91.9053	-91.9053	-91.9053	-91.9053	-91.9053	-91.9053	-91.9053	-91.9053	-91.9053	-91.9053	-91.9053	-91.9053 (71)
Water heating gains (Table 5)												
	140.6369	138.2994	133.7964	123.9268	117.8814	111.5624	107.6812	110.8878	114.6472	121.6587	131.1199	139.3750 (72)
Total internal gains												
	505.4631	516.1593	495.4317	477.7016	454.0378	434.7591	418.5498	419.6569	432.1084	449.9804	477.0600	495.2748 (73)

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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	
South	7.2300		46.7521		0.3800		0.7000		0.7700		62.3095 (78)	
West	8.7700		19.6403		0.3800		0.7000		0.7700		31.7513 (80)	
Solar gains	94.0608	164.1592	232.2797	296.1005	335.9267	334.4938	322.1381	292.8568	254.7571	183.7686	113.4481	79.9518 (83)
Total gains	599.5239	680.3184	727.7114	773.8021	789.9645	769.2529	740.6878	712.5137	686.8655	633.7490	590.5081	575.2267 (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	154.7273	155.3780	156.0342	159.4002	160.0908	163.6361	163.6361	164.3640	162.1993	160.0908	158.7154	157.3634
alpha	11.3152	11.3585	11.4023	11.6267	11.6727	11.9091	11.9091	11.9576	11.8133	11.6727	11.5810	11.4909
util living area	0.9842	0.9458	0.8598	0.6851	0.5155	0.3565	0.2545	0.2754	0.4343	0.7144	0.9373	0.9883 (86)
MIT	20.7971	20.8988	20.9684	20.9974	20.9999	21.0000	21.0000	21.0000	21.0000	20.9966	20.9260	20.7805 (87)
Th 2	20.4049	20.4073	20.4096	20.4214	20.4238	20.4356	20.4356	20.4380	20.4309	20.4238	20.4191	20.4144 (88)
util rest of house	0.9788	0.9314	0.8337	0.6533	0.4836	0.3251	0.2219	0.2418	0.3984	0.6765	0.9189	0.9842 (89)
MIT 2	20.1816	20.3039	20.3809	20.4194	20.4237	20.4356	20.4356	20.4380	20.4309	20.4214	20.3474	20.1698 (90)
Living area fraction	0.9788	0.9314	0.8337	0.6533	0.4836	0.3251	0.2219	0.2418	0.3984	0.6765	0.9189	0.9842 (89)
MIT	20.4049	20.5197	20.5941	20.6291	20.6327	20.6404	20.6404	20.6419	20.6373	20.6301	20.5573	20.3914 (92)
Temperature adjustment	20.2549	20.3697	20.4441	20.4791	20.4827	20.4904	20.4904	20.4919	20.4873	20.4801	20.4073	-0.1500
adjusted MIT	20.2549	20.3697	20.4441	20.4791	20.4827	20.4904	20.4904	20.4919	20.4873	20.4801	20.4073	20.2414 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9772	0.9304	0.8353	0.6565	0.4869	0.3281	0.2251	0.2450	0.4020	0.6803	0.9185	0.9828 (94)
Useful gains	585.8660	632.9785	607.8673	507.9992	384.6332	252.4037	166.7033	174.5615	276.1205	431.1301	542.3592	565.3126 (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	723.0349	698.1142	626.6175	509.3526	384.6776	252.4040	166.7033	174.5615	276.1240	432.7406	587.8999	714.7769 (97)
Space heating kWh	102.0537	43.7712	13.9502	0.9744	0.0330	0.0000	0.0000	0.0000	0.0000	1.1982	32.7893	111.2015 (98a)
Space heating requirement - total per year (kWh/year)												305.9714
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	102.0537	43.7712	13.9502	0.9744	0.0330	0.0000	0.0000	0.0000	0.0000	1.1982	32.7893	111.2015 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												305.9714
Space heating per m2										(98c) / (4) =		4.2396 (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 %)												88.8000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	102.0537	43.7712	13.9502	0.9744	0.0330	0.0000	0.0000	0.0000	0.0000	1.1982	32.7893	111.2015 (98)
Space heating efficiency (main heating system 1)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000 (210)
Space heating fuel (main heating system)	114.9253	49.2919	15.7096	1.0973	0.0372	0.0000	0.0000	0.0000	0.0000	1.3493	36.9249	125.2269 (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	249.2651	220.4184	233.9587	205.0398	198.3474	178.2660	175.5236	182.6985	184.9457	206.7996	220.6160	246.4414 (64)
Efficiency of water heater (217)m	82.2207	81.1629	80.2577	79.8383	79.8013	79.8000	79.8000	79.8000	79.8000	79.8466	80.8604	79.8000 (216)
Fuel for water heating, kWh/month	303.1659	271.5754	291.5093	256.8189	248.5515	223.3909	219.9544	228.9455	231.7615	258.9960	272.8355	299.0918 (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	22.0264	19.8948	22.0264	21.3159	22.0264	21.3159	22.0264	22.0264	21.3159	22.0264	21.3159	22.0264 (231)
Lighting	20.7714	16.6636	15.0037	10.9923	8.4908	6.9371	7.7456	10.0680	13.0774	17.1582	19.3802	21.3487 (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)

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Annual totals kWh/year	
Space heating fuel - main system 1	344.5624 (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	3106.5967 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	173.3433 (230a)
central heating pump	41.0000 (230c)
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	259.3433 (231)
Electricity for lighting (calculated in Appendix L)	167.6369 (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	3878.1393 (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	344.5624	0.2100	72.3581	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3106.5967	0.2100	652.3853	(264)
Space and water heating			724.7434	(265)
Pumps, fans and electric keep-hot	259.3433	0.1387	35.9741	(267)
Energy for lighting	167.6369	0.1443	24.1952	(268)
Total CO2, kg/year			784.9127	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.8800	(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	344.5624	1.1300	389.3555	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3106.5967	1.1300	3510.4543	(278)
Space and water heating			3899.8098	(279)
Pumps, fans and electric keep-hot	259.3433	1.5128	392.3346	(281)
Energy for lighting	167.6369	1.5338	257.1270	(282)
Total Primary energy kWh/year			4549.2714	(286)
Dwelling Primary energy Rate (DPER)			63.0400	(287)

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

1. Overall dwelling characteristics

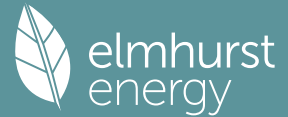
	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling	72.1700	2.5000	180.4250	(1b) - (3b)
Ground floor				(4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.1700			
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 180.4250 (5)

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) =	0.1663 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.4163	(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) =	0.3538 (21)

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

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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												
	0.4511	0.4423	0.4334	0.3892	0.3804	0.3361	0.3361	0.3273	0.3538	0.3804	0.3981	0.4158 (22b)
Effective ac	0.6018	0.5978	0.5939	0.5757	0.5723	0.5565	0.5565	0.5536	0.5626	0.5723	0.5792	0.5864 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			1.8400	1.0000	1.8400		(26)
TER Opening Type			16.0000	1.1450	18.3206		(27)
External Wall 1	51.2700	16.0000	35.2700	0.1800	6.3486		(29a)
Corridor Wall	4.3900	1.8400	2.5500	0.1800	0.4590		(29a)
Total net area of external elements Aum(A, m2)			55.6600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.9682		(33)
Main dwelling							
Party Wall 1			60.7300	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							349.7672 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	27.2400	0.0700	1.9068
E16 Corner (normal)	5.7000	0.0900	0.5130
E18 Party wall between dwellings	5.7000	0.0600	0.3420
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	8.7400	0.0200	0.1748
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	42.6200	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0900	-0.2565
E7 Party floor between dwellings (in blocks of flats)	3.0800	0.0700	0.2156
E25 Staggered party wall between dwellings	0.0000	0.0600	0.0000
E2 Other lintels (including other steel lintels)	8.9700	0.0500	0.4485
E3 Sill	8.0700	0.0500	0.4035
E4 Jamb	23.2800	0.0500	1.1640
E16 Corner (normal)	0.0000	0.0900	0.0000
E17 Corner (inverted - internal area greater than external area)	0.0000	-0.0900	-0.0000
E18 Party wall between dwellings	0.0000	0.0600	0.0000
E25 Staggered party wall between dwellings	5.7000	0.0600	0.3420
P1 Party wall - Ground floor	0.0000	0.0800	0.0000
E5 Ground floor (normal)	0.0000	0.1600	0.0000
E5 Ground floor (normal)	0.0000	0.1600	0.0000
E14 Flat roof	0.0000	0.0800	0.0000
E15 Flat roof with parapet	0.0000	0.5600	0.0000
P4 Party wall - Roof (insulation at ceiling level)	0.0000	0.1200	0.0000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			5.2537 (36)
Point Thermal Bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 32.2219 (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	35.8291	35.5938	35.3632	34.2800	34.0773	33.1339	33.1339	32.9592	33.4973	34.0773	34.4873	34.9159 (38)
Heat transfer coeff	68.0510	67.8157	67.5851	66.5019	66.2992	65.3558	65.3558	65.1811	65.7192	66.2992	66.7092	67.1378 (39)
Average = Sum(39)m / 12 =												66.5009
HLP	0.9429	0.9397	0.9365	0.9215	0.9187	0.9056	0.9056	0.9032	0.9106	0.9187	0.9243	0.9303 (40)
HLP (average)												0.9214
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2976 (42)
Hot water usage for mixer showers	62.7434	61.8005	60.4265	57.7976	55.8575	53.6940	52.4642	53.8278	55.3226	57.6456	60.3310	62.5030 (42a)
Hot water usage for baths	27.1049	26.7024	26.1355	25.0903	24.3077	23.4399	22.9711	23.5340	24.1469	25.0755	26.1422	27.0133 (42b)
Hot water usage for other uses	38.1601	36.7724	35.3848	33.9971	32.6095	31.2219	31.2219	32.6095	33.9971	35.3848	36.7724	38.1601 (42c)
Average daily hot water use (litres/day)												117.6689 (43)
Daily hot water use	128.0084	125.2753	121.9468	116.8851	112.7747	108.3557	106.6572	109.9713	113.4666	118.1059	123.2456	127.6764 (44)
Energy conte	202.7341	178.3904	187.4277	160.0098	151.8164	133.2360	128.9926	136.1675	139.9157	160.2686	175.5860	199.9104 (45)
Energy content (annual)										Total = Sum(45)m =		1954.4552
Distribution loss (46)m = 0.15 x (45)m	30.4101	26.7586	28.1142	24.0015	22.7725	19.9854	19.3489	20.4251	20.9874	24.0403	26.3379	29.9866 (46)
Water storage loss (or HIU loss):												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	249.3290	220.4761	234.0226	205.1016	198.4113	178.3278	175.5875	182.7624	185.0076	206.8635	220.6778	246.5053 (62)
WWHRS	-28.6837	-25.3681	-26.5640	-21.9960	-20.4995	-17.5416	-16.4424	-17.4849	-18.1492	-21.3959	-24.2390	-28.1525 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64d)
Output from w/h	220.6453	195.1081	207.4586	183.1056	177.9118	160.7862	159.1451	165.2775	166.8584	185.4676	196.4389	218.3528 (64)
Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2236.5559 (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	104.6850	92.9834	99.5956	89.2767	87.7549	80.3744	80.1660	82.5516	82.5954	90.5652	94.4558	103.7461 (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	114.8817	114.8817	114.8817	114.8817	114.8817	114.8817	114.8817	114.8817	114.8817	114.8817	114.8817	114.8817 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	102.0539	112.9883	102.0539	105.4557	102.0539	105.4557	102.0539	102.0539	105.4557	102.0539	105.4557	102.0539 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	202.3078	204.4071	199.1169	187.8546	173.6380	160.2765	151.3501	149.2508	154.5410	165.8033	180.0198	193.3814 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4882	34.4882	34.4882	34.4882	34.4882	34.4882	34.4882	34.4882	34.4882	34.4882	34.4882	34.4882 (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)	-91.9053	-91.9053	-91.9053	-91.9053	-91.9053	-91.9053	-91.9053	-91.9053	-91.9053	-91.9053	-91.9053	-91.9053 (71)
Water heating gains (Table 5)	140.7056	138.3681	133.8651	123.9955	117.9501	111.6312	107.7500	110.9565	114.7159	121.7274	131.1886	139.4437 (72)
Total internal gains	505.5318	516.2280	495.5004	477.7703	454.1066	434.8278	418.6185	419.7256	432.1771	450.0491	477.1287	495.3435 (73)

6. Solar gains

[Jan]	Area		Solar flux		Specific data		FF		Access		Gains	
	m2		Table 6a		or Table 6b		or Table 6c		factor		W	
			W/m2						Table 6d			
South	7.2300		46.7521		0.6300		0.7000		0.7700		103.3025 (78)	
West	8.7700		19.6403		0.6300		0.7000		0.7700		52.6403 (80)	
Solar gains	155.9429	272.1586	385.0953	490.9035	556.9311	554.5555	534.0710	485.5257	422.3605	304.6690	188.0850	132.5517 (83)
Total gains	661.4747	788.3866	880.5957	968.6737	1011.0376	989.3833	952.6894	905.2514	854.5376	754.7181	665.2137	627.8953 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	103.0383	103.3958	103.7486	105.4385	105.7608	107.2875	107.2875	107.5751	106.6943	105.7608	105.1108	104.4398
alpha	7.8692	7.8931	7.9166	8.0292	8.0507	8.1525	8.1525	8.1717	8.1130	8.0507	8.0074	7.9627
util living area	0.9940	0.9775	0.9292	0.7917	0.6054	0.4225	0.3018	0.3312	0.5292	0.8453	0.9792	0.9958 (86)
MIT	20.4433	20.6265	20.8118	20.9559	20.9947	20.9997	21.0000	21.0000	20.9985	20.9399	20.6784	20.4146 (87)
Th 2	20.1312	20.1339	20.1366	20.1493	20.1517	20.1628	20.1628	20.1648	20.1585	20.1517	20.1469	20.1418 (88)
util rest of house	0.9916	0.9692	0.9070	0.7478	0.5521	0.3674	0.2444	0.2711	0.4654	0.7978	0.9699	0.9940 (89)
MIT 2	19.5026	19.7324	19.9530	20.1138	20.1484	20.1627	20.1628	20.1648	20.1578	20.1050	19.8102	19.4751 (90)
Living area fraction	19.8438	20.0568	20.2646	20.4193	20.4554	20.4663	20.4665	20.4678	20.4628	20.4079	20.1251	19.8159 (92)
MIT	19.8438	20.0568	20.2646	20.4193	20.4554	20.4663	20.4665	20.4678	20.4628	20.4079	20.1251	19.8159 (92)
Temperature adjustment												0.0000
adjusted MIT	19.8438	20.0568	20.2646	20.4193	20.4554	20.4663	20.4665	20.4678	20.4628	20.4079	20.1251	19.8159 (93)

8. Space heating requirement

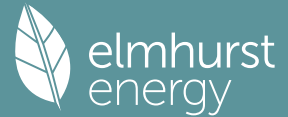
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9905	0.9683	0.9106	0.7623	0.5713	0.3874	0.2652	0.2929	0.4886	0.8130	0.9697	0.9932 (94)
Useful gains	655.2146	763.3868	801.8998	738.3839	577.6209	383.2945	252.6922	265.1333	417.5098	613.6149	645.0264	623.6031 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1057.7714	1027.8660	930.2807	766.0560	580.4775	383.3978	252.6959	265.1415	418.1584	650.2531	868.8960	1048.4207 (97)
Space heating kWh	299.5023	177.7300	95.5153	19.9239	2.1253	0.0000	0.0000	0.0000	0.0000	27.2588	161.1861	316.0643 (98a)
Space heating requirement - total per year (kWh/year)												1099.3061
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	299.5023	177.7300	95.5153	19.9239	2.1253	0.0000	0.0000	0.0000	0.0000	27.2588	161.1861	316.0643 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1099.3061
Space heating per m2										(98c) / (4) =		15.2322 (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	299.5023	177.7300	95.5153	19.9239	2.1253	0.0000	0.0000	0.0000	0.0000	27.2588	161.1861	316.0643 (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)	324.4878	192.5569	103.4836	21.5860	2.3026	0.0000	0.0000	0.0000	0.0000	29.5329	174.6328	342.4316 (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	220.6453	195.1081	207.4586	183.1056	177.9118	160.7862	159.1451	165.2775	166.8584	185.4676	196.4389	218.3528 (64)
Fuel for water heating, kWh/month	84.7456	83.8512	82.4339	80.6017	79.8956	79.8000	79.8000	79.8000	79.8000	80.8500	83.6198	84.8883 (217)
Space cooling fuel requirement (221)m	260.3619	232.6838	251.6666	227.1735	222.6804	201.4865	199.4299	207.1147	209.0957	229.3971	234.9192	257.2237 (219)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Lighting	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	21.2048	17.0113	15.3168	11.2217	8.6680	7.0818	7.9072	10.2781	13.3502	17.5162	19.7845	21.7941 (232)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	-19.3182	-28.6117	-43.1825	-51.0617	-57.2666	-54.2617	-53.5990	-49.5022	-42.6658	-33.8094	-21.7213	-16.5450 (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	-7.0995	-15.2504	-30.9070	-47.3065	-63.4259	-64.0490	-63.2963	-53.1917	-38.4638	-22.0985	-9.5708	-5.5910 (233b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Annual totals kWh/year												
Space heating fuel - main system 1												1191.0142 (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												2733.2329 (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)												171.1348 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-891.7957 (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												3289.5861 (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	1191.0142	0.2100	250.1130 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2733.2329	0.2100	573.9789 (264)
Space and water heating			824.0919 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	171.1348	0.1443	24.7000 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-471.5453	0.1336	-62.9799
PV Unit electricity exported	-420.2504	0.1253	-52.6764
Total			-115.6563 (269)
Total CO2, kg/year			745.0649 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.3200 (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	1191.0142	1.1300	1345.8460 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2733.2329	1.1300	3088.5532 (278)
Space and water heating			4434.3992 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	171.1348	1.5338	262.4922 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-471.5453	1.4936	-704.2809
PV Unit electricity exported	-420.2504	0.4601	-193.3476
Total			-897.6285 (283)
Total Primary energy kWh/year			3929.3637 (286)
Target Primary Energy Rate (TPER)			54.4500 (287)

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Plot Reference	K108 - Mid			Issued on Date	25/03/2026	
Assessment Reference	1b2p-50-Mid		Plot Type Ref	1b2p-50-Mid		
Plot Address				SAP Version	10.2	
SAP Rating	85 B		DER	12.97	TER	12.26
Environmental	91 B		% DER < TER			-5.79
CO ₂ Emissions (t/year)	0.63		DFEE	22.46	TFEE	22.93
Compliance Check	See BREL		% DFEE < TFEE			2.07
% DPER < TPER	-14.71		DPER	74.83	TPER	65.23
Assessor Details	Miss Alicja Kreglewska				Assessor ID	L728-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	49.9700 (1b)	2.5000 (2b)	124.9250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.9700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	124.9250 (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	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)

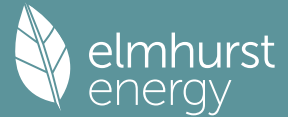
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	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
Main dwelling							
Window			8.7700	0.8687	7.6187		(27)
Door			1.8400	1.0000	1.8400		(26)
External Wall 1	23.4800	8.7700	14.7100	0.1800	2.6478	70.0000	1029.7000 (29a)
Corridor Wall	14.1400	1.8400	12.3000	0.2000	2.4600	70.0000	861.0000 (29a)
Total net area of external elements Aum(A, m ²)			37.6200				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	14.5665	(33)
Main dwelling							
Party Wall 1			44.1200	0.0000	0.0000	140.0000	6176.8000 (32)
Party Floor 1			49.9700			80.0000	3997.6000 (32d)
Party Ceiling 1			49.9700			100.0000	4997.0000 (32b)
Internal Wall 1			80.8500			9.0000	727.6500 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17789.7500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		356.0086 (35)
List of Thermal Bridges		

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6. Solar gains

[Jan]	Area m2				Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W		
West	8.7700				19.6403	0.3800	0.7000		0.7700	31.7513 (80)		
Solar gains	31.7513	62.1123	102.2901	149.1841	182.8307	187.1597	178.1837	153.0572	118.9677	73.7015	39.5902	26.1107 (83)
Total gains	432.2719	470.3592	494.7623	527.7372	543.4433	532.2995	511.0429	487.0741	462.5180	431.7775	418.4671	419.0817 (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	169.1909	169.8878	170.5904	174.1928	174.9316	178.7216	178.7216	179.4994	177.1861	174.9316	173.4602	172.0134
alpha	12.2794	12.3259	12.3727	12.6129	12.6621	12.9148	12.9148	12.9666	12.8124	12.6621	12.5640	12.4676
util living area	0.9677	0.9229	0.8299	0.6494	0.4834	0.3324	0.2381	0.2600	0.4161	0.6787	0.8981	0.9734 (86)
MIT	20.8791	20.9404	20.9836	20.9991	21.0000	21.0000	21.0000	21.0000	21.0000	20.9987	20.9648	20.8698 (87)
Th 2	20.4440	20.4461	20.4483	20.4591	20.4613	20.4722	20.4722	20.4744	20.4678	20.4613	20.4570	20.4526 (88)
util rest of house	0.9582	0.9054	0.8036	0.6208	0.4554	0.3050	0.2095	0.2303	0.3840	0.6443	0.8748	0.9653 (89)
MIT 2	20.3159	20.3873	20.4338	20.4585	20.4613	20.4722	20.4722	20.4744	20.4678	20.4605	20.4247	20.3131 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	20.5941	20.6605	20.7054	20.7255	20.7274	20.7329	20.7329	20.7340	20.7307	20.7263	20.6915	20.5880 (92)
Temperature adjustment	-0.1500											
adjusted MIT	20.4441	20.5105	20.5554	20.5755	20.5774	20.5829	20.5829	20.5840	20.5807	20.5763	20.5415	20.4380 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9582	0.9076	0.8088	0.6270	0.4614	0.3108	0.2155	0.2365	0.3908	0.6517	0.8787	0.9650 (94)
Useful gains	414.1950	426.8969	400.1681	330.8692	250.7665	165.4245	110.1252	115.1843	180.7407	281.3759	367.6918	404.4248 (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	471.5231	454.0691	407.1499	331.2161	250.7740	165.4246	110.1252	115.1843	180.7414	281.8183	382.9250	466.4857 (97)
Space heating kWh	42.6521	18.2597	5.1945	0.2498	0.0056	0.0000	0.0000	0.0000	0.0000	0.3291	10.9680	46.1734 (98a)
Space heating requirement - total per year (kWh/year)	123.8321											
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	42.6521	18.2597	5.1945	0.2498	0.0056	0.0000	0.0000	0.0000	0.0000	0.3291	10.9680	46.1734 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	123.8321											
Space heating per m2	(98c) / (4) = 2.4781 (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 %)												88.8000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	42.6521	18.2597	5.1945	0.2498	0.0056	0.0000	0.0000	0.0000	0.0000	0.3291	10.9680	46.1734 (98)
Space heating efficiency (main heating system 1)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000 (210)
Space heating fuel (main heating system)	48.0316	20.5627	5.8496	0.2813	0.0063	0.0000	0.0000	0.0000	0.0000	0.3706	12.3513	51.9970 (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	216.2929	191.4062	203.4773	179.0173	173.6577	156.5982	154.5454	160.5529	162.1901	180.7338	192.0591	213.9283 (64)
Efficiency of water heater (217)m	81.1548	80.5106	80.0018	79.8113	79.8003	79.8000	79.8000	79.8000	79.8000	79.8147	80.2393	79.8000 (216)
Fuel for water heating, kWh/month	266.5189	237.7402	254.3408	224.3008	217.6155	196.2383	193.6659	201.1941	203.2458	226.4417	239.3578	263.2573 (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	17.4977	15.8044	17.4977	16.9333	17.4977	16.9333	17.4977	17.4977	16.9333	17.4977	16.9333	17.4977 (231)
Lighting	15.4940	12.4298	11.1917	8.1995	6.3335	5.1746	5.7777	7.5100	9.7548	12.7988	14.4562	15.9246 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												

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Space heating fuel - main system 1	139.4506 (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	2723.9172 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	120.0217 (230a)
central heating pump	41.0000 (230c)
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	206.0217 (231)
Electricity for lighting (calculated in Appendix L)	125.0451 (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	3194.4346 (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	139.4506	0.2100	29.2846 (261)	
Total CO2 associated with community systems			0.0000 (373)	
Water heating (other fuel)	2723.9172	0.2100	572.0226 (264)	
Space and water heating			601.3072 (265)	
Pumps, fans and electric keep-hot	206.0217	0.1387	28.5777 (267)	
Energy for lighting	125.0451	0.1443	18.0479 (268)	
Total CO2, kg/year			647.9329 (272)	
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.9700 (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	139.4506	1.1300	157.5792 (275)	
Total CO2 associated with community systems			0.0000 (473)	
Water heating (other fuel)	2723.9172	1.1300	3078.0264 (278)	
Space and water heating			3235.6056 (279)	
Pumps, fans and electric keep-hot	206.0217	1.5128	311.6696 (281)	
Energy for lighting	125.0451	1.5338	191.7984 (282)	
Total Primary energy kWh/year			3739.0736 (286)	
Dwelling Primary energy Rate (DPER)			74.8300 (287)	

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

1. Overall dwelling characteristics

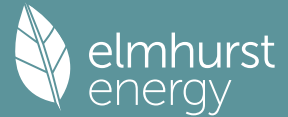
	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling	49.9700 (1b)	x 2.5000 (2b)	= 124.9250 (1b) - (3b)	
Ground floor				
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.9700		(4)	
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 124.9250 (5)	

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) =	0.1601 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000 (17)	
Infiltration rate		0.4101 (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) =	0.3178 (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)	

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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	0.4052	0.3973	0.3893	0.3496	0.3417	0.3019	0.3019	0.2940	0.3178	0.3417	0.3576	0.3734 (22b)
Effective ac	0.5821	0.5789	0.5758	0.5611	0.5584	0.5456	0.5456	0.5432	0.5505	0.5584	0.5639	0.5697 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			1.8400	1.0000	1.8400		(26)
TER Opening Type			8.7700	1.1450	10.0420		(27)
External Wall 1	23.4800	8.7700	14.7100	0.1800	2.6478		(29a)
Corridor Wall	14.1400	1.8400	12.3000	0.1800	2.2140		(29a)
Total net area of external elements Aum(A, m2)			37.6200				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	16.7438	(33)
Main dwelling							
Party Wall 1			44.1200	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							356.0086 (35)

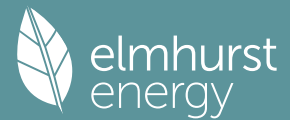
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	9.6200	0.0700	0.6734
E16 Corner (normal)	0.0000	0.0900	0.0000
E18 Party wall between dwellings	5.7000	0.0600	0.3420
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.8600	0.0200	0.1372
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	30.9600	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	0.0000	-0.0900	-0.0000
E7 Party floor between dwellings (in blocks of flats)	9.9200	0.0700	0.6944
E25 Staggered party wall between dwellings	0.0000	0.0600	0.0000
E2 Other lintels (including other steel lintels)	4.9500	0.0500	0.2475
E3 Sill	4.0500	0.0500	0.2025
E4 Jamb	12.4800	0.0500	0.6240
E16 Corner (normal)	0.0000	0.0900	0.0000
E17 Corner (inverted - internal area greater than external area)	0.0000	-0.0900	-0.0000
E18 Party wall between dwellings	2.8500	0.0600	0.1710
E25 Staggered party wall between dwellings	2.8500	0.0600	0.1710
P1 Party wall - Ground floor	0.0000	0.0800	0.0000
E5 Ground floor (normal)	0.0000	0.1600	0.0000
E5 Ground floor (normal)	0.0000	0.1600	0.0000
E14 Flat roof	0.0000	0.0800	0.0000
E15 Flat roof with parapet	0.0000	0.5600	0.0000
P4 Party wall - Roof (insulation at ceiling level)	0.0000	0.1200	0.0000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			3.2630 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss		(33) + (36) + (36a) =	20.0068 (37)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.6892 (42)
Hot water usage for mixer showers												
52.5421	51.7525	50.6019	48.4004	46.7758	44.9640	43.9342	45.0761	46.3278	48.2731	50.5219	52.3408	(42a)
Hot water usage for baths												
22.7181	22.3807	21.9055	21.0295	20.3735	19.6462	19.2533	19.7251	20.2388	21.0171	21.9112	22.6413	(42b)
Hot water usage for other uses												
31.9293	30.7682	29.6071	28.4461	27.2850	26.1240	26.1240	27.2850	28.4461	29.6071	30.7682	31.9293	(42c)
Average daily hot water use (litres/day)												98.5319 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
107.1894	104.9014	102.1146	97.8760	94.4343	90.7341	89.3114	92.0862	95.0127	98.8973	103.2013	106.9113	(44)
Energy content (annual)	169.7619	149.3782	156.9463	133.9873	127.1267	111.5682	108.0144	114.0219	117.1601	134.2028	147.0291	167.3973 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1636.5943
25.4643	22.4067	23.5419	20.0981	19.0690	16.7352	16.2022	17.1033	17.5740	20.1304	22.0544	25.1096	(46)
Water storage loss (or HIU loss):												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage												
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month												
216.3568	191.4639	203.5412	179.0792	173.7216	156.6600	154.6093	160.6168	162.2520	180.7977	192.1210	213.9922	(62)
WWHRS	-24.0201	-21.2435	-22.2450	-18.4197	-17.1665	-14.6895	-13.7691	-14.6421	-15.1984	-17.9172	-20.2980	-23.5752 (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												
192.3367	170.2204	181.2962	160.6594	156.5551	141.9705	140.8402	145.9748	147.0536	162.8805	171.8230	190.4170	(64)
12Total per year (kWh/year)												1962.0273 (64)
Electric shower(s)												1962 (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												
93.7217	83.3368	89.4606	80.6243	79.5456	73.1699	73.1907	75.1882	75.0292	81.8983	84.9607	92.9355	(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	84.4609	84.4609	84.4609	84.4609	84.4609	84.4609	84.4609	84.4609	84.4609	84.4609	84.4609	84.4609 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.1249	84.2812	76.1249	78.6624	76.1249	78.6624	76.1249	76.1249	78.6624	76.1249	78.6624	76.1249 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	147.1560	148.6831	144.8350	136.6430	126.3020	116.5830	110.0901	108.5631	112.4111	120.6031	130.9441	140.6631 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4461	31.4461	31.4461	31.4461	31.4461	31.4461	31.4461	31.4461	31.4461	31.4461	31.4461	31.4461 (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)	-67.5687	-67.5687	-67.5687	-67.5687	-67.5687	-67.5687	-67.5687	-67.5687	-67.5687	-67.5687	-67.5687	-67.5687 (71)
Water heating gains (Table 5)	125.9701	124.0131	120.2427	111.9781	106.9161	101.6248	98.3746	101.0594	104.2072	110.0784	118.0009	124.9133 (72)
Total internal gains	400.5893	408.3156	392.5409	378.6218	360.6813	345.2085	332.9279	334.0857	343.6190	358.1447	378.9457	393.0396 (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	
West	8.7700		19.6403		0.6300		0.7000		0.7700		52.6403 (80)	
Solar gains	52.6403	102.9757	169.5863	247.3315	303.1140	310.2911	295.4098	253.7527	197.2359	122.1893	65.6363	43.2889 (83)
Total gains	453.2296	511.2913	562.1272	625.9533	663.7953	655.4997	628.3377	587.8383	540.8549	480.3340	444.5820	436.3285 (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	112.2984	112.6348	112.9665	114.5511	114.8526	116.2769	116.2769	116.5445	115.7241	114.8526	114.2444	113.6155
alpha	8.4866	8.5090	8.5311	8.6367	8.6568	8.7518	8.7518	8.7696	8.7149	8.6568	8.6163	8.5744
util living area	0.9936	0.9815	0.9406	0.7990	0.5998	0.4148	0.2976	0.3318	0.5435	0.8619	0.9795	0.9951 (86)
MIT	20.5254	20.6587	20.8238	20.9635	20.9967	20.9999	21.0000	21.0000	20.9989	20.9441	20.7229	20.5047 (87)
Th 2	20.1840	20.1863	20.1885	20.1988	20.2008	20.2098	20.2098	20.2115	20.2063	20.2008	20.1968	20.1927 (88)
util rest of house	0.9910	0.9744	0.9211	0.7569	0.5496	0.3637	0.2442	0.2749	0.4817	0.8174	0.9705	0.9931 (89)
MIT 2	19.6493	19.8171	20.0149	20.1695	20.1987	20.2097	20.2098	20.2115	20.2058	20.1569	19.9072	19.6306 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	20.0820	20.2328	20.4144	20.5616	20.5928	20.6000	20.6001	20.6009	20.5975	20.5457	20.3101	20.0623 (92)
Temperature adjustment	0.0000											
adjusted MIT	20.0820	20.2328	20.4144	20.5616	20.5928	20.6000	20.6001	20.6009	20.5975	20.5457	20.3101	20.0623 (93)

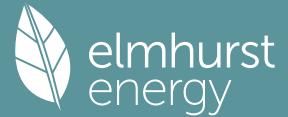
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9905	0.9749	0.9270	0.7765	0.5743	0.3889	0.2705	0.3030	0.5122	0.8377	0.9720	0.9927 (94)
Useful gains	448.9453	498.4636	521.0986	486.0396	381.2364	254.9507	169.9958	178.1192	277.0504	402.3764	432.1121	433.1338 (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	694.4738	672.6906	608.6711	503.0688	382.6185	254.9908	169.9972	178.1227	277.4531	427.9184	571.3967	689.9165 (97)
Space heating kWh	182.6732	117.0806	65.1539	12.2610	1.0283	0.0000	0.0000	0.0000	0.0000	19.0033	100.2849	191.0463 (98a)
Space heating requirement - total per year (kWh/year)	688.5314											
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	182.6732	117.0806	65.1539	12.2610	1.0283	0.0000	0.0000	0.0000	0.0000	19.0033	100.2849	191.0463 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	688.5314											
Space heating per m ²	(98c) / (4) = 13.7789 (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	182.6732	117.0806	65.1539	12.2610	1.0283	0.0000	0.0000	0.0000	0.0000	19.0033	100.2849	191.0463 (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)	197.9125	126.8478	70.5893	13.2838	1.1141	0.0000	0.0000	0.0000	0.0000	20.5886	108.6510	206.9841 (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	192.3367	170.2204	181.2962	160.6594	156.5551	141.9705	140.8402	145.9748	147.0536	162.8805	171.8230	190.4170 (64)
Efficiency of water heater	79.8000 (216)											

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(217)m	83.9443	83.2379	81.9970	80.3776	79.8528	79.8000	79.8000	79.8000	79.8000	80.6541	82.8964	84.0672	(217)
Fuel for water heating, kWh/month	229.1242	204.4985	221.1009	199.8808	196.0546	177.9079	176.4915	182.9258	184.2777	201.9495	207.2743	226.5057	(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	15.8173	12.6892	11.4252	8.3706	6.4657	5.2825	5.8982	7.6667	9.9583	13.0659	14.7579	16.2569	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-13.5393	-20.1410	-30.5362	-36.2890	-40.8763	-38.8191	-38.3696	-35.3648	-30.3558	-23.9006	-15.2621	-11.5876	(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	-4.7521	-10.2288	-20.7629	-31.8205	-42.6903	-43.0983	-42.5679	-35.7398	-25.8178	-14.8096	-6.4044	-3.7392	(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												745.9712	(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												2407.9913	(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)												127.6543	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-617.4731	(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												2750.1437	(238)

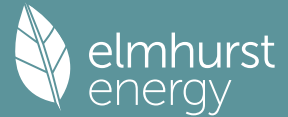
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	745.9712	0.2100	156.6540 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2407.9913	0.2100	505.6782 (264)
Space and water heating			662.3321 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	127.6543	0.1443	18.4245 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-335.0416	0.1335	-44.7119
PV Unit electricity exported	-282.4316	0.1253	-35.3951
Total			-80.1070 (269)
Total CO2, kg/year			612.5788 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.2600 (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	745.9712	1.1300	842.9475 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2407.9913	1.1300	2721.0302 (278)
Space and water heating			3563.9777 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	127.6543	1.5338	195.8004 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-335.0416	1.4932	-500.2676
PV Unit electricity exported	-282.4316	0.4600	-129.9169
Total			-630.1846 (283)
Total Primary energy kWh/year			3259.6943 (286)
Target Primary Energy Rate (TPER)			65.2300 (287)

Full SAP Calculation Printout



Plot Reference	KG04 - GF				Issued on Date	25/03/2026	
Assessment Reference	2b4p-72-GF			Plot Type Ref	2b4p-72-GF		
Plot Address					SAP Version	10.2	
SAP Rating	84 B	DER	12.84	TER	13.85		
Environmental	90 B	% DER < TER				7.29	
CO ₂ Emissions (t/year)	0.83	DFEE	37.48	TFEE	39.18		
Compliance Check	See BREL	% DFEE < TFEE				4.34	
% DPER < TPER	-0.87	DPER	74.08	TPER	73.44		
Assessor Details	Miss Alicja Kreglewska				Assessor ID	L728-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	72.1700 (1b)	3.1500 (2b)	227.3355 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.1700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	227.3355 (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)

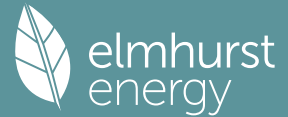
3. Heat losses and heat loss parameter

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
Main dwelling							
Window			16.0000	0.8687	13.8996		(27)
Door			1.8400	1.0000	1.8400		(26)
Ground floor			72.1700	0.1000	7.2170	110.0000	7938.7000 (28a)
External Wall 1	56.6700	16.0000	40.6700	0.1800	7.3206	70.0000	2846.8999 (29a)
Corridor Wall	4.8500	1.8400	3.0100	0.2000	0.6020	70.0000	210.7000 (29a)
Total net area of external elements A _{um} (A, m ²)			133.6900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.8792		(33)
Main dwelling							
Party Wall 1			67.1300	0.0000	0.0000	140.0000	9398.1996 (32)
Party Ceiling 1			72.1700			100.0000	7217.0000 (32b)
Internal Wall 1			122.5000			9.0000	1102.5000 (32c)
Heat capacity C _m = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		28713.9995 (34)
Thermal mass parameter (TMP = C _m / TFA) in kJ/m ² K							397.8662 (35)
List of Thermal Bridges							

elmhurst
energy

505.4631	516.1593	495.4317	477.7016	454.0378	434.7591	418.5498	419.6569	432.1084	449.9804	477.0600	495.2748	(73)
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6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d		Gains W	
South					7.2300	46.7521		0.3800	0.7000		0.7700		62.3095 (78)	
West					8.7700	19.6403		0.3800	0.7000		0.7700		31.7513 (80)	
Solar gains	94.0608	164.1592	232.2797	296.1005	335.9267	334.4938	322.1381	292.8568	254.7571	183.7686	113.4481	79.9518 (83)		
Total gains	599.5239	680.3184	727.7114	773.8021	789.9645	769.2529	740.6878	712.5137	686.8655	633.7490	590.5081	575.2267 (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	133.9590	134.4992	135.0437	137.8340	138.4059	141.3383	141.3383	141.9398	140.1506	138.4059	137.2667	136.1462
alpha	9.9306	9.9666	10.0029	10.1889	10.2271	10.4226	10.4226	10.4627	10.3434	10.2271	10.1511	10.0764
util living area	0.9974	0.9899	0.9646	0.8587	0.6743	0.4694	0.3352	0.3628	0.5710	0.8834	0.9885	0.9981 (86)
MIT	20.5820	20.7032	20.8370	20.9622	20.9965	20.9999	21.0000	21.0000	20.9995	20.9582	20.7632	20.5668 (87)
Th 2	20.2317	20.2346	20.2374	20.2518	20.2546	20.2690	20.2690	20.2719	20.2633	20.2546	20.2489	20.2432 (88)
util rest of house	0.9961	0.9854	0.9503	0.8201	0.6222	0.4159	0.2795	0.3054	0.5104	0.8411	0.9824	0.9972 (89)
MIT 2	19.7561	19.9110	20.0751	20.2215	20.2526	20.2690	20.2690	20.2719	20.2630	20.2229	19.9993	19.7467 (90)
Living area fraction	20.0557	20.1984	20.3515	20.4902	20.5224	20.5341	20.5342	20.5360	20.5302	20.4897	20.2764	20.0442 (92)
Temperature adjustment	19.9057	20.0484	20.2015	20.3402	20.3724	20.3841	20.3842	20.3860	20.3802	20.3397	20.1264	-0.1500
adjusted MIT												19.8942 (93)

8. Space heating requirement

Utilisation	0.9954	0.9840	0.9495	0.8250	0.6305	0.4243	0.2883	0.3144	0.5201	0.8463	0.9811	0.9967 (94)
Useful gains	596.7592	669.4632	690.9383	638.3847	498.0695	326.3899	213.5513	223.9878	357.2113	536.3702	579.3660	573.3074 (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	929.1864	898.3347	809.2518	662.0168	499.7793	326.4147	213.5517	223.9887	357.4107	561.2806	756.9214	919.4408 (97)
Space heating kWh	247.3258	153.8016	88.0252	17.0151	1.2721	0.0000	0.0000	0.0000	0.0000	18.5333	127.8399	257.5233 (98a)
Space heating requirement - total per year (kWh/year)												911.3364
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	247.3258	153.8016	88.0252	17.0151	1.2721	0.0000	0.0000	0.0000	0.0000	18.5333	127.8399	257.5233 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												911.3364
Space heating per m2										(98c) / (4) =		12.6276 (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 %)												88.8000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	247.3258	153.8016	88.0252	17.0151	1.2721	0.0000	0.0000	0.0000	0.0000	18.5333	127.8399	257.5233 (98)
Space heating efficiency (main heating system 1)	88.8000	88.8000	88.8000	88.8000	88.8000	0.0000	0.0000	0.0000	0.0000	88.8000	88.8000	88.8000 (210)
Space heating fuel (main heating system)	278.5200	173.2000	99.1275	19.1612	1.4326	0.0000	0.0000	0.0000	0.0000	20.8708	143.9638	290.0037 (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	249.2651	220.4184	233.9587	205.0398	198.3474	178.2660	175.5236	182.6985	184.9457	206.7996	220.6160	246.4414 (64)
Efficiency of water heater (217)m	84.0423	83.2685	82.0741	80.4246	79.8516	79.8000	79.8000	79.8000	79.8000	80.4708	82.8818	79.8000 (216)
Fuel for water heating, kWh/month	296.5949	264.7080	285.0579	254.9467	248.3951	223.3909	219.9544	228.9455	231.7615	256.9871	266.1814	84.1586 (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	25.8542	23.3522	25.8542	25.0202	25.8542	25.0202	25.8542	25.0202	25.8542	25.0202	25.8542	25.8542 (231)
Lighting	20.7714	16.6636	15.0037	10.9923	8.4908	6.9371	7.7456	10.0680	13.0774	17.1582	19.3802	21.3487 (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)

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Annual totals kWh/year		
Space heating fuel - main system 1	1026.2797	(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	3069.7533	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)		
mechanical ventilation fans (SFP = 0.7875)	218.4126	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	304.4126	(231)
Electricity for lighting (calculated in Appendix L)	167.6369	(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	4568.0824	(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	1026.2797	0.2100	215.5187 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3069.7533	0.2100	644.6482 (264)
Space and water heating			860.1669 (265)
Pumps, fans and electric keep-hot	304.4126	0.1387	42.2258 (267)
Energy for lighting	167.6369	0.1443	24.1952 (268)
Total CO2, kg/year			926.5879 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.8400 (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	1026.2797	1.1300	1159.6961 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3069.7533	1.1300	3468.8212 (278)
Space and water heating			4628.5172 (279)
Pumps, fans and electric keep-hot	304.4126	1.5128	460.5154 (281)
Energy for lighting	167.6369	1.5338	257.1270 (282)
Total Primary energy kWh/year			5346.1596 (286)
Dwelling Primary energy Rate (DPER)			74.0800 (287)

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

1. Overall dwelling characteristics

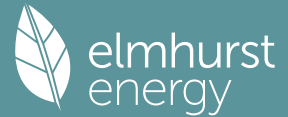
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	72.1700	3.1500	227.3355
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.1700		
Dwelling volume			

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1320 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3820 (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) = 0.3247 (21)

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

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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												
	0.4140	0.4058	0.3977	0.3571	0.3490	0.3084	0.3084	0.3003	0.3247	0.3490	0.3653	0.3815 (22b)
Effective ac	0.5857	0.5824	0.5791	0.5638	0.5609	0.5476	0.5476	0.5451	0.5527	0.5609	0.5667	0.5728 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			1.8400	1.0000	1.8400		(26)
TER Opening Type			16.0000	1.1450	18.3206		(27)
Ground floor			72.1700	0.1300	9.3821		(28a)
External Wall 1	56.6700	16.0000	40.6700	0.1800	7.3206		(29a)
Corridor Wall	4.8500	1.8400	3.0100	0.1800	0.5418		(29a)
Total net area of external elements Aum(A, m2)			133.6900				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	37.4051	(33)
Main dwelling							
Party Wall 1			67.1300	0.0000	0.0000		(32)

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

397.8662 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	13.6200	0.0700	0.9534
E16 Corner (normal)	6.3000	0.0900	0.5670
E18 Party wall between dwellings	6.3000	0.0600	0.3780
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.3700	0.0200	0.0874
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	21.3100	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	3.1500	-0.0900	-0.2835
E7 Party floor between dwellings (in blocks of flats)	1.5400	0.0700	0.1078
E25 Staggered party wall between dwellings	0.0000	0.0600	0.0000
E2 Other lintels (including other steel lintels)	8.9700	0.0500	0.4485
E3 Sill	8.0700	0.0500	0.4035
E4 Jamb	23.2800	0.0500	1.1640
E16 Corner (normal)	0.0000	0.0900	0.0000
E17 Corner (inverted - internal area greater than external area)	0.0000	-0.0900	-0.0000
E18 Party wall between dwellings	0.0000	0.0600	0.0000
E25 Staggered party wall between dwellings	6.3000	0.0600	0.3780
P1 Party wall - Ground floor	21.3100	0.0800	1.7048
E5 Ground floor (normal)	17.9900	0.1600	2.8784
E5 Ground floor (normal)	1.5400	0.1600	0.2464
E14 Flat roof	0.0000	0.0800	0.0000
E15 Flat roof with parapet	0.0000	0.5600	0.0000
P4 Party wall - Roof (insulation at ceiling level)	0.0000	0.1200	0.0000

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

9.0337 (36)

Point Thermal Bridges

(33a) = 0.0000
(33) + (36) + (36a) = 46.4388 (37)

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

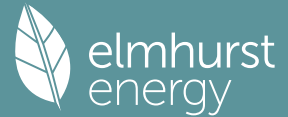
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	43.9380	43.6884	43.4438	42.2947	42.0797	41.0788	41.0788	40.8935	41.4643	42.0797	42.5146	42.9693 (38)
Heat transfer coeff	90.3768	90.1272	89.8826	88.7335	88.5185	87.5176	87.5176	87.3323	87.9031	88.5185	88.9534	89.4081 (39)
Average = Sum(39)m / 12 =												88.7324

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2523	1.2488	1.2454	1.2295	1.2265	1.2127	1.2127	1.2101	1.2180	1.2265	1.2326	1.2389 (40)
HLP (average)												1.2295
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2976 (42)
Hot water usage for mixer showers												
62.7434	61.8005	60.4265	57.7976	55.8575	53.6940	52.4642	53.8278	55.3226	57.6456	60.3310	62.5030 (42a)	
Hot water usage for baths												
27.1049	26.7024	26.1355	25.0903	24.3077	23.4399	22.9711	23.5340	24.1469	25.0755	26.1422	27.0133 (42b)	
Hot water usage for other uses												
38.1601	36.7724	35.3848	33.9971	32.6095	31.2219	31.2219	32.6095	33.9971	35.3848	36.7724	38.1601 (42c)	
Average daily hot water use (litres/day)												117.6689 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
128.0084	125.2753	121.9468	116.8851	112.7747	108.3557	106.6572	109.9713	113.4666	118.1059	123.2456	127.6764 (44)	
Energy content (annual)	202.7341	178.3904	187.4277	160.0098	151.8164	133.2360	128.9926	136.1675	139.9157	160.2686	175.5860	199.9104 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1954.4552
30.4101	26.7586	28.1142	24.0015	22.7725	19.9854	19.3489	20.4251	20.9874	24.0403	26.3379	29.9866 (46)	
Water storage loss (or HIU loss):												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)	
If cylinder contains dedicated solar storage												
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)	
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)	
Total heat required for water heating calculated for each month												
249.3290	220.4761	234.0226	205.1016	198.4113	178.3278	175.5875	182.7624	185.0076	206.8635	220.6778	246.5053 (62)	
WWHRS	-28.6837	-25.3681	-26.5640	-21.9960	-20.4995	-17.5416	-16.4424	-17.4849	-18.1492	-21.3959	-24.2390	-28.1525 (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												
220.6453	195.1081	207.4586	183.1056	177.9118	160.7862	159.1451	165.2775	166.8584	185.4676	196.4389	218.3528 (64)	
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2236.5559 (64)
Electric shower(s)												2237 (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												
104.6850	92.9834	99.5956	89.2767	87.7549	80.3744	80.1660	82.5516	82.5954	90.5652	94.4558	103.7461 (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	114.8817	114.8817	114.8817	114.8817	114.8817	114.8817	114.8817	114.8817	114.8817	114.8817	114.8817	114.8817 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	102.0539	112.9883	102.0539	105.4557	102.0539	105.4557	102.0539	102.0539	105.4557	102.0539	105.4557	102.0539 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	202.3078	204.4071	199.1169	187.8546	173.6380	160.2765	151.3501	149.2508	154.5410	165.8033	180.0198	193.3814 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4882	34.4882	34.4882	34.4882	34.4882	34.4882	34.4882	34.4882	34.4882	34.4882	34.4882	34.4882 (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)	-91.9053	-91.9053	-91.9053	-91.9053	-91.9053	-91.9053	-91.9053	-91.9053	-91.9053	-91.9053	-91.9053	-91.9053 (71)
Water heating gains (Table 5)	140.7056	138.3681	133.8651	123.9955	117.9501	111.6312	107.7500	110.9565	114.7159	121.7274	131.1886	139.4437 (72)
Total internal gains	505.5318	516.2280	495.5004	477.7703	454.1066	434.8278	418.6185	419.7256	432.1771	450.0491	477.1287	495.3435 (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	
South	7.2300		46.7521		0.6300		0.7000		0.7700		103.3025 (78)	
West	8.7700		19.6403		0.6300		0.7000		0.7700		52.6403 (80)	
Solar gains	155.9429	272.1586	385.0953	490.9035	556.9311	554.5555	534.0710	485.5257	422.3605	304.6690	188.0850	132.5517 (83)
Total gains	661.4747	788.3866	880.5957	968.6737	1011.0376	989.3833	952.6894	905.2514	854.5376	754.7181	665.2137	627.8953 (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	88.2539	88.4983	88.7392	89.8884	90.1067	91.1372	91.1372	91.3306	90.7375	90.1067	89.6662	89.2101
alpha	6.8836	6.8999	6.9159	6.9926	7.0071	7.0758	7.0758	7.0887	7.0492	7.0071	6.9777	6.9473
util living area	0.9981	0.9932	0.9774	0.9151	0.7698	0.5617	0.4038	0.4430	0.6902	0.9438	0.9938	0.9986 (86)
MIT	20.1514	20.3321	20.5573	20.8123	20.9550	20.9956	20.9996	20.9993	20.9832	20.7911	20.4236	20.1241 (87)
Th 2	19.8784	19.8811	19.8838	19.8965	19.8988	19.9099	19.9099	19.9119	19.9056	19.8988	19.8940	19.8890 (88)
util rest of house	0.9971	0.9897	0.9662	0.8780	0.6965	0.4685	0.3040	0.3387	0.5907	0.9096	0.9901	0.9979 (89)
MIT 2	18.9186	19.1499	19.4318	19.7354	19.8711	19.9084	19.9098	19.9118	19.8985	19.7231	19.2777	18.8921 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.3658	19.5787	19.8401	20.1261	20.2643	20.3028	20.3052	20.3063	20.2920	20.1105	19.6934	19.3390 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.3658	19.5787	19.8401	20.1261	20.2643	20.3028	20.3052	20.3063	20.2920	20.1105	19.6934	19.3390 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9964	0.9884	0.9656	0.8868	0.7221	0.5025	0.3403	0.3766	0.6271	0.9175	0.9891	0.9974 (94)
Useful gains	659.1041	779.2790	850.3053	858.9842	730.0800	497.1329	324.1621	340.9357	535.8505	692.4162	657.9833	626.2713 (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	1361.6019	1322.9539	1199.0411	996.1290	758.0960	499.0926	324.2664	341.1462	544.2946	841.8586	1120.2222	1353.5464 (97)
Space heating kWh	522.6583	365.3495	259.4594	98.7442	20.8439	0.0000	0.0000	0.0000	0.0000	111.1851	332.8120	541.0926 (98a)
Space heating requirement - total per year (kWh/year)												2252.1451
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	522.6583	365.3495	259.4594	98.7442	20.8439	0.0000	0.0000	0.0000	0.0000	111.1851	332.8120	541.0926 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2252.1451
Space heating per m2												(98c) / (4) = 31.2061 (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	522.6583	365.3495	259.4594	98.7442	20.8439	0.0000	0.0000	0.0000	0.0000	111.1851	332.8120	541.0926 (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)	566.2604	395.8283	281.1044	106.9818	22.5828	0.0000	0.0000	0.0000	0.0000	120.4606	360.5763	586.2325 (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												

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Water heating requirement	220.6453	195.1081	207.4586	183.1056	177.9118	160.7862	159.1451	165.2775	166.8584	185.4676	196.4389	218.3528 (64)
Efficiency of water heater												79.8000 (216)
(217)m	85.9234	85.4453	84.5625	82.7378	80.6573	79.8000	79.8000	79.8000	79.8000	82.9510	85.2321	86.0110 (217)
Fuel for water heating, kWh/month	256.7930	228.3428	245.3317	221.3082	220.5775	201.4865	199.4299	207.1147	209.0957	223.5869	230.4751	253.8663 (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	21.2048	17.0113	15.3168	11.2217	8.6680	7.0818	7.9072	10.2781	13.3502	17.5162	19.7845	21.7941 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-19.3182	-28.6117	-43.1825	-51.0617	-57.2666	-54.2617	-53.5990	-49.5022	-42.6658	-33.8094	-21.7213	-16.5450 (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	-7.0995	-15.2504	-30.9070	-47.3065	-63.4259	-64.0490	-63.2963	-53.1917	-38.4638	-22.0985	-9.5708	-5.5910 (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												2440.0271 (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												2697.4083 (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)												171.1348 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-891.7957 (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												4502.7744 (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	2440.0271	0.2100	512.4057 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2697.4083	0.2100	566.4557 (264)
Space and water heating			1078.8614 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	171.1348	0.1443	24.7000 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-471.5453	0.1336	-62.9799
PV Unit electricity exported	-420.2504	0.1253	-52.6764
Total			-115.6563 (269)
Total CO2, kg/year			999.8344 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.8500 (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	2440.0271	1.1300	2757.2307 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2697.4083	1.1300	3048.0713 (278)
Space and water heating			5805.3020 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	171.1348	1.5338	262.4922 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-471.5453	1.4936	-704.2809
PV Unit electricity exported	-420.2504	0.4601	-193.3476
Total			-897.6285 (283)
Total Primary energy kWh/year			5300.2665 (286)
Target Primary Energy Rate (TPER)			73.4400 (287)

Appendix C

Hot water heat pump datasheet

CURV-HP200M3

200L Air Sourced Hot Water Cylinder

Project
cürv

REVOLUTIONISE YOUR HOT WATER

Simple and easy to install, any qualified plumber could execute efficiency



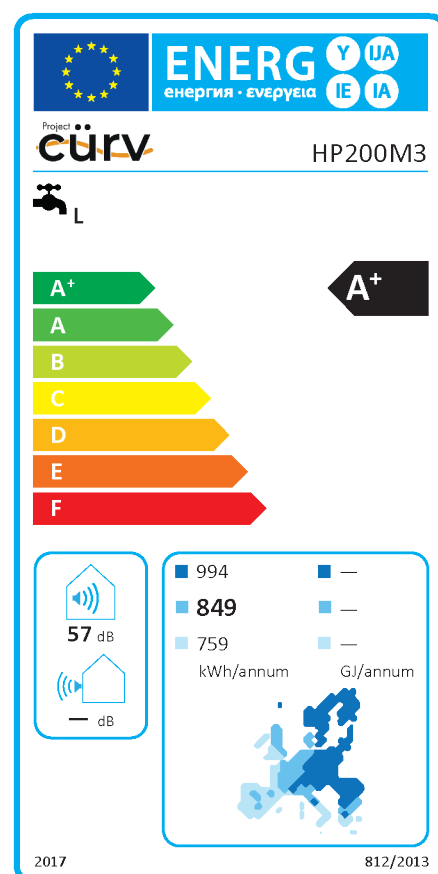
Heating your water alongside infrared technology or GCH, opt for our sleek, smart electric powered hot water cylinder.

To understand how your Air Sourced Hot Water Cylinder works, just think of how a refrigerator works: it transfers the heat present inside it to the surrounding environment. The Cürv® Air Sourced Hot Water Cylinder reverses the cycle by subtracting heat from the air to transfer it to the water.

- Fast heat up time
- Range of modes to work around your life including holiday, eco, and boost
- High performance guaranteed under a five-year warranty
- Easy to install by any plumber
- Significantly reducing carbon emissions
- EPC rating A+
- Reduces energy bills



* 1 year of protection on electronics.



CURV-HP200M3

200L Air Sourced Hot Water Cylinder

Project
cürv

Tank

Tank Volume	195L
Rated Voltage/Frequency	220V~240V/50Hz
Tank Rated Pressure	0.7MPa
Corrosion Protection	Magnesium Rod
Water Proof Grade	IPX4

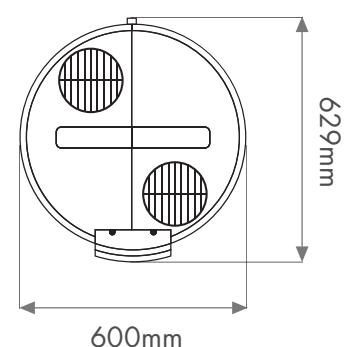
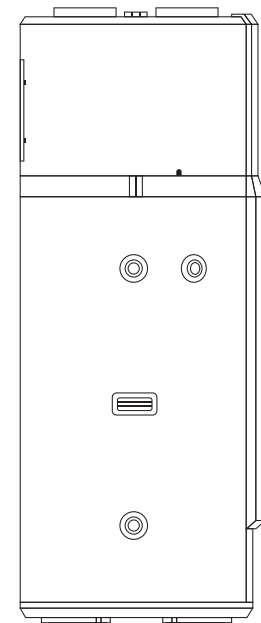
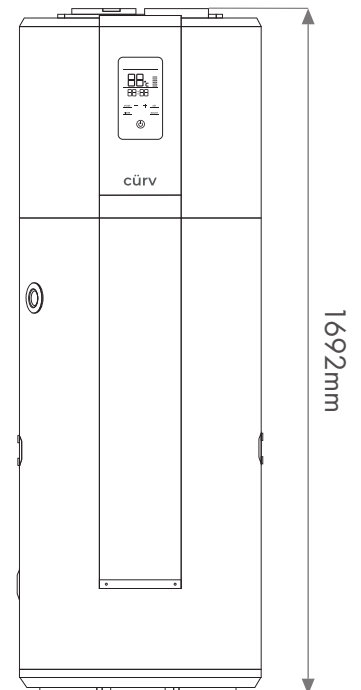
Performances

Type Of Extraction	Ambient / Exterior
COP @ 7°C / EN16147	3.04
COP @ 14°C / EN16147	3.39
Tapping Cycle	L
Power Input By Electric Backup	1500W
Rated Power Input By Heat Pump	495W
Maximum Power Input By Heat Pump	865W
Maximum Power Input	2365W
Standby Power Input / Pes	27W
Max Volume Of Usable Hot Water At 40°C Setting At 55°C	224L
Heating Up Time (7°C)	5.50h
Heating Up Time (14°C)	4.68h
Default Temperature Setting	55°C
Temperature Setting Range - With Heater	35°C - 75°C
Maximum Length Of Air Duct	5m
Diameter Of Air Duct Connection	180mm
Max Working Pressure Of Refrigerant	0.8/2.8MPa
Refrigerant Type /Weight	R134a /0.9kg
Sound Power Level	57dB
Ambient Temperature For Use Of Product	-7~35°C
Operating Temperature Of Heat Pump	-7~35°C

Dimension And Connections

Water Inlet And Outlet Connection	G3/4"F
Safety Valve Connection	G3/4"F
Drain & Water Intlet Connection	G3/4"F
Product Dimensions	600*629*1692mm
Packing Dimension Without Pallet	736*695*1810mm
Packing Dimension With Pallet	736*695*1940mm
Net /Gross Weight	91/103kg
Standing Heat Loss	1.17kWh/24h

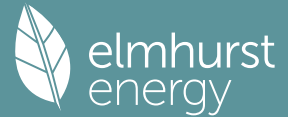
*The COP and noise level data was tested in Haier lab
Manufactured by Haier, exclusively for cürv®



Appendix D

Be Green SAP Worksheets

Full SAP Calculation Printout



Plot Reference	B101 - Mid				Issued on Date	25/03/2026	
Assessment Reference	1b2p-54-Mid			Plot Type Ref	2b4p-71-Mid		
Plot Address					SAP Version	10.2	
SAP Rating	81 B		DER	4.84		TER	12.94
Environmental	96 A		% DER < TER				62.60
CO ₂ Emissions (t/year)	0.27		DFEE	35.39		TFEE	34.56
Compliance Check	See BREL		% DFEE < TFEE				-2.39
% DPER < TPER	27.37		DPER	49.78		TPER	68.54
Assessor Details	Miss Alicja Kreglewska				Assessor ID	L728-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	70.8600 (1b)	2.5000 (2b)	177.1500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.8600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	177.1500 (5)

2. Ventilation rate

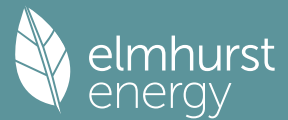
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1388 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												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
Main dwelling							
Window			19.8400	0.8687	17.2355		(27)
Door			1.8400	1.0000	1.8400		(26)
External Wall 1	79.9100	19.8400	60.0700	0.1800	10.8126	70.0000	4204.9003 (29a)
Corridor Wall	4.1900	1.8400	2.3500	0.2000	0.4700	70.0000	164.5000 (29a)
Core/stair	12.3400		12.3400	0.2000	2.4680	9.0000	111.0600 (29a)
Total net area of external elements Aum(A, m ²)			96.4400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.8261		(33)
Main dwelling							
Party Floor 1			70.8600			80.0000	5668.8000 (32d)
Party Ceiling 1			70.8600			100.0000	7086.0000 (32b)
Internal Wall 1			129.2500			9.0000	1163.2500 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	18398.5103 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							259.6459 (35)
List of Thermal Bridges							

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K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	46.7000	0.0600	2.8020
E16 Corner (normal)	8.5500	0.1270	1.0859
E18 Party wall between dwellings	0.0000	0.0250	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	9.3800	0.1000	0.9380
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	0.0000	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	0.0000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	11.6000	0.1000	1.1600
E25 Staggered party wall between dwellings	0.0000	0.1200	0.0000
E2 Other lintels (including other steel lintels)	11.2900	0.0170	0.1919
E3 Sill	10.3900	0.0300	0.3117
E4 Jamb	29.7400	0.1200	3.5688
E16 Corner (normal)	2.8500	0.1300	0.3705
E17 Corner (inverted - internal area greater than external area)	0.0000	0.0000	0.0000
E18 Party wall between dwellings	0.0000	0.0900	0.0000
E25 Staggered party wall between dwellings	0.0000	0.0900	0.0000
P1 Party wall - Ground floor	0.0000	0.0500	0.0000
E5 Ground floor (normal)	0.0000	0.1000	0.0000
E5 Ground floor (normal)	0.0000	0.2300	0.0000
E14 Flat roof	0.0000	0.1600	0.0000
E15 Flat roof with parapet	0.0000	0.3000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	0.0000	0.0300	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) (36a) = 0.0000
 Point Thermal bridges (33) + (36) + (36a) = 43.2549 (37)
 Total fabric heat loss

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	15.8955	15.6927	15.4899	14.4760	14.2733	13.2593	13.2593	13.0566	13.6649	14.2733	14.6788	15.0844
Heat transfer coeff	59.1504	58.9476	58.7448	57.7309	57.5282	56.5142	56.5142	56.3115	56.9198	57.5282	57.9337	58.3393
Average = Sum(39)m / 12 =												

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.8348	0.8319	0.8290	0.8147	0.8119	0.7975	0.7975	0.7947	0.8033	0.8119	0.8176	0.8233
HLP (average)												
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

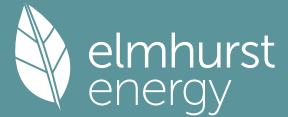
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2668 (42)
Hot water usage for mixer showers													
62.2268	61.2916	59.9290	57.3217	55.3976	53.2518	52.0322	53.3846	54.8671	57.1709	59.8342	61.9884	61.9884 (42a)	
Hot water usage for baths													
26.8828	26.4835	25.9213	24.8847	24.1084	23.2477	22.7828	23.3411	23.9490	24.8700	25.9280	26.7919	26.7919 (42b)	
Hot water usage for other uses													
37.8445	36.4684	35.0922	33.7160	32.3399	30.9637	30.9637	32.3399	33.7160	35.0922	36.4684	37.8445	37.8445 (42c)	
Average daily hot water use (litres/day)													116.6997 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
126.9541	124.2435	120.9425	115.9224	111.8459	107.4633	105.7787	109.0656	112.5321	117.1331	122.2305	126.6248	126.6248 (44)	
Energy content (annual)	201.0643	176.9211	185.8840	158.6919	150.5661	132.1386	127.9302	135.0460	138.7633	158.9485	174.1398	198.2638	198.2638 (45)
Distribution loss (46)m = 0.15 x (45)m													Total = Sum(45)m = 1938.3577
30.1596	26.5382	27.8826	23.8038	22.5849	19.8208	19.1895	20.2569	20.8145	23.8423	26.1210	29.7396	29.7396 (46)	
Water storage loss (or HIU loss):													
Store volume													200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.1700 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.6318 (55)
Total storage loss													
19.5858	17.6904	19.5858	18.9540	19.5858	18.9540	19.5858	19.5858	18.9540	19.5858	18.9540	19.5858	19.5858 (56)	
If cylinder contains dedicated solar storage													
19.5858	17.6904	19.5858	18.9540	19.5858	18.9540	19.5858	19.5858	18.9540	19.5858	18.9540	19.5858	19.5858 (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													
220.6501	194.6115	205.4698	177.6459	170.1519	151.0926	147.5160	154.6318	157.7173	178.5343	193.0938	217.8496	217.8496 (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													
220.6501	194.6115	205.4698	177.6459	170.1519	151.0926	147.5160	154.6318	157.7173	178.5343	193.0938	217.8496	217.8496 (64)	
12Total per year (kWh/year)													Total per year (kWh/year) = Sum(64)m = 2168.9647 (64)
Electric shower(s)													2169 (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													
66.8539	58.8263	61.8064	52.7651	50.0632	43.9361	42.5368	44.9028	46.1388	52.8504	57.9015	65.9227	65.9227 (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	113.3411	113.3411	113.3411	113.3411	113.3411	113.3411	113.3411	113.3411	113.3411	113.3411	113.3411	113.3411	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	100.5219	111.2921	100.5219	103.8726	100.5219	103.8726	100.5219	100.5219	103.8726	100.5219	103.8726	100.5219	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	199.2959	201.3639	196.1525	185.0579	171.0530	157.8903	149.0968	147.0288	152.2402	163.3348	177.3397	190.5024	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3341	34.3341	34.3341	34.3341	34.3341	34.3341	34.3341	34.3341	34.3341	34.3341	34.3341	34.3341	(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)	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	(71)
Water heating gains (Table 5)	89.8573	87.5391	83.0732	73.2848	67.2893	61.0224	57.1731	60.3532	64.0817	71.0355	80.4187	88.6058	(72)
Total internal gains	446.6774	457.1974	436.7498	419.2176	395.8664	379.7876	363.7942	364.9062	377.1968	391.8945	418.6334	436.6324	(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	4.8900				11.2829	0.3800	0.7000	0.7700	10.1706 (75)			
Southeast	8.7700				36.7938	0.3800	0.7000	0.7700	59.4825 (77)			
Northwest	6.1800				11.2829	0.3800	0.7000	0.7700	12.8536 (81)			
Solar gains	82.5068	148.1872	223.0699	310.4433	378.8006	389.7316	370.0539	316.9664	252.9982	169.2556	100.2168	69.7074 (83)
Total gains	529.1842	605.3847	659.8198	729.6610	774.6670	769.5192	733.8481	681.8725	630.1950	561.1500	518.8502	506.3398 (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	86.4017	86.6990	86.9982	88.5261	88.8382	90.4320	90.4320	90.7577	89.7877	88.8382	88.2163	87.6030
alpha	6.7601	6.7799	6.7999	6.9017	6.9225	7.0288	7.0288	7.0505	6.9858	6.9225	6.8811	6.8402
util living area	0.9931	0.9823	0.9540	0.8536	0.6732	0.4688	0.3387	0.3796	0.6144	0.9000	0.9822	0.9947 (86)
MIT	20.2813	20.4487	20.6540	20.8819	20.9789	20.9985	20.9999	20.9997	20.9913	20.8544	20.5388	20.2577 (87)
Th 2	20.2233	20.2258	20.2282	20.2406	20.2431	20.2555	20.2555	20.2579	20.2505	20.2431	20.2381	20.2332 (88)
util rest of house	0.9910	0.9771	0.9413	0.8215	0.6242	0.4148	0.2815	0.3185	0.5514	0.8687	0.9760	0.9931 (89)
MIT 2	19.5743	19.7407	19.9397	20.1543	20.2307	20.2549	20.2554	20.2579	20.2465	20.1380	19.8408	19.5593 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.8645	20.0312	20.2329	20.4529	20.5378	20.5600	20.5609	20.5623	20.5521	20.4320	20.1273	19.8459 (92)
Temperature adjustment	0.3000											
adjusted MIT	20.1645	20.3312	20.5329	20.7529	20.8378	20.8600	20.8609	20.8623	20.8521	20.7320	20.4273	20.1459 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9908	0.9779	0.9467	0.8437	0.6630	0.4587	0.3281	0.3683	0.6022	0.8897	0.9777	0.9928 (94)
Useful gains	524.3253	592.0144	624.6450	615.6190	513.5827	352.9683	240.7395	251.1403	379.4990	499.2767	507.3054	502.7101 (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	938.3903	909.6352	824.3579	684.2774	525.6795	353.7813	240.8037	251.2796	384.3298	582.8753	772.0996	930.2727 (97)
Space heating kWh	308.0643	213.4412	148.5864	49.4340	9.0000	0.0000	0.0000	0.0000	0.0000	62.1974	190.6518	318.1066 (98a)
Space heating requirement - total per year (kWh/year)	1299.4818											
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	308.0643	213.4412	148.5864	49.4340	9.0000	0.0000	0.0000	0.0000	0.0000	62.1974	190.6518	318.1066 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	1299.4818											
Space heating per m2	(98c) / (4) = 18.3387 (99)											

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)											
Fraction of space heat from main system(s)	1.0000 (202)											
Fraction of main heating from main system 2	0.0000 (203)											
Fraction of total heating from main system 1	1.0000 (204)											
Fraction of total heating from main system 2	0.0000 (205)											
Efficiency of main space heating system 1 (in %)	100.0000 (206)											
Efficiency of main space heating system 2 (in %)	0.0000 (207)											
Efficiency of secondary/supplementary heating system, %	0.0000 (208)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	308.0643	213.4412	148.5864	49.4340	9.0000	0.0000	0.0000	0.0000	0.0000	62.1974	190.6518	318.1066 (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)	308.0643	213.4412	148.5864	49.4340	9.0000	0.0000	0.0000	0.0000	0.0000	62.1974	190.6518	318.1066 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Space heating fuel used, main system 2	0.0000 (213)											
Water heating												
Water heating requirement	220.6501	194.6115	205.4698	177.6459	170.1519	151.0926	147.5160	154.6318	157.7173	178.5343	193.0938	217.8496 (64)
Efficiency of water heater	254.8850	254.8850	254.8850	254.8850	254.8850	254.8850	254.8850	254.8850	254.8850	254.8850	254.8850	254.8850 (216)
(217)m	254.8850	254.8850	254.8850	254.8850	254.8850	254.8850	254.8850	254.8850	254.8850	254.8850	254.8850	254.8850 (217)
Fuel for water heating, kWh/month	86.5685	76.3527	80.6128	69.6965	66.7563	59.2788	57.8755	60.6673	61.8778	70.0450	75.7572	85.4698 (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	14.4551	13.0562	14.4551	13.9888	14.4551	13.9888	14.4551	14.4551	13.9888	14.4551	13.9888	14.4551 (231)
Lighting	20.4596	16.4134	14.7785	10.8273	8.3633	6.8329	7.6293	9.9169	12.8810	16.9006	19.0892	21.0282 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-5.1158	-9.2415	-17.8261	-26.1816	-33.6041	-33.5376	-32.5166	-27.0466	-19.2033	-11.9479	-6.1332	-4.1765 (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)												

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(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												1299.4818	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												254.8850	
Water heating fuel used												850.9582	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)													
mechanical ventilation fans (SFP = 0.7875)												170.1969	(230a)
Total electricity for the above, kWh/year												170.1969	(231)
Electricity for lighting (calculated in Appendix L)												165.1203	(232)

Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-226.5308	(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												2259.2263	(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	1299.4818	0.1573	204.4545	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	850.9582	0.1413	120.2178	(264)
Space and water heating			324.6723	(265)
Pumps, fans and electric keep-hot	170.1969	0.1387	23.6084	(267)
Energy for lighting	165.1203	0.1443	23.8320	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-226.5308	0.1300	-29.4573	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-29.4573	(269)
Total CO2, kg/year			342.6554	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.8400	(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	1299.4818	1.5824	2056.3548	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	850.9582	1.5224	1295.4956	(278)
Space and water heating			3351.8504	(279)
Pumps, fans and electric keep-hot	170.1969	1.5128	257.4738	(281)
Energy for lighting	165.1203	1.5338	253.2670	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-226.5308	1.4803	-335.3385	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-335.3385	(283)
Total Primary energy kWh/year			3527.2528	(286)
Dwelling Primary energy Rate (DPER)			49.7800	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)

CALCULATION OF TARGET EMISSIONS

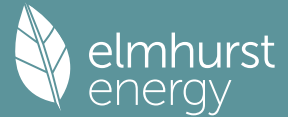
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	70.8600 (1b)	x 2.5000 (2b)	= 177.1500 (1b) - (3b)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	70.8600			(4)
Dwelling volume		(3a) + (3b) + (3c) + (3d) + (3e)... (3n) =	177.1500 (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)

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Number of flueless gas fires

0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =

Air changes per hour
30.0000 / (5) = 0.1693 (8)

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

Yes
Blower Door
5.0000 (17)
0.4193 (18)
1 (19)

Shelter factor

(20) = 1 - [0.075 x (19)] = 0.9250 (20)

Infiltration rate adjusted to include shelter factor

(21) = (18) x (20) = 0.3879 (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	0.4946	0.4849	0.4752	0.4267	0.4170	0.3685	0.3685	0.3588	0.3879	0.4170	0.4364	0.4558 (22b)
	0.6223	0.6176	0.6129	0.5910	0.5869	0.5679	0.5679	0.5644	0.5752	0.5869	0.5952	0.6039 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			1.8400	1.0000	1.8400		(26)
TER Opening Type			15.8600	1.1450	18.1603		(27)
External Wall 1	79.9100	15.8600	64.0500	0.1800	11.5290		(29a)
Corridor Wall	4.1900	1.8400	2.3500	0.1800	0.4230		(29a)
Core/stair	12.3400		12.3400	0.1800	2.2212		(29a)
Total net area of external elements Aum(A, m2)			96.4400				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 34.1735		(33)

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

259.6459 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	46.7000	0.0700	3.2690
E16 Corner (normal)	8.5500	0.0900	0.7695
E18 Party wall between dwellings	0.0000	0.0600	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	9.3800	0.0200	0.1876
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	0.0000	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	0.0000	-0.0900	-0.0000
E7 Party floor between dwellings (in blocks of flats)	11.6000	0.0700	0.8120
E25 Staggered party wall between dwellings	0.0000	0.0600	0.0000
E2 Other lintels (including other steel lintels)	11.2900	0.0500	0.5645
E3 Sill	10.3900	0.0500	0.5195
E4 Jamb	29.7400	0.0500	1.4870
E16 Corner (normal)	2.8500	0.0900	0.2565
E17 Corner (inverted - internal area greater than external area)	0.0000	-0.0900	-0.0000
E18 Party wall between dwellings	0.0000	0.0600	0.0000
E25 Staggered party wall between dwellings	0.0000	0.0600	0.0000
P1 Party wall - Ground floor	0.0000	0.0800	0.0000
E5 Ground floor (normal)	0.0000	0.1600	0.0000
E5 Ground floor (normal)	0.0000	0.1600	0.0000
E14 Flat roof	0.0000	0.0800	0.0000
E15 Flat roof with parapet	0.0000	0.5600	0.0000
P4 Party wall - Roof (insulation at ceiling level)	0.0000	0.1200	0.0000

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

7.8656 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 42.0391 (37)

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

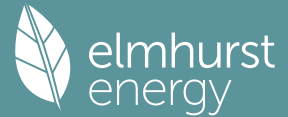
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	36.3793	36.1017	35.8295	34.5514	34.3122	33.1990	33.1990	32.9928	33.6278	34.3122	34.7960	35.3018 (38)
Heat transfer coeff	78.4184	78.1408	77.8686	76.5905	76.3513	75.2381	75.2381	75.0319	75.6669	76.3513	76.8351	77.3409 (39)
Average = Sum(39)m / 12 =												76.5893

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1067	1.1027	1.0989	1.0809	1.0775	1.0618	1.0618	1.0589	1.0678	1.0775	1.0843	1.0915 (40)
HLP (average)												1.0809
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2668 (42)
Hot water usage for mixer showers	62.2268	61.2916	59.9290	57.3217	55.3976	53.2518	52.0322	53.3846	54.8671	57.1709	59.8342	61.9884 (42a)
Hot water usage for baths	26.8828	26.4835	25.9213	24.8847	24.1084	23.2477	22.7828	23.3411	23.9490	24.8700	25.9280	26.7919 (42b)
Hot water usage for other uses	37.8445	36.4684	35.0922	33.7160	32.3399	30.9637	30.9637	32.3399	33.7160	35.0922	36.4684	37.8445 (42c)
Average daily hot water use (litres/day)												116.6997 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	126.9541	124.2435	120.9425	115.9224	111.8459	107.4633	105.7787	109.0656	112.5321	117.1331	122.2305	126.6248 (44)
Energy content (annual)	201.0643	176.9211	185.8840	158.6919	150.5661	132.1386	127.9302	135.0460	138.7633	158.9485	174.1398	198.2638 (45)
Distribution loss	Total = Sum(45)m = 1938.3577											
(46)m = 0.15 x (45)m	30.1596	26.5382	27.8826	23.8038	22.5849	19.8208	19.1895	20.2569	20.8145	23.8423	26.1210	29.7396 (46)
Water storage loss (or HIU loss):												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	247.6592	219.0069	232.4789	203.7838	197.1610	177.2305	174.5251	181.6409	183.8551	205.5434	219.2316	244.8587 (62)

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WVHRS	-28.4475	-25.1592	-26.3453	-21.8149	-20.3307	-17.3971	-16.3070	-17.3409	-17.9998	-21.2197	-24.0394	-27.9207 (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	219.2117	193.8477	206.1337	181.9689	176.8303	159.8334	158.2181	164.3000	165.8554	184.3237	195.1923	216.9380 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =											2222.6529 (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	104.1298	92.4949	99.0824	88.8385	87.3391	80.0096	79.8127	82.1787	82.2123	90.1263	93.9750	103.1986 (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	113.3411	113.3411	113.3411	113.3411	113.3411	113.3411	113.3411	113.3411	113.3411	113.3411	113.3411	113.3411	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	100.5149	111.2843	100.5149	103.8654	100.5149	103.8654	100.5149	100.5149	103.8654	100.5149	103.8654	100.5149	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	199.2959	201.3639	196.1525	185.0579	171.0530	157.8903	149.0968	147.0288	152.2402	163.3348	177.3397	190.5024	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3341	34.3341	34.3341	34.3341	34.3341	34.3341	34.3341	34.3341	34.3341	34.3341	34.3341	34.3341	(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)	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	-90.6729	(71)
Water heating gains (Table 5)	139.9594	137.6412	133.1752	123.3869	117.3913	111.1244	107.2752	110.4552	114.1837	121.1375	130.5208	138.7079	(72)
Total internal gains	499.7725	510.2917	489.8449	472.3125	448.9615	429.8824	413.8892	415.0012	427.2917	444.9895	471.7282	489.7275	(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				3.9100	11.2829	0.6300	0.7000	0.7700	13.4825 (75)			
Southeast				7.0100	36.7938	0.6300	0.7000	0.7700	78.8252 (77)			
Northwest				4.9400	11.2829	0.6300	0.7000	0.7700	17.0342 (81)			
Solar gains	109.3419	196.3860	295.6281	411.4264	502.0235	516.5120	490.4324	420.0729	335.2927	224.3078	132.8123	92.3794 (83)
Total gains	609.1143	706.6778	785.4730	883.7389	950.9850	946.3944	904.3216	835.0741	762.5844	669.2974	604.5405	582.1068 (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	65.1722	65.4037	65.6323	66.7276	66.9366	67.9270	67.9270	68.1136	67.5421	66.9366	66.5151	66.0802
alpha	5.3448	5.3602	5.3755	5.4485	5.4624	5.5285	5.5285	5.5409	5.5028	5.4624	5.4343	5.4053
util living area	0.9910	0.9796	0.9520	0.8643	0.7015	0.5028	0.3652	0.4115	0.6553	0.9076	0.9798	0.9928 (86)
MIT	19.9556	20.1624	20.4351	20.7578	20.9361	20.9915	20.9988	20.9977	20.9667	20.7225	20.2935	19.9298 (87)
Th 2	19.9954	19.9986	20.0017	20.0165	20.0193	20.0322	20.0322	20.0346	20.0272	20.0193	20.0137	20.0078 (88)
util rest of house	0.9881	0.9733	0.9375	0.8288	0.6415	0.4295	0.2854	0.3261	0.5746	0.8739	0.9724	0.9904 (89)
MIT 2	18.8015	19.0639	19.4030	19.7895	19.9713	20.0279	20.0318	20.0338	20.0075	19.7631	19.2430	18.7781 (90)
Living area fraction	19.2751	19.5147	19.8265	20.1869	20.3673	20.4233	20.4287	20.4294	fLA = Living area / (4) =			
MIT	19.2751	19.5147	19.8265	20.1869	20.3673	20.4233	20.4287	20.4294	20.4012	20.1568	19.6741	19.2508 (91)
Temperature adjustment												0.0000
adjusted MIT	19.2751	19.5147	19.8265	20.1869	20.3673	20.4233	20.4287	20.4294	20.4012	20.1568	19.6741	19.2508 (92)
												0.0000
												19.2508 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9854	0.9695	0.9345	0.8355	0.6636	0.4594	0.3181	0.3612	0.6067	0.8793	0.9692	0.9881	(94)
Useful gains	600.1984	685.0975	734.0304	738.3299	631.0376	434.7826	287.7084	301.6411	462.6399	588.5216	585.9231	575.1526	(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	1174.3255	1142.0045	1037.7194	864.4693	661.7562	438.1353	288.0603	302.3345	476.7885	729.6773	966.1323	1164.0385	(97)
Space heating kWh	427.1506	307.0415	225.9446	90.8203	22.8547	0.0000	0.0000	0.0000	0.0000	105.0199	273.7506	438.1311	(98a)
Space heating requirement - total per year (kWh/year)												1890.7133	
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	427.1506	307.0415	225.9446	90.8203	22.8547	0.0000	0.0000	0.0000	0.0000	105.0199	273.7506	438.1311	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1890.7133	
Space heating per m2												(98c) / (4) =	26.6824 (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	

Full SAP Calculation Printout



Space heating requirement	427.1506	307.0415	225.9446	90.8203	22.8547	0.0000	0.0000	0.0000	0.0000	105.0199	273.7506	438.1311 (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)	462.7850	332.6560	244.7937	98.3969	24.7613	0.0000	0.0000	0.0000	0.0000	113.7810	296.5878	474.6816 (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	219.2117	193.8477	206.1337	181.9689	176.8303	159.8334	158.2181	164.3000	165.8554	184.3237	195.1923	216.9380 (64)
Efficiency of water heater	85.5286	85.0862	84.2660	82.5867	80.7365	79.8000	79.8000	79.8000	79.8000	82.8477	84.8183	79.8000 (216)
Fuel for water heating, kWh/month	256.3023	227.8250	244.6225	220.3367	219.0213	200.2924	198.2683	205.8897	207.8388	222.4851	230.1300	85.6028 (217)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685 (231)
Lighting	20.8850	16.7547	15.0858	11.0525	8.5373	6.9750	7.7880	10.1231	13.1489	17.2521	19.4862	21.4655 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-18.9809	-28.1193	-42.4506	-50.2107	-56.3260	-53.3769	-52.7264	-48.6903	-41.9562	-33.2350	-21.3450	-16.2554 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-6.9573	-14.9466	-30.2941	-46.3720	-62.1757	-62.7862	-62.0471	-52.1395	-37.7008	-21.6580	-9.3791	-5.4788 (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												2048.4434 (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												2686.4362 (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)												168.5540 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-875.6083 (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												4113.8253 (238)

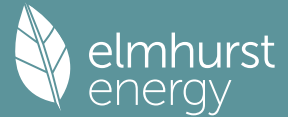
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2048.4434	0.2100	430.1731 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2686.4362	0.2100	564.1516 (264)
Space and water heating			994.3247 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	168.5540	0.1443	24.3275 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-463.6728	0.1336	-61.9256
PV Unit electricity exported	-411.9354	0.1253	-51.6335
Total			-113.5591 (269)
Total CO2, kg/year			917.0224 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.9400 (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	2048.4434	1.1300	2314.7411 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2686.4362	1.1300	3035.6729 (278)
Space and water heating			5350.4140 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	168.5540	1.5338	258.5337 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-463.6728	1.4935	-692.5122
PV Unit electricity exported	-411.9354	0.4601	-189.5196
Total			-882.0318 (283)
Total Primary energy kWh/year			4857.0167 (286)
Target Primary Energy Rate (TPER)			68.5400 (287)

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Plot Reference	Be Green_Copy				Issued on Date	25/03/2026	
Assessment Reference	Be Green_Copy			Plot Type Ref			
Plot Address					SAP Version	10.2	
SAP Rating	50 E	DER	9.78	TER	7.49		
Environmental	89 B	% DER < TER				-30.57	
CO ₂ Emissions (t/year)	1.62	DFEE	97.62	TFEE	36.34		
Compliance Check	See BREL	% DFEE < TFEE				-168.61	
% DPER < TPER	-154.96	DPER	100.99	TPER	39.61		
Assessor Details	Miss Alicja Kreglewska				Assessor ID	L728-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	109.1700 (1b)	x 2.0200 (2b)	= 220.5234 (1b) - (3b)
First floor	87.9800 (1c)	x 2.0200 (2c)	= 177.7196 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	197.1500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 398.2430 (5)

2. Ventilation rate

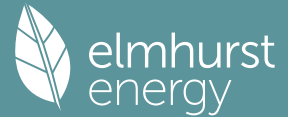
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	6 * 10 = 60.0000 (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) = 60.0000 / (5) = 0.1507 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.9007 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.9007 (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	1.1483	1.1258	1.1033	0.9907	0.9682	0.8556	0.8556	0.8331	0.9007	0.9682	1.0132	1.0583 (22b)
Effective ac	1.1483	1.1258	1.1033	0.9908	0.9687	0.8661	0.8661	0.8470	0.9056	0.9687	1.0132	1.0583 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Main dwelling												
Window			21.6300	1.5918	34.4298		(27)					
Door			3.8800	3.0000	11.6400		(26)					
Heatloss Floor 1			109.1700	0.7000	76.4190		(28a)					
External Wall 1	197.1800	25.5100	171.6700	0.3000	51.5010		(29a)					
External Roof 1	67.9800		67.9800	0.3500	23.7930		(30)					
Ground Floor Roof	24.5900		24.5900	0.3500	8.6065		(30)					
Flat Side Roof	7.5000		7.5000	0.3500	2.6250		(30)					
Sloped Side Roof	16.2100		16.2100	0.3500	5.6735		(30)					
Total net area of external elements Aum(A, m2)			422.6300				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		214.6878		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Default value 0.200 * total exposed area)							84.5260 (36)					
Point Thermal bridges						(36a) =	0.0000					
Total fabric heat loss						(33) + (36) + (36a) =	299.2138 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 150.9156	Feb 147.9564	Mar 144.9973	Apr 130.2073	May 127.3089	Jun 113.8165	Jul 113.8165	Aug 111.3179	Sep 119.0136	Oct 127.3089	Nov 133.1608	Dec 139.0790 (38)

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Heat transfer coeff
450.1293 447.1702 444.2111 429.4211 426.5227 413.0303 413.0303 410.5317 418.2274 426.5227 432.3746 438.2928 (39)
Average = Sum(39)m / 12 = 429.1220

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	2.2832	2.2682	2.2532	2.1781	2.1634	2.0950	2.0950	2.0823	2.1214	2.1634	2.1931	2.2231	(40)
HLP (average)												2.1766	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.9982 (42)
Hot water usage for mixer showers 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (42a)
Hot water usage for baths 90.4577 89.1143 87.2225 83.7343 81.1224 78.2262 76.6618 78.5404 80.5858 83.6849 87.2449 90.1519 (42b)
Hot water usage for other uses 47.7207 45.9854 44.2501 42.5148 40.7795 39.0442 39.0442 40.7795 42.5148 44.2501 45.9854 47.7207 (42c)
Average daily hot water use (litres/day) 127.2510 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	138.1784	135.0997	131.4726	126.2491	121.9019	117.2704	115.7060	119.3199	123.1007	127.9350	133.2303	137.8726	(44)
Energy conte	218.8409	192.3802	202.0685	172.8287	164.1034	144.1976	139.9364	147.7430	151.7954	173.6066	189.8110	215.8752	(45)
Energy content (annual)										Total =	Sum(45)m =	2113.1869	
Distribution loss (46)m = 0.15 x (45)m	32.8261	28.8570	30.3103	25.9243	24.6155	21.6296	20.9905	22.1614	22.7693	26.0410	28.4716	32.3813	(46)
Water storage loss (or HIU loss):												150.0000	(47)
Store volume												1.9000	(48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400	(49)
Temperature factor from Table 2b												1.0260	(55)
Enter (49) or (54) in (55)													
Total storage loss	31.8060	28.7280	31.8060	30.7800	31.8060	30.7800	31.8060	31.8060	30.7800	31.8060	30.7800	31.8060	(56)
If cylinder contains dedicated solar storage	31.8060	28.7280	31.8060	30.7800	31.8060	30.7800	31.8060	31.8060	30.7800	31.8060	30.7800	31.8060	(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	273.9093	242.1194	257.1369	226.1207	219.1718	197.4896	195.0048	202.8114	205.0874	228.6750	243.1030	270.9436	(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	273.9093	242.1194	257.1369	226.1207	219.1718	197.4896	195.0048	202.8114	205.0874	228.6750	243.1030	270.9436	(64)
12Total per year (kWh/year)										Total per year (kWh/year) =	Sum(64)m =	2761.5729	(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) =												0.0000	(64a)
Heat gains from water heating, kWh/month	116.8193	103.7578	111.2425	100.0991	98.6191	90.5793	90.5836	93.1793	93.1056	101.7789	105.7458	115.8332	(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	149.9105	149.9105	149.9105	149.9105	149.9105	149.9105	149.9105	149.9105	149.9105	149.9105	149.9105	149.9105	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	210.3089	232.8420	210.3089	217.3192	210.3089	217.3192	210.3089	210.3089	217.3192	210.3089	217.3192	210.3089	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	368.3286	372.1507	362.5192	342.0147	316.1315	291.8050	275.5533	271.7312	281.3628	301.8672	327.7504	352.0770	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.9911	37.9911	37.9911	37.9911	37.9911	37.9911	37.9911	37.9911	37.9911	37.9911	37.9911	37.9911	(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)	-119.9284	-119.9284	-119.9284	-119.9284	-119.9284	-119.9284	-119.9284	-119.9284	-119.9284	-119.9284	-119.9284	-119.9284	(71)
Water heating gains (Table 5)	157.0152	154.4014	149.5195	139.0266	132.5526	125.8046	121.7521	125.2409	129.3133	136.7996	146.8691	155.6898	(72)
Total internal gains	803.6259	827.3673	790.3207	766.3337	726.9661	702.9019	675.5875	675.2542	695.9684	716.9489	759.9119	786.0489	(73)

6. Solar gains

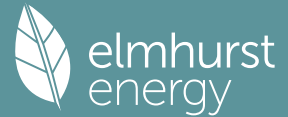
[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W							
North	4.2300	10.6334	0.7600	0.7000	0.7700	16.5828	(74)						
East	4.8500	19.6403	0.7600	0.7000	0.7700	35.1183	(76)						
South	8.1300	46.7521	0.7600	0.7000	0.7700	140.1316	(78)						
West	4.4200	19.6403	0.7600	0.7000	0.7700	32.0048	(80)						
Solar gains	223.8375	392.4970	562.4355	732.2852	847.3350	851.7464	816.8909	730.3655	621.6311	441.0670	270.2554	190.1096	(83)
Total gains	1027.4634	1219.8644	1352.7562	1498.6189	1574.3011	1554.6483	1492.4784	1405.6197	1317.5995	1158.0159	1030.1673	976.1585	(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	30.4156	30.6169	30.8209	31.8824	32.0990	33.1476	33.1476	33.3494	32.7357	32.0990	31.6646	31.2370	
alpha	3.0277	3.0411	3.0547	3.1255	3.1399	3.2098	3.2098	3.2233	3.1824	3.1399	3.1110	3.0825	
util living area	0.9979	0.9962	0.9933	0.9853	0.9661	0.9161	0.8314	0.8615	0.9534	0.9891	0.9966	0.9983	(86)

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Living	18.0741	18.2968	18.6921	19.2966	19.8774	20.4344	20.7326	20.6851	20.2472	19.4896	18.7230	18.0942
Non living	17.1639	17.3913	17.7911	18.4188	18.9985	19.5587	19.8177	19.7879	19.3772	18.6176	17.8426	17.2040
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	19.8584	19.8659	19.8734	19.9109	19.9183	19.9525	19.9525	19.9588	19.9393	19.9183	19.9034	19.8884 (88)
util rest of house	0.9974	0.9954	0.9916	0.9810	0.9537	0.8760	0.7331	0.7778	0.9301	0.9852	0.9956	0.9979 (89)
MIT 2	19.8584	19.8659	19.8734	19.9109	19.9183	19.9525	19.9525	19.9588	19.9393	19.9183	19.9034	19.8884 (90)
Living area fraction									FLA = Living area / (4) =			
MIT	19.9717	19.9784	19.9852	20.0190	20.0256	20.0564	20.0564	20.0621	20.0446	20.0256	20.0122	19.9987 (91)
Temperature adjustment												0.0000
adjusted MIT	19.9717	19.9784	19.9852	20.0190	20.0256	20.0564	20.0564	20.0621	20.0446	20.0256	20.0122	19.9987 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9975	0.9955	0.9918	0.9815	0.9552	0.8809	0.7453	0.7882	0.9330	0.9856	0.9957	0.9980 (94)
Useful gains	1024.8910	1214.3438	1341.6119	1470.8963	1503.7223	1369.4217	1112.2728	1107.9336	1229.2891	1141.3651	1025.7877	974.1591 (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	7054.2786	6742.6250	5990.2712	4774.7240	3551.0576	2253.6683	1427.6078	1503.4212	2486.1739	4020.2326	5582.9205	6924.4617 (97)
Space heating kWh	4485.8644	3715.0049	3458.6025	2378.7559	1523.2174	0.0000	0.0000	0.0000	0.0000	2141.8774	3281.1356	4427.0252 (98a)
Space heating requirement - total per year (kWh/year)												25411.4833
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	4485.8644	3715.0049	3458.6025	2378.7559	1523.2174	0.0000	0.0000	0.0000	0.0000	2141.8774	3281.1356	4427.0252 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												25411.4833
Space heating per m2										(98c) / (4) =		128.8942 (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 %)												255.1719 (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	4485.8644	3715.0049	3458.6025	2378.7559	1523.2174	0.0000	0.0000	0.0000	0.0000	2141.8774	3281.1356	4427.0252 (98)
Space heating efficiency (main heating system 1)	255.1719	255.1719	255.1719	255.1719	255.1719	0.0000	0.0000	0.0000	0.0000	255.1719	255.1719	255.1719 (210)
Space heating fuel (main heating system)	1757.9778	1455.8835	1355.4013	932.2172	596.9379	0.0000	0.0000	0.0000	0.0000	839.3862	1285.8533	1734.9191 (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	273.9093	242.1194	257.1369	226.1207	219.1718	197.4896	195.0048	202.8114	205.0874	228.6750	243.1030	270.9436 (64)
Efficiency of water heater (217)m	112.5000	112.5000	112.5000	112.5000	112.5000	112.5000	112.5000	112.5000	112.5000	112.5000	112.5000	112.5000 (216)
Fuel for water heating, kWh/month	243.4749	215.2172	228.5661	200.9962	194.8194	175.5464	173.3376	180.2768	182.2999	203.2666	216.0915	240.8388 (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	44.7103	35.8683	32.2954	23.6610	18.2764	14.9320	16.6724	21.6714	28.1490	36.9330	41.7157	45.9529 (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												9958.5761 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												112.5000
Water heating fuel used												2454.7314 (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)												360.8376 (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												12774.1452 (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	9958.5761	0.1536	1530.0832 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2454.7314	0.1409	345.8188 (264)
Space and water heating			1875.9020 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	360.8376	0.1443	52.0800 (268)
Total CO2, kg/year			1927.9820 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			9.7800 (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	9958.5761	1.5688	15623.3173 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2454.7314	1.5209	3733.4411 (278)
Space and water heating			19356.7585 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	360.8376	1.5338	553.4648 (282)
Total Primary energy kWh/year			19910.2233 (286)
Dwelling Primary energy Rate (DPER)			100.9900 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	109.1700 (1b)	x 2.0200 (2b)	= 220.5234 (1b) - (3b)
First floor	87.9800 (1c)	x 2.0200 (2c)	= 177.7196 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	197.1500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	398.2430 (5)

2. Ventilation rate

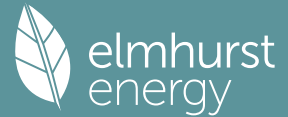
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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) = 0.1004 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3504 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3504 (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	0.4468	0.4381	0.4293	0.3855	0.3767	0.3329	0.3329	0.3242	0.3504	0.3767	0.3942	0.4118 (22b)
Effective ac	0.5998	0.5959	0.5921	0.5743	0.5710	0.5554	0.5554	0.5525	0.5614	0.5710	0.5777	0.5848 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			3.8800	1.0000	3.8800		(26)
TER Opening Type			21.6300	1.1450	24.7672		(27)
Heatloss Floor 1			109.1700	0.1300	14.1921		(28a)
External Wall 1	197.1800	25.5100	171.6700	0.1800	30.9006		(29a)
External Roof 1	67.9800		67.9800	0.1100	7.4778		(30)
Ground Floor Roof	24.5900		24.5900	0.1100	2.7049		(30)
Flat Side Roof	7.5000		7.5000	0.1100	0.8250		(30)
Sloped Side Roof	16.2100		16.2100	0.1100	1.7831		(30)
Total net area of external elements Aum(A, m2)			422.6300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	86.5307		(33)

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Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)
 Thermal bridges (User defined value 0.050 * total exposed area) 21.1315 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 107.6622 (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 78.8286 78.3191 77.8198 75.4745 75.0357 72.9931 72.9931 72.6148 73.7799 75.0357 75.9234 76.8515 (38)
 Average = Sum(39)m / 12 = 186.4907 185.9813 185.4820 183.1367 182.6979 180.6553 180.6553 180.2770 181.4421 182.6979 183.5856 184.5136 (39)
 183.1346

HLP Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 HLP (average) 0.9459 0.9433 0.9408 0.9289 0.9267 0.9163 0.9163 0.9144 0.9203 0.9267 0.9312 0.9359 (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 2.9982 (42)
 Hot water usage for mixer showers 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (42a)
 Hot water usage for baths 85.9348 84.6586 82.8613 79.5476 77.0663 74.3149 72.8287 74.6134 76.5566 79.5006 82.8826 85.6443 (42b)
 Hot water usage for other uses 45.3347 43.6861 42.0376 40.3891 38.7405 37.0920 37.0920 38.7405 40.3891 42.0376 43.6861 45.3347 (42c)
 Average daily hot water use (litres/day) 120.8885 (43)
 Daily hot water use Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 Energy conte 131.2695 128.3447 124.8990 119.9367 115.8068 111.4069 109.9207 113.3539 116.9456 121.5382 126.5688 130.9790 (44)
 Energy content (annual) 207.8988 182.7612 191.9650 164.1873 155.8982 136.9878 132.9396 140.3558 144.2057 164.9262 180.3204 205.0815 (45)
 Distribution loss (46)m = 0.15 x (45)m Total = Sum(45)m = 2007.5275
 31.1848 27.4142 28.7948 24.6281 23.3847 20.5482 19.9409 21.0534 21.6308 24.7389 27.0481 30.7622 (46)
 Water storage loss (or HIU loss): 150.0000 (47)
 Store volume 1.3938 (48)
 a) If manufacturer declared loss factor is known (kWh/day): 0.5400 (49)
 Temperature factor from Table 2b 0.7527 (55)
 Enter (49) or (54) in (55)
 Total storage loss 23.3325 21.0745 23.3325 22.5798 23.3325 22.5798 23.3325 23.3325 22.5798 23.3325 22.5798 23.3325 (56)
 If cylinder contains dedicated solar storage 23.3325 21.0745 23.3325 22.5798 23.3325 22.5798 23.3325 23.3325 22.5798 23.3325 22.5798 23.3325 (57)
 Primary loss 23.2624 21.0112 23.2624 22.5120 23.2624 22.5120 23.2624 23.2624 22.5120 23.2624 22.5120 23.2624 (59)
 Combi loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (61)
 Total heat required for water heating calculated for each month 254.4937 224.8469 238.5600 209.2791 202.4931 182.0796 179.5345 186.9507 189.2975 211.5211 225.4123 251.6764 (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 254.4937 224.8469 238.5600 209.2791 202.4931 182.0796 179.5345 186.9507 189.2975 211.5211 225.4123 251.6764 (64)
 Total per year (kWh/year) = Sum(64)m = 2556.1449 (64)
 2556 (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 106.4023 94.4367 101.1043 90.6657 89.1121 81.6219 81.4783 83.9442 84.0219 92.1139 96.0300 105.4655 (65)

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

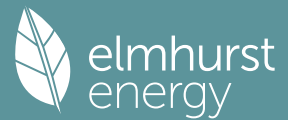
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 (66)m 149.9105 149.9105 149.9105 149.9105 149.9105 149.9105 149.9105 149.9105 149.9105 149.9105 149.9105 149.9105 (66)
 Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 210.3089 232.8420 210.3089 217.3192 210.3089 217.3192 210.3089 210.3089 217.3192 210.3089 217.3192 210.3089 (67)
 Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 368.3286 372.1507 362.5192 342.0147 316.1315 291.8050 275.5533 271.7312 281.3628 301.8672 327.7504 352.0770 (68)
 Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 37.9911 37.9911 37.9911 37.9911 37.9911 37.9911 37.9911 37.9911 37.9911 37.9911 37.9911 37.9911 (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) -119.9284 -119.9284 -119.9284 -119.9284 -119.9284 -119.9284 -119.9284 -119.9284 -119.9284 -119.9284 -119.9284 -119.9284 (71)
 Water heating gains (Table 5) 143.0138 140.5308 135.8929 125.9246 119.7743 113.3638 109.5139 112.8283 116.6970 123.8090 133.3750 141.7547 (72)
 Total internal gains 792.6245 816.4966 779.6941 756.2317 717.1879 690.4611 663.3493 662.8415 683.3522 706.9583 749.4178 775.1138 (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
 North 4.2300 10.6334 0.6300 0.7700 13.7462 (74)
 East 4.8500 19.6403 0.6300 0.7700 29.1113 (76)
 South 8.1300 46.7521 0.6300 0.7700 116.1618 (78)
 West 4.4200 19.6403 0.6300 0.7700 26.5303 (80)
 Solar gains 185.5495 325.3594 466.2295 607.0259 702.3961 706.0529 677.1595 605.4345 515.2995 365.6213 224.0275 157.5909 (83)
 Total gains 978.1740 1141.8560 1245.9236 1363.2576 1419.5840 1396.5140 1340.5088 1268.2761 1198.6516 1072.5796 973.4453 932.7046 (84)

7. Mean internal temperature (heating season)

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Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	73.4137	73.6148	73.8129	74.7582	74.9378	75.7851	75.7851	75.9441	75.4564	74.9378	74.5754	74.2003
alpha	5.8942	5.9077	5.9209	5.9839	5.9959	6.0523	6.0523	6.0629	6.0304	5.9959	5.9717	5.9467
util living area	0.9993	0.9979	0.9943	0.9782	0.9217	0.7662	0.5825	0.6357	0.8757	0.9856	0.9980	0.9994 (86)
MIT	19.7932	19.9520	20.1800	20.5001	20.7786	20.9510	20.9920	20.9869	20.8852	20.5222	20.1051	19.7736 (87)
Th 2	20.1286	20.1308	20.1329	20.1430	20.1449	20.1536	20.1536	20.1553	20.1503	20.1449	20.1411	20.1371 (88)
util rest of house	0.9990	0.9972	0.9923	0.9696	0.8902	0.6882	0.4760	0.5282	0.8174	0.9784	0.9972	0.9993 (89)
MIT 2	18.6977	18.9027	19.1955	19.6071	19.9418	20.1228	20.1508	20.1501	20.0644	19.6398	19.1067	18.6788 (90)
Living area fraction	18.8064	19.0068	19.2932	19.6957	20.0248	20.2050	20.2343	20.2331	fLA = Living area / (4) =			0.0992 (91)
MIT	18.8064	19.0068	19.2932	19.6957	20.0248	20.2050	20.2343	20.2331	20.1458	19.7274	19.2058	18.7874 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8064	19.0068	19.2932	19.6957	20.0248	20.2050	20.2343	20.2331	20.1458	19.7274	19.2058	18.7874 (93)

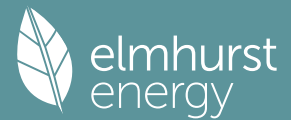
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9984	0.9958	0.9894	0.9637	0.8849	0.6933	0.4864	0.5385	0.8171	0.9735	0.9959	0.9988 (94)
Useful gains	976.6186	1137.1079	1232.7230	1313.8081	1256.1203	968.1990	652.0637	682.9923	979.4051	1044.1333	969.4784	931.5872 (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	2705.3040	2623.5989	2372.9075	1977.0890	1520.9300	1012.5722	656.5472	691.0223	1096.9656	1667.5517	2222.4464	2691.5773 (97)
Space heating kWh	1286.1419	998.9220	848.2972	477.5622	197.0184	0.0000	0.0000	0.0000	0.0000	463.8233	902.1370	1309.4326 (98a)
Space heating requirement - total per year (kWh/year)												6483.3346
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	1286.1419	998.9220	848.2972	477.5622	197.0184	0.0000	0.0000	0.0000	0.0000	463.8233	902.1370	1309.4326 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6483.3346
Space heating per m2										(98c) / (4) =		32.8853 (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	1286.1419	998.9220	848.2972	477.5622	197.0184	0.0000	0.0000	0.0000	0.0000	463.8233	902.1370	1309.4326 (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)	1393.4365	1082.2557	919.0653	517.4022	213.4544	0.0000	0.0000	0.0000	0.0000	502.5171	977.3965	1418.6702 (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	254.4937	224.8469	238.5600	209.2791	202.4931	182.0796	179.5345	186.9507	189.2975	211.5211	225.4123	251.6764 (64)	
Efficiency of water heater (217)m	87.1759	86.9973	86.6549	85.8498	83.9983	79.8000	79.8000	79.8000	79.8000	85.7703	86.8420	87.2142 (217)	
Fuel for water heating, kWh/month	291.9313	258.4528	275.2990	243.7735	241.0680	228.1699	224.9806	234.2741	237.2149	246.6136	259.5659	288.5725 (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	43.6980	35.0562	31.5642	23.1253	17.8626	14.5939	16.2949	21.1807	27.5117	36.0968	40.7713	44.9125 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)	-88.9317	-119.1480	-162.7181	-173.3551	-179.0022	-164.0769	-161.8271	-156.4539	-146.1070	-131.3576	-95.4364	-77.6189 (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)	-70.9147	-146.2492	-285.5765	-421.8429	-551.2735	-551.7871	-545.4731	-464.9178	-344.7852	-206.9249	-93.9033	-56.3196 (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													7024.1979 (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													3029.9163 (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)													352.6682 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-5396.0008 (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)

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Energy used	0.0000 (237)
Total delivered energy for all uses	5096.7815 (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	7024.1979	0.2100	1475.0816 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3029.9163	0.2100	636.2824 (264)
Space and water heating			2111.3640 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	352.6682	0.1443	50.9009 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1656.0329	0.1357	-224.8008
PV Unit electricity exported	-3739.9679	0.1264	-472.6757
Total			-697.4765 (269)
Total CO2, kg/year			1476.7176 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			7.4900 (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	7024.1979	1.1300	7937.3436 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3029.9163	1.1300	3423.8054 (278)
Space and water heating			11361.1490 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	352.6682	1.5338	540.9342 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1656.0329	1.5018	-2486.9648
PV Unit electricity exported	-3739.9679	0.4639	-1735.1237
Total			-4222.0884 (283)
Total Primary energy kWh/year			7810.0956 (286)
Target Primary Energy Rate (TPER)			39.6100 (287)

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Plot Reference	C102 - Mid			Issued on Date	25/03/2026	
Assessment Reference	1b2p-54-Mid	Plot Type Ref	1b2p-54-Mid			
Plot Address				SAP Version	10.2	
SAP Rating	81 B	DER	5.02	TER	13.80	
Environmental	97 A	% DER < TER				63.62
CO ₂ Emissions (t/year)	0.22	DFEE	37.02	TFEE	35.57	
Compliance Check	See BREL	% DFEE < TFEE				-4.07
% DPER < TPER	29.27	DPER	51.53	TPER	72.86	
Assessor Details	Miss Alicja Kreglewska			Assessor ID	L728-0001	
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	55.8600 (1b)	2.5000 (2b)	139.6500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.8600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	139.6500 (5)

2. Ventilation rate

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

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.0000	(17)
Infiltration rate	0.1500	(18)
Number of sides sheltered	1	(19)

Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1388 (21)

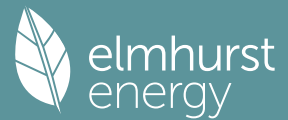
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												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
Main dwelling							
Window			14.2400	0.8687	12.3707		(27)
Door			1.8400	1.0000	1.8400		(26)
External Wall 1	54.8600	14.2400	40.6200	0.1800	7.3116	70.0000	2843.4000 (29a)
Corridor Wall	4.2800	1.8400	2.4400	0.2000	0.4880	70.0000	170.8000 (29a)
Core/stair	16.2500		16.2500	0.2000	3.2500	9.0000	146.2500 (29a)
Total net area of external elements Aum(A, m ²)			75.3900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.2603		(33)
Main dwelling							
Party Wall 1			24.8500	0.0000	0.0000	140.0000	3479.0001 (32)
Party Floor 1			55.8600			80.0000	4468.8000 (32d)
Party Ceiling 1			55.8600			100.0000	5586.0000 (32b)
Internal Wall 1			75.3000			9.0000	677.7000 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17371.9501 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		310.9909 (35)

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List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	28.4600	0.0600	1.7076
E16 Corner (normal)	8.5500	0.1270	1.0859
E18 Party wall between dwellings	2.8500	0.0250	0.0713
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	10.0400	0.1000	1.0040
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	17.4400	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	2.8500	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	14.4000	0.1000	1.4400
E25 Staggered party wall between dwellings	0.0000	0.1200	0.0000
E2 Other lintels (including other steel lintels)	8.5500	0.0170	0.1454
E3 Sill	7.6500	0.0300	0.2295
E4 Jamb	26.1400	0.1200	3.1368
E16 Corner (normal)	2.8500	0.1300	0.3705
E17 Corner (inverted - internal area greater than external area)	0.0000	0.0000	0.0000
E18 Party wall between dwellings	0.0000	0.0900	0.0000
E25 Staggered party wall between dwellings	2.8500	0.0900	0.2565
P1 Party wall - Ground floor	0.0000	0.0500	0.0000
E5 Ground floor (normal)	0.0000	0.1000	0.0000
E5 Ground floor (normal)	0.0000	0.2300	0.0000
E14 Flat roof	0.0000	0.1600	0.0000
E15 Flat roof with parapet	0.0000	0.3000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	0.0000	0.0300	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.4474 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 34.7076 (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	
	12.5307	12.3708	12.2110	11.4117	11.2518	10.4525	10.4525	10.2927	10.7723	11.2518	11.5715	11.8912	(38)
Heat transfer coeff	47.2383	47.0784	46.9186	46.1193	45.9594	45.1601	45.1601	45.0003	45.4799	45.9594	46.2791	46.5988	(39)
Average = Sum(39)m / 12 =												46.0793	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8457	0.8428	0.8399	0.8256	0.8228	0.8085	0.8085	0.8056	0.8142	0.8228	0.8285	0.8342	(40)
HLP (average)												0.8249	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

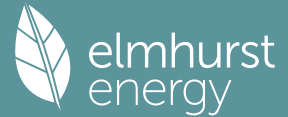
4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.8625 (42)
Hot water usage for mixer showers													
55.4477	54.6144	53.4002	51.0770	49.3625	47.4505	46.3637	47.5688	48.8897	50.9426	53.3158	55.2353	(42a)	
Hot water usage for baths													
23.9676	23.6116	23.1103	22.1861	21.4941	20.7267	20.3122	20.8100	21.3519	22.1730	23.1163	23.8865	(42b)	
Hot water usage for other uses													
33.7040	32.4784	31.2528	30.0272	28.8016	27.5760	27.5760	28.8016	30.0272	31.2528	32.4784	33.7040	(42c)	
Average daily hot water use (litres/day)												103.9826	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	113.1192	110.7044	107.7633	103.2903	99.6581	95.7532	94.2519	97.1803	100.2688	104.3684	108.9104	112.8258	(44)
Energy conte	179.1532	157.6416	165.6282	141.3992	134.1590	117.7397	113.9895	120.3295	123.6415	141.6270	155.1628	176.6579	(45)
Energy content (annual)										Total = Sum(45)m =		1727.1290	
Distribution loss (46)m = 0.15 x (45)m													
26.8730	23.6462	24.8442	21.2099	20.1238	17.6610	17.0984	18.0494	18.5462	21.2440	23.2744	26.4987	(46)	
Water storage loss (or HIU loss):													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.1700	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.6318	(55)
Total storage loss													
19.5858	17.6904	19.5858	18.9540	19.5858	18.9540	19.5858	19.5858	18.9540	19.5858	18.9540	19.5858	(56)	
If cylinder contains dedicated solar storage													
19.5858	17.6904	19.5858	18.9540	19.5858	18.9540	19.5858	19.5858	18.9540	19.5858	18.9540	19.5858	(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													
198.7390	175.3320	185.2140	160.3532	153.7448	136.6937	133.5753	139.9153	142.5955	161.2128	174.1168	196.2437	(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	198.7390	175.3320	185.2140	160.3532	153.7448	136.6937	133.5753	139.9153	142.5955	161.2128	174.1168	196.2437	(64)
12Total per year (kWh/year)												1957.7360	(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	59.5684	52.4158	55.0714	47.0152	44.6079	39.1485	37.9015	40.0096	41.1108	47.0910	51.5916	58.7387	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
81.9116	90.6879	81.9116	84.6420	81.9116	84.6420	81.9116	81.9116	84.6420	81.9116	84.6420	81.9116	(67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
162.3990	164.0842	159.8375	150.7970	139.3849	128.6591	121.4936	119.8084	124.0551	133.0956	144.5077	155.2335	(68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	(69)	
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)													
-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	(71)	
Water heating gains (Table 5)													
80.0651	77.9997	74.0207	65.2989	59.9568	54.3728	50.9429	53.7763	57.0983	63.2943	71.6551	78.9499	(72)	
Total internal gains	375.3134	383.7095	366.7075	351.6756	332.1910	318.6116	305.2858	306.4340	316.7331	329.2392	351.7425	367.0327	(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
North					7.3700	10.6334		0.3800		0.7000	0.7700	14.4462 (74)
East					4.0300	19.6403		0.3800		0.7000	0.7700	14.5904 (76)
West					2.8400	19.6403		0.3800		0.7000	0.7700	10.2821 (80)
Solar gains	39.3187	76.2633	127.0410	192.2161	244.7275	255.2779	241.0341	200.3881	149.5968	90.5973	48.8343	32.4970 (83)
Total gains	414.6321	459.9728	493.7485	543.8917	576.9184	573.8895	546.3199	506.8221	466.3299	419.8365	400.5768	399.5297 (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	102.1532	102.5001	102.8493	104.6318	104.9957	106.8540	106.8540	107.2336	106.1028	104.9957	104.2703	103.5550
alpha	7.8102	7.8333	7.8566	7.9755	7.9997	8.1236	8.1236	8.1489	8.0735	7.9997	7.9514	7.9037
util living area	0.9969	0.9920	0.9765	0.8997	0.7222	0.5027	0.3637	0.4083	0.6637	0.9374	0.9911	0.9976 (86)
MIT	20.3664	20.4908	20.6654	20.8837	20.9817	20.9991	20.9999	20.9999	20.9927	20.8571	20.5834	20.3504 (87)
Th 2	20.2139	20.2164	20.2189	20.2312	20.2337	20.2460	20.2460	20.2485	20.2411	20.2337	20.2287	20.2238 (88)
util rest of house	0.9957	0.9891	0.9679	0.8700	0.6696	0.4440	0.3014	0.3417	0.5951	0.9110	0.9873	0.9967 (89)
MIT 2	19.6421	19.7672	19.9389	20.1476	20.2236	20.2457	20.2460	20.2485	20.2380	20.1316	19.8699	19.6347 (90)
Living area fraction	19.9722	20.0970	20.2700	20.4831	20.5692	20.5891	20.5896	20.5909	20.5820	20.4622	20.1951	19.9609 (92)
Temperature adjustment	20.2722	20.3970	20.5700	20.7831	20.8692	20.8891	20.8896	20.8909	20.8820	20.7622	20.4951	0.3000
adjusted MIT												20.2609 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9958	0.9899	0.9721	0.8919	0.7135	0.4941	0.3545	0.3986	0.6533	0.9301	0.9888	0.9967 (94)
Useful gains	412.8826	455.3114	479.9916	485.1134	411.6237	283.5411	193.6930	202.0256	304.6431	390.5000	396.0859	398.2199 (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	754.5012	729.5754	660.1458	548.0392	421.4098	284.0151	193.7205	202.0934	308.4434	467.0505	619.9128	748.4216 (97)
Space heating kWh	254.1643	184.3055	134.0347	45.3066	7.2809	0.0000	0.0000	0.0000	0.0000	56.9535	161.1554	260.5500 (98a)
Space heating requirement - total per year (kWh/year)												1103.7509
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	254.1643	184.3055	134.0347	45.3066	7.2809	0.0000	0.0000	0.0000	0.0000	56.9535	161.1554	260.5500 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1103.7509
Space heating per m2										(98c) / (4) =		19.7592 (99)

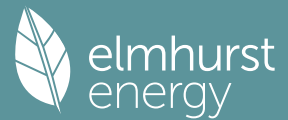
9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Fraction of main heating from main system 2												0.0000 (203)
Fraction of total heating from main system 1												1.0000 (204)
Fraction of total heating from main system 2												0.0000 (205)
Efficiency of main space heating system 1 (in %)												100.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	254.1643	184.3055	134.0347	45.3066	7.2809	0.0000	0.0000	0.0000	0.0000	56.9535	161.1554	260.5500 (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)	254.1643	184.3055	134.0347	45.3066	7.2809	0.0000	0.0000	0.0000	0.0000	56.9535	161.1554	260.5500 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Space heating fuel used, main system 2												0.0000 (213)
Water heating												
Water heating requirement	198.7390	175.3320	185.2140	160.3532	153.7448	136.6937	133.5753	139.9153	142.5955	161.2128	174.1168	196.2437 (64)
Efficiency of water heater	254.8850	254.8850	254.8850	254.8850	254.8850	254.8850	254.8850	254.8850	254.8850	254.8850	254.8850	254.8850 (216)
Fuel for water heating, kWh/month	77.9720	68.7887	72.6657	62.9120	60.3193	53.6296	52.4061	54.8935	55.9450	63.2492	68.3119	76.9930 (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	11.3952	10.2924	11.3952	11.0276	11.3952	11.0276	11.3952	11.3952	11.0276	11.3952	11.0276	11.3952 (231)
Lighting	16.6717	13.3747	12.0424	8.8228	6.8150	5.5679	6.2169	8.0809	10.4963	13.7171	15.5551	17.1351 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-11.2002	-17.4940	-27.5407	-33.0650	-37.3912	-35.6411	-35.1670	-31.9088	-26.5356	-20.5844	-12.7945	-9.4939 (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)

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	1103.7509	1.5816	1745.7424 (275)
Space heating - main system 2	0.0000	0.0000	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	768.0860	1.5223	1169.2367 (278)
Space and water heating			2914.9792 (279)
Pumps, fans and electric keep-hot	134.1687	1.5128	202.9705 (281)
Energy for lighting	134.5506	1.5338	206.3781 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-298.8165	1.4918	-445.7874
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-445.7874 (283)
Total Primary energy kWh/year			2878.5404 (286)
Dwelling Primary energy Rate (DPER)			51.5300 (287)

		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)

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Number of passive vents
Number of flueless gas fires

0 * 10 = 0.0000 (7b)
0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =
Pressure test
Pressure Test Method
Measured/design AP50
Infiltration rate
Number of sides sheltered

Air changes per hour
20.0000 / (5) = 0.1432 (8)
Yes
Blower Door
5.0000 (17)
0.3932 (18)
1 (19)

Shelter factor
Infiltration rate adjusted to include shelter factor (20) = 1 - [0.075 x (19)] = 0.9250 (20)
(21) = (18) x (20) = 0.3637 (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												
	0.4637	0.4547	0.4456	0.4001	0.3910	0.3455	0.3455	0.3364	0.3637	0.3910	0.4092	0.4274 (22b)
Effective ac	0.6075	0.6034	0.5993	0.5800	0.5764	0.5597	0.5597	0.5566	0.5661	0.5764	0.5837	0.5913 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			1.8400	1.0000	1.8400		(26)
TER Opening Type			12.1300	1.1450	13.8893		(27)
External Wall 1	54.8600	12.1300	42.7300	0.1800	7.6914		(29a)
Corridor Wall	4.2800	1.8400	2.4400	0.1800	0.4392		(29a)
Core/stair	16.2500		16.2500	0.1800	2.9250		(29a)
Total net area of external elements Aum(A, m2)			75.3900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.7849		(33)
Main dwelling							
Party Wall 1			24.8500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							310.9909 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	28.4600	0.0700	1.9922
E16 Corner (normal)	8.5500	0.0900	0.7695
E18 Party wall between dwellings	2.8500	0.0600	0.1710
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	10.0400	0.0200	0.2008
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	17.4400	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0900	-0.2565
E7 Party floor between dwellings (in blocks of flats)	14.4000	0.0700	1.0080
E25 Staggered party wall between dwellings	0.0000	0.0600	0.0000
E2 Other lintels (including other steel lintels)	8.5500	0.0500	0.4275
E3 Sill	7.6500	0.0500	0.3825
E4 Jamb	26.1400	0.0500	1.3070
E16 Corner (normal)	2.8500	0.0900	0.2565
E17 Corner (inverted - internal area greater than external area)	0.0000	-0.0900	-0.0000
E18 Party wall between dwellings	0.0000	0.0600	0.0000
E25 Staggered party wall between dwellings	2.8500	0.0600	0.1710
P1 Party wall - Ground floor	0.0000	0.0800	0.0000
E5 Ground floor (normal)	0.0000	0.1600	0.0000
E5 Ground floor (normal)	0.0000	0.1600	0.0000
E14 Flat roof	0.0000	0.0800	0.0000
E15 Flat roof with parapet	0.0000	0.5600	0.0000
P4 Party wall - Roof (insulation at ceiling level)	0.0000	0.1200	0.0000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			6.4295 (36)
Point Thermal Bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 33.2144 (37)

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

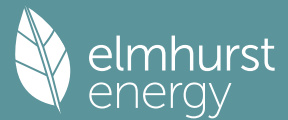
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	27.9978	27.8053	27.6167	26.7308	26.5650	25.7934	25.7934	25.6505	26.0906	26.5650	26.9004	27.2509 (38)
Heat transfer coeff	61.2122	61.0198	60.8311	59.9452	59.7794	59.0078	59.0078	58.8649	59.3050	59.7794	60.1148	60.4653 (39)
Average = Sum(39)m / 12 =												59.9444

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1.0958	1.0924	1.0890	1.0731	1.0702	1.0564	1.0564	1.0538	1.0617	1.0702	1.0762	1.0824 (40)
HLP (average)												1.0731
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.8625 (42)
Hot water usage for mixer showers												
	55.4477	54.6144	53.4002	51.0770	49.3625	47.4505	46.3637	47.5688	48.8897	50.9426	53.3158	55.2353 (42a)
Hot water usage for baths	23.9676	23.6116	23.1103	22.1861	21.4941	20.7267	20.3122	20.8100	21.3519	22.1730	23.1163	23.8865 (42b)
Hot water usage for other uses	33.7040	32.4784	31.2528	30.0272	28.8016	27.5760	27.5760	28.8016	30.0272	31.2528	32.4784	33.7040 (42c)
Average daily hot water use (litres/day)												103.9826 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	113.1192	110.7044	107.7633	103.2903	99.6581	95.7532	94.2519	97.1803	100.2688	104.3684	108.9104	112.8258 (44)
Energy conte	179.1532	157.6416	165.6282	141.3992	134.1590	117.7397	113.9895	120.3295	123.6415	141.6270	155.1628	176.6579 (45)
Energy content (annual)										Total = Sum(45)m =		1727.1290
Distribution loss (46)m = 0.15 x (45)m												
	26.8730	23.6462	24.8442	21.2099	20.1238	17.6610	17.0984	18.0494	18.5462	21.2440	23.2744	26.4987 (46)
Water storage loss (or HIU loss):												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage												
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)

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Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month												
	225.7481	199.7273	212.2231	186.4910	180.7539	162.8315	160.5844	166.9244	168.7333	188.2219	200.2547	223.2528 (62)
WWHRS	-25.3484	-22.4183	-23.4752	-19.4384	-18.1159	-15.5019	-14.5305	-15.4518	-16.0388	-18.9080	-21.4205	-24.8790 (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	200.3997	177.3090	188.7479	167.0527	162.6380	147.3297	146.0539	151.4727	152.6945	169.3139	178.8342	198.3738 (64)
												2040.2200 (64)
12Total per year (kWh/year)												2040 (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												
	96.8444	86.0844	92.3473	83.0887	81.8838	75.2219	75.1774	77.2855	77.1843	84.3669	87.6651	96.0147 (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	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	81.9800	90.7635	81.9800	84.7126	81.9800	84.7126	81.9800	81.9800	84.7126	81.9800	84.7126	81.9800 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	162.3990	164.0842	159.8375	150.7970	139.3849	128.6591	121.4936	119.8084	124.0551	133.0956	144.5077	155.2335 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125 (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)												
	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004 (71)
Water heating gains (Table 5)												
	130.1671	128.1018	124.1227	115.4010	110.0589	104.4749	101.0449	103.8783	107.2004	113.3964	121.7571	129.0520 (72)
Total internal gains	428.4837	436.8871	419.8779	404.8482	385.3613	368.7843	355.4562	356.6044	366.9057	382.4096	404.9151	420.2031 (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			
North				6.2800	10.6334	0.6300	0.7000	0.7700	20.4081 (74)			
East				3.4300	19.6403	0.6300	0.7000	0.7700	20.5880 (76)			
West				2.4200	19.6403	0.6300	0.7000	0.7700	14.5256 (80)			
Solar gains	55.5217	107.6906	179.3942	271.4318	345.5893	360.4906	340.3752	282.9734	211.2462	127.9316	68.9586	45.8889 (83)
Total gains	484.0054	544.5777	599.2721	676.2800	730.9507	729.2749	695.8313	639.5778	578.1519	510.3412	473.8737	466.0920 (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	78.8330	79.0816	79.3268	80.4992	80.7224	81.7780	81.7780	81.9765	81.3682	80.7224	80.2722	79.8068
alpha	6.2555	6.2721	6.2885	6.3666	6.3815	6.4519	6.4519	6.4651	6.4245	6.3815	6.3515	6.3205
util living area	0.9951	0.9888	0.9700	0.8926	0.7240	0.5142	0.3727	0.4224	0.6835	0.9337	0.9880	0.9961 (86)
MIT	20.1230	20.2795	20.5116	20.8019	20.9564	20.9957	20.9995	20.9990	20.9771	20.7636	20.4022	20.1034 (87)
Th 2	20.0043	20.0071	20.0098	20.0228	20.0253	20.0366	20.0366	20.0387	20.0323	20.0253	20.0203	20.0152 (88)
util rest of house												
	0.9932	0.9846	0.9587	0.8580	0.6610	0.4387	0.2914	0.3347	0.5985	0.9033	0.9826	0.9945 (89)
MIT 2	19.0039	19.2039	19.4945	19.8422	19.9949	20.0348	20.0365	20.0385	20.0201	19.8112	19.3709	18.9874 (90)
Living area fraction												
	19.5140	19.6941	19.9581	20.2796	20.4332	20.4727	20.4755	20.4763	20.4563	20.2453	19.8409	19.4961 (92)
MIT												0.0000
Temperature adjustment												
adjusted MIT	19.5140	19.6941	19.9581	20.2796	20.4332	20.4727	20.4755	20.4763	20.4563	20.2453	19.8409	19.4961 (93)

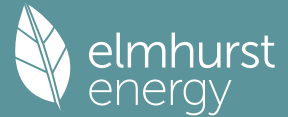
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9919	0.9829	0.9580	0.8680	0.6882	0.4731	0.3285	0.3748	0.6368	0.9112	0.9814	0.9934 (94)
Useful gains	480.0960	535.2669	574.0996	586.9834	503.0611	345.0359	228.5651	239.6849	368.1878	465.0234	465.0543	463.0312 (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	931.2794	902.7348	818.6711	682.1517	522.0636	346.5376	228.6821	239.9500	376.9589	576.5892	765.9190	924.8819 (97)
Space heating kWh	335.6804	246.9384	181.9612	68.5212	14.1379	0.0000	0.0000	0.0000	0.0000	83.0049	216.6226	343.6169 (98a)
Space heating requirement - total per year (kWh/year)												1490.4836
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												
	335.6804	246.9384	181.9612	68.5212	14.1379	0.0000	0.0000	0.0000	0.0000	83.0049	216.6226	343.6169 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1490.4836
Space heating per m ²												26.6825 (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)

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Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	335.6804	246.9384	181.9612	68.5212	14.1379	0.0000	0.0000	0.0000	0.0000	83.0049	216.6226	343.6169 (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)	363.6841	267.5389	197.1411	74.2375	15.3173	0.0000	0.0000	0.0000	0.0000	89.9295	234.6940	372.2827 (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	200.3997	177.3090	188.7479	167.0527	162.6380	147.3297	146.0539	151.4727	152.6945	169.3139	178.8342	198.3738 (64)
Efficiency of water heater	85.2076	84.8028	83.9777	82.2240	80.4521	79.8000	79.8000	79.8000	79.8000	82.5524	84.4908	79.8000 (216)
Fuel for water heating, kWh/month	235.1900	209.0840	224.7595	203.1679	202.1551	184.6237	183.0249	189.8154	191.3465	205.0986	211.6612	85.2797 (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	17.0338	13.6652	12.3040	9.0144	6.9630	5.6888	6.3519	8.2564	10.7243	14.0708	15.8929	17.5072 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-19.1601	-27.9689	-41.6212	-48.5206	-53.8407	-50.8353	-50.2360	-46.6838	-40.6564	-32.7655	-21.4096	-16.4569 (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)	-8.1033	-17.2971	-34.8397	-52.9962	-70.7149	-71.2622	-70.4009	-59.2971	-43.0700	-24.9319	-10.8841	-6.3876 (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												1614.8252 (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												2472.5422 (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)												137.4727 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-920.3402 (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												3390.4999 (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	1614.8252	0.2100	339.1133 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2472.5422	0.2100	519.2339 (264)
Space and water heating			858.3472 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	137.4727	0.1443	19.8416 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-450.1551	0.1338	-60.2481
PV Unit electricity exported	-470.1850	0.1255	-59.0237
Total			-119.2718 (269)
Total CO2, kg/year			770.8462 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.8000 (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	1614.8252	1.1300	1824.7524 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2472.5422	1.1300	2793.9727 (278)
Space and water heating			4618.7252 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	137.4727	1.5338	210.8601 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-450.1551	1.4946	-672.8029
PV Unit electricity exported	-470.1850	0.4608	-216.6498
Total			-889.4527 (283)
Total Primary energy kWh/year			4070.2334 (286)
Target Primary Energy Rate (TPER)			72.8600 (287)

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Plot Reference	C202 - Top			Issued on Date	25/03/2026		
Assessment Reference	1b2p-54-Top		Plot Type Ref	1b2p-54-Top			
Plot Address				SAP Version	10.2		
SAP Rating	76 C		DER	6.34		TER	16.29
Environmental	96 A		% DER < TER				61.08
CO ₂ Emissions (t/year)	0.28		DFEE	44.66		TFEE	46.60
Compliance Check	See BREL		% DFEE < TFEE				4.15
% DPER < TPER	24.48		DPER	65.15		TPER	86.26
Assessor Details	Miss Alicja Kreglewska				Assessor ID	L728-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	55.8600 (1b)	2.5000 (2b)	139.6500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.8600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	139.6500 (5)

2. Ventilation rate

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

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.0000	(17)
Infiltration rate	0.1500	(18)
Number of sides sheltered	1	(19)

Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1388 (21)

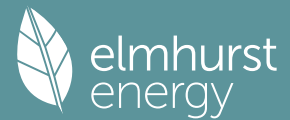
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												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
Main dwelling							
Window			14.2400	0.8687	12.3707		(27)
Door			1.8400	1.0000	1.8400		(26)
External Wall 1	54.8600	14.2400	40.6200	0.1800	7.3116	70.0000	2843.4000 (29a)
Corridor Wall	4.2800	1.8400	2.4400	0.2000	0.4880	70.0000	170.8000 (29a)
Core/stair	16.2500		16.2500	0.2000	3.2500	9.0000	146.2500 (29a)
External Roof 1	55.8600		55.8600	0.0900	5.0274	9.0000	502.7400 (30)
Total net area of external elements Aum (A, m ²)			131.2500				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	30.2877	(33)
Main dwelling							
Party Wall 1			24.8500	0.0000	0.0000	140.0000	3479.0001 (32)
Party Floor 1			55.8600			80.0000	4468.8000 (32d)
Internal Wall 1			75.3000			9.0000	677.7000 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12288.6901 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		219.9909 (35)

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List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	14.2300	0.0600	0.8538
E16 Corner (normal)	8.5500	0.1270	1.0859
E18 Party wall between dwellings	2.8500	0.0250	0.0713
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.0200	0.1000	0.5020
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.7200	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	2.8500	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	7.2000	0.1000	0.7200
E25 Staggered party wall between dwellings	0.0000	0.1200	0.0000
E2 Other lintels (including other steel lintels)	8.5500	0.0170	0.1454
E3 Sill	7.6500	0.0300	0.2295
E4 Jamb	26.1400	0.1200	3.1368
E16 Corner (normal)	2.8500	0.1300	0.3705
E17 Corner (inverted - internal area greater than external area)	0.0000	0.0000	0.0000
E18 Party wall between dwellings	0.0000	0.0900	0.0000
E25 Staggered party wall between dwellings	2.8500	0.0900	0.2565
P1 Party wall - Ground floor	0.0000	0.0500	0.0000
E5 Ground floor (normal)	0.0000	0.1000	0.0000
E5 Ground floor (normal)	0.0000	0.2300	0.0000
E14 Flat roof	2.5100	0.1600	0.4016
E15 Flat roof with parapet	8.5100	0.3000	2.5530
P4 Party wall - Roof (insulation at ceiling level)	8.7200	0.0300	0.2616
E12 Gable (insulation at ceiling level)	10.8400	0.1200	1.3008
E10 Eaves (insulation at ceiling level)	4.6800	0.0900	0.4212
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			12.3098 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss		(33) + (36) + (36a) =	42.5974 (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	12.5307	12.3708	12.2110	11.4117	11.2518	10.4525	10.4525	10.2927	10.7723	11.2518	11.5715	11.8912 (38)
Average = Sum(39)m / 12 =	55.1281	54.9682	54.8084	54.0091	53.8492	53.0499	53.0499	52.8901	53.3697	53.8492	54.1689	54.4886 (39)
HLP	0.9869	0.9840	0.9812	0.9669	0.9640	0.9497	0.9497	0.9468	0.9554	0.9640	0.9697	0.9755 (40)
HLP (average)												0.9661
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

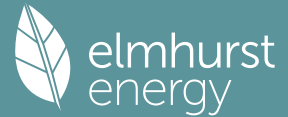
4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.8625 (42)
Hot water usage for mixer showers	55.4477	54.6144	53.4002	51.0770	49.3625	47.4505	46.3637	47.5688	48.8897	50.9426	53.3158	55.2353 (42a)
Hot water usage for baths	23.9676	23.6116	23.1103	22.1861	21.4941	20.7267	20.3122	20.8100	21.3519	22.1730	23.1163	23.8865 (42b)
Hot water usage for other uses	33.7040	32.4784	31.2528	30.0272	28.8016	27.5760	27.5760	28.8016	30.0272	31.2528	32.4784	33.7040 (42c)
Average daily hot water use (litres/day)												103.9826 (43)
Daily hot water use	113.1192	110.7044	107.7633	103.2903	99.6581	95.7532	94.2519	97.1803	100.2688	104.3684	108.9104	112.8258 (44)
Energy content (annual)	179.1532	157.6416	165.6282	141.3992	134.1590	117.7397	113.9895	120.3295	123.6415	141.6270	155.1628	176.6579 (45)
Distribution loss (46)m = 0.15 x (45)m	26.8730	23.6462	24.8442	21.2099	20.1238	17.6610	17.0984	18.0494	18.5462	21.2440	23.2744	26.4987 (46)
Water storage loss (or HIU loss):												200.0000 (47)
Store volume												1.1700 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.6318 (55)
Enter (49) or (54) in (55)												
Total storage loss	19.5858	17.6904	19.5858	18.9540	19.5858	18.9540	19.5858	19.5858	18.9540	19.5858	18.9540	19.5858 (56)
If cylinder contains dedicated solar storage	19.5858	17.6904	19.5858	18.9540	19.5858	18.9540	19.5858	19.5858	18.9540	19.5858	18.9540	19.5858 (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	198.7390	175.3320	185.2140	160.3532	153.7448	136.6937	133.5753	139.9153	142.5955	161.2128	174.1168	196.2437 (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	198.7390	175.3320	185.2140	160.3532	153.7448	136.6937	133.5753	139.9153	142.5955	161.2128	174.1168	196.2437 (64)
12Total per year (kWh/year)												1957.7360 (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	59.5684	52.4158	55.0714	47.0152	44.6079	39.1485	37.9015	40.0096	41.1108	47.0910	51.5916	58.7387 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	81.9116	90.6879	81.9116	84.6420	81.9116	81.9116	81.9116	81.9116	84.6420	81.9116	84.6420	81.9116 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	162.3990	164.0842	159.8375	150.7970	139.3849	128.6591	121.4936	119.8084	124.0551	133.0956	144.5077	155.2335 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125 (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)	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004 (71)
Water heating gains (Table 5)	80.0651	77.9997	74.0207	65.2989	59.9568	54.3728	50.9429	53.7763	57.0983	63.2943	71.6551	78.9499 (72)
Total internal gains	375.3134	383.7095	366.7075	351.6756	332.1910	318.6116	305.2858	306.4340	316.7331	329.2392	351.7425	367.0327 (73)

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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	
North	7.3700		10.6334		0.3800		0.7000		0.7700		14.4462 (74)	
East	4.0300		19.6403		0.3800		0.7000		0.7700		14.5904 (76)	
West	2.8400		19.6403		0.3800		0.7000		0.7700		10.2821 (80)	
Solar gains	39.3187	76.2633	127.0410	192.2161	244.7275	255.2779	241.0341	200.3881	149.5968	90.5973	48.8343	32.4970 (83)
Total gains	414.6321	459.9728	493.7485	543.8917	576.9184	573.8895	546.3199	506.8221	466.3299	419.8365	400.5768	399.5297 (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	61.9199	62.1000	62.2811	63.2028	63.3904	64.3455	64.3455	64.5400	63.9600	63.3904	63.0163	62.6465
alpha	5.1280	5.1400	5.1521	5.2135	5.2260	5.2897	5.2897	5.3027	5.2640	5.2260	5.2011	5.1764
util living area	0.9907	0.9831	0.9655	0.9054	0.7747	0.5760	0.4245	0.4749	0.7276	0.9334	0.9821	0.9922 (86)
MIT	19.8823	20.0507	20.3021	20.6454	20.8814	20.9802	20.9967	20.9942	20.9361	20.6296	20.2090	19.8596 (87)
Th 2	20.0943	20.0967	20.0991	20.1110	20.1134	20.1255	20.1255	20.1279	20.1207	20.1134	20.1086	20.1038 (88)
util rest of house	0.9882	0.9785	0.9561	0.8805	0.7240	0.5035	0.3416	0.3874	0.6556	0.9102	0.9764	0.9901 (89)
MIT 2	19.0838	19.2516	19.4992	19.8323	20.0356	20.1163	20.1245	20.1261	20.0863	19.8268	19.4189	19.0689 (90)
Living area fraction	19.4477	19.6158	19.8652	20.2029	20.4211	20.5100	20.5220	20.5218	20.4736	20.1927	19.7790	19.4293 (92)
MIT	19.4477	19.6158	19.8652	20.2029	20.4211	20.5100	20.5220	20.5218	20.4736	20.1927	19.7790	19.4293 (92)
Temperature adjustment												0.3000
adjusted MIT	19.7477	19.9158	20.1652	20.5029	20.7211	20.8100	20.8220	20.8218	20.7736	20.4927	20.0790	19.7293 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9870	0.9775	0.9569	0.8922	0.7596	0.5607	0.4078	0.4573	0.7102	0.9210	0.9762	0.9890 (94)
Useful gains	409.2579	449.6016	472.4439	485.2459	438.2344	321.7595	222.7928	231.7669	331.1841	386.6771	391.0441	395.1520 (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	851.6033	825.3928	748.9655	626.6622	485.7769	329.4419	223.9794	233.8680	356.1694	532.7130	703.0573	846.1688 (97)
Space heating kWh	329.1049	252.5317	205.7321	101.8198	35.3716	0.0000	0.0000	0.0000	0.0000	108.6507	224.6496	335.5564 (98a)
Space heating requirement - total per year (kWh/year)												1593.4168
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	329.1049	252.5317	205.7321	101.8198	35.3716	0.0000	0.0000	0.0000	0.0000	108.6507	224.6496	335.5564 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1593.4168
Space heating per m2										(98c) / (4) =		28.5252 (99)

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

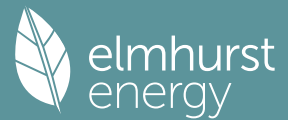
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Fraction of main heating from main system 2												0.0000 (203)
Fraction of total heating from main system 1												1.0000 (204)
Fraction of total heating from main system 2												0.0000 (205)
Efficiency of main space heating system 1 (in %)												100.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	329.1049	252.5317	205.7321	101.8198	35.3716	0.0000	0.0000	0.0000	0.0000	108.6507	224.6496	335.5564 (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)	329.1049	252.5317	205.7321	101.8198	35.3716	0.0000	0.0000	0.0000	0.0000	108.6507	224.6496	335.5564 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Space heating fuel used, main system 2												0.0000 (213)
Water heating												
Water heating requirement	198.7390	175.3320	185.2140	160.3532	153.7448	136.6937	133.5753	139.9153	142.5955	161.2128	174.1168	196.2437 (64)
Efficiency of water heater	254.8850	254.8850	254.8850	254.8850	254.8850	254.8850	254.8850	254.8850	254.8850	254.8850	254.8850	254.8850 (216)
(217)m	254.8850	254.8850	254.8850	254.8850	254.8850	254.8850	254.8850	254.8850	254.8850	254.8850	254.8850	254.8850 (217)
Fuel for water heating, kWh/month	77.9720	68.7887	72.6657	62.9120	60.3193	53.6296	52.4061	54.8935	55.9450	63.2492	68.3119	76.9930 (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	11.3952	10.2924	11.3952	11.0276	11.3952	11.0276	11.3952	11.3952	11.0276	11.3952	11.0276	11.3952 (231)
Lighting	16.6717	13.3747	12.0424	8.8228	6.8150	5.5679	6.2169	8.0809	10.4963	13.7717	15.5551	17.1351 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-11.3062	-17.7569	-28.1727	-34.1972	-38.3579	-35.6411	-35.1670	-31.9088	-26.5356	-21.0584	-12.9604	-9.5764 (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)

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	1593.4168	1.5766	2512.1260 (275)
Space heating - main system 2	0.0000	0.0000	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	768.0860	1.5223	1169.2367 (278)
Space and water heating			3681.3627 (279)
Pumps, fans and electric keep-hot	134.1687	1.5128	202.9705 (281)
Energy for lighting	134.5506	1.5338	206.3781 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-302.6387	1.4923	-451.6403
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-451.6403 (283)
Total Primary energy kWh/year			3639.0710 (286)
Dwelling Primary energy Rate (DPER)			65.1500 (287)

1. Overall dwelling characteristics									
		Area (m ²)		Storey height (m)		Volume (m ³)			
Main dwelling									
Ground floor		55.8600	(1b)	x	2.5000	(2b)	=	139.6500	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.8600								(4)
Dwelling volume					(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	139.6500		(5)

		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)

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Number of blocked chimneys
Number of intermittent extract fans
Number of passive vents
Number of flueless gas fires

0 * 20 = 0.0000 (6f)
2 * 10 = 20.0000 (7a)
0 * 10 = 0.0000 (7b)
0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =
Pressure Test
Pressure Test Method
Measured/design AF50
Infiltration rate
Number of sides sheltered

Air changes per hour
20.0000 / (5) = 0.1432 (8)
Yes
Blower Door
5.0000 (17)
0.3932 (18)
1 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3637 (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	0.4637	0.4547	0.4456	0.4001	0.3910	0.3455	0.3455	0.3364	0.3637	0.3910	0.4092	0.4274 (22b)
Effective ac	0.6075	0.6034	0.5993	0.5800	0.5764	0.5597	0.5597	0.5566	0.5661	0.5764	0.5837	0.5913 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			1.8400	1.0000	1.8400		(26)
TER Opening Type			12.1300	1.1450	13.8893		(27)
External Wall 1	54.8600	12.1300	42.7300	0.1800	7.6914		(29a)
Corridor Wall	4.2800	1.8400	2.4400	0.1800	0.4392		(29a)
Core/stair	16.2500		16.2500	0.1800	2.9250		(29a)
External Roof 1	55.8600		55.8600	0.1100	6.1446		(30)
Total net area of external elements Aum(A, m2)			131.2500				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) = 32.9295		(33)
Main dwelling							
Party Wall 1			24.8500	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 219.9909 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	14.2300	0.0700	0.9961
E16 Corner (normal)	8.5500	0.0900	0.7695
E18 Party wall between dwellings	2.8500	0.0600	0.1710
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.0200	0.0200	0.1004
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.7200	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0900	-0.2565
E7 Party floor between dwellings (in blocks of flats)	7.2000	0.0700	0.5040
E25 Staggered party wall between dwellings	0.0000	0.0600	0.0000
E2 Other lintels (including other steel lintels)	8.5500	0.0500	0.4275
E3 Sill	7.6500	0.0500	0.3825
E4 Jamb	26.1400	0.0500	1.3070
E16 Corner (normal)	2.8500	0.0900	0.2565
E17 Corner (inverted - internal area greater than external area)	0.0000	-0.0900	-0.0000
E18 Party wall between dwellings	0.0000	0.0600	0.0000
E25 Staggered party wall between dwellings	2.8500	0.0600	0.1710
P1 Party wall - Ground floor	0.0000	0.0800	0.0000
E5 Ground floor (normal)	0.0000	0.1600	0.0000
E5 Ground floor (normal)	0.0000	0.1600	0.0000
E14 Flat roof	2.5100	0.0800	0.2008
E15 Flat roof with parapet	8.5100	0.5600	4.7656
P4 Party wall - Roof (insulation at ceiling level)	8.7200	0.1200	1.0464
E12 Gable (insulation at ceiling level)	10.8400	0.0600	0.6504
E10 Eaves (insulation at ceiling level)	4.6800	0.0600	0.2808

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.7730 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 44.7025 (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	27.9978	27.8053	27.6167	26.7308	26.5650	25.7934	25.7934	25.6505	26.0906	26.5650	26.9004	27.2509 (38)
Heat transfer coeff	72.7003	72.5079	72.3192	71.4333	71.2675	70.4959	70.4959	70.3530	70.7931	71.2675	71.6029	71.9534 (39)
Average = Sum(39)m / 12 =												71.4325

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3015	1.2980	1.2947	1.2788	1.2758	1.2620	1.2620	1.2595	1.2673	1.2758	1.2818	1.2881 (40)
HLP (average)												1.2788
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy											1.8625 (42)	
Hot water usage for mixer showers												
55.4477	54.6144	53.4002	51.0770	49.3625	47.4505	46.3637	47.5688	48.8897	50.9426	53.3158	55.2353 (42a)	
Hot water usage for baths												
23.9676	23.6116	23.1103	22.1861	21.4941	20.7267	20.3122	20.8100	21.3519	22.1730	23.1163	23.8865 (42b)	
Hot water usage for other uses												
33.7040	32.4784	31.2528	30.0272	28.8016	27.5760	27.5760	28.8016	30.0272	31.2528	32.4784	33.7040 (42c)	
Average daily hot water use (litres/day)											103.9826 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
	113.1192	110.7044	107.7633	103.2903	99.6581	95.7532	94.2519	97.1803	100.2688	104.3684	108.9104	112.8258 (44)
Energy conte	179.1532	157.6416	165.6282	141.3992	134.1590	117.7397	113.9895	120.3295	123.6415	141.6270	155.1628	176.6579 (45)
Energy content (annual)										Total = Sum(45)m =		1727.1290
Distribution loss (46)m = 0.15 x (45)m												
	26.8730	23.6462	24.8442	21.2099	20.1238	17.6610	17.0984	18.0494	18.5462	21.2440	23.2744	26.4987 (46)
Water storage loss (or HIU loss):												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)

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Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	225.7481	199.7273	212.2231	186.4910	180.7539	162.8315	160.5844	166.9244	168.7333	188.2219	200.2547	223.2528 (62)
WWHRS	-25.3484	-22.4183	-23.4752	-19.4384	-18.1159	-15.5019	-14.5305	-15.4518	-16.0388	-18.9080	-21.4205	-24.8790 (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	200.3997	177.3090	188.7479	167.0527	162.6380	147.3297	146.0539	151.4727	152.6945	169.3139	178.8342	198.3738 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =											2040.2200 (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	96.8444	86.0844	92.3473	83.0887	81.8838	75.2219	75.1774	77.2855	77.1843	84.3669	87.6651	96.0147 (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	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	81.9800	90.7635	81.9800	84.7126	81.9800	84.7126	81.9800	81.9800	84.7126	81.9800	84.7126	81.9800 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	162.3990	164.0842	159.8375	150.7970	139.3849	128.6591	121.4936	119.8084	124.0551	133.0956	144.5077	155.2335 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125 (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)	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004 (71)
Water heating gains (Table 5)	130.1671	128.1018	124.1227	115.4010	110.0589	104.4749	101.0449	103.8783	107.2004	113.3964	121.7571	129.0520 (72)
Total internal gains	428.4837	436.8871	419.8779	404.8482	385.3613	368.7843	355.4562	356.6044	366.9057	382.4096	404.9151	420.2031 (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
North					6.2800	10.6334	0.6300	0.7000			0.7700	20.4081 (74)
East					3.4300	19.6403	0.6300	0.7000			0.7700	20.5880 (76)
West					2.4200	19.6403	0.6300	0.7000			0.7700	14.5256 (80)
Solar gains	55.5217	107.6906	179.3942	271.4318	345.5893	360.4906	340.3752	282.9734	211.2462	127.9316	68.9586	45.8889 (83)
Total gains	484.0054	544.5777	599.2721	676.2800	730.9507	729.2749	695.8313	639.5778	578.1519	510.3412	473.8737	466.0920 (84)

7. Mean internal temperature (heating season)

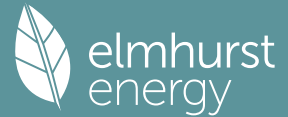
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	46.9534	47.0780	47.2008	47.7862	47.8973	48.4216	48.4216	48.5199	48.2183	47.8973	47.6730	47.4408
alpha	4.1302	4.1385	4.1467	4.1857	4.1932	4.2281	4.2281	4.2347	4.2146	4.1932	4.1782	4.1627
util living area	0.9864	0.9768	0.9554	0.8918	0.7660	0.5849	0.4375	0.4916	0.7347	0.9239	0.9759	0.9883 (86)
MIT	19.4843	19.6917	20.0191	20.4601	20.7873	20.9490	20.9881	20.9809	20.8681	20.4423	19.8995	19.4566 (87)
Th 2	19.8397	19.8424	19.8450	19.8575	19.8598	19.8707	19.8707	19.8727	19.8665	19.8598	19.8551	19.8502 (88)
util rest of house	0.9825	0.9703	0.9425	0.8612	0.7059	0.4946	0.3293	0.3780	0.6489	0.8953	0.9679	0.9849 (89)
MIT 2	18.1125	18.3760	18.7868	19.3263	19.6859	19.8418	19.8669	19.8659	19.7786	19.3211	18.6502	18.0845 (90)
Living area fraction	18.7377	18.9757	19.3485	19.8430	20.1879	20.3465	20.3779	20.3741	20.2752	19.8322	19.2196	18.7099 (92)
MIT	18.7377	18.9757	19.3485	19.8430	20.1879	20.3465	20.3779	20.3741	20.2752	19.8322	19.2196	18.7099 (92)
Temperature adjustment	18.7377	18.9757	19.3485	19.8430	20.1879	20.3465	20.3779	20.3741	20.2752	19.8322	19.2196	18.7099 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	473.1391	524.9245	560.7197	582.1206	529.5337	389.3824	263.4744	274.7937	394.3830	456.4872	455.9194	456.9617 (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	1049.6282	1020.5960	929.1917	781.6975	604.9090	405.1031	266.3271	279.5893	437.1614	657.9534	867.7962	1044.0360 (97)
Space heating kWh	428.9079	333.0912	274.1432	143.6953	56.0792	0.0000	0.0000	0.0000	0.0000	149.8909	296.5513	436.7832 (98a)
Space heating requirement - total per year (kWh/year)												2119.1423
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	428.9079	333.0912	274.1432	143.6953	56.0792	0.0000	0.0000	0.0000	0.0000	149.8909	296.5513	436.7832 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2119.1423
Space heating per m2												(98c) / (4) = 37.9367 (99)

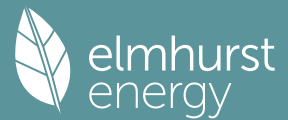
9a. Energy requirements - Individual heating systems, including micro-CHP

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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	428.9079	333.0912	274.1432	143.6953	56.0792	0.0000	0.0000	0.0000	0.0000	149.8909	296.5513	436.7832 (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)	464.6890	360.8789	297.0132	155.6829	60.7575	0.0000	0.0000	0.0000	0.0000	162.3953	321.2907	473.2213 (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	200.3997	177.3090	188.7479	167.0527	162.6380	147.3297	146.0539	151.4727	152.6945	169.3139	178.8342	198.3738 (64)
Efficiency of water heater												79.8000 (216)
(217)m	85.7213	85.4520	84.8958	83.7239	81.9291	79.8000	79.8000	79.8000	79.8000	83.7876	85.1858	85.7785 (217)
Fuel for water heating, kWh/month	233.7805	207.4954	222.3289	199.5282	198.5108	184.6237	183.0249	189.8154	191.3465	202.0750	209.9343	231.2628 (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	17.0338	13.6652	12.3040	9.0144	6.9630	5.6888	6.3519	8.2564	10.7243	14.0708	15.8929	17.5072 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-19.1601	-27.9689	-41.6212	-48.5206	-53.8407	-50.8353	-50.2360	-46.6838	-40.6564	-32.7655	-21.4096	-16.4569 (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	-8.1033	-17.2971	-34.8397	-52.9962	-70.7149	-71.2622	-70.4009	-59.2971	-43.0700	-24.9319	-10.8841	-6.3876 (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												2295.9288 (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												2453.7262 (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)												137.4727 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-920.3402 (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												4052.7875 (238)
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP												
	Energy							Emission factor			Emissions	
	kWh/year							kg CO2/kWh			kg CO2/year	
Space heating - main system 1	2295.9288							0.2100			482.1450 (261)	
Total CO2 associated with community systems											0.0000 (373)	
Water heating (other fuel)	2453.7262							0.2100			515.2825 (264)	
Space and water heating											997.4275 (265)	
Pumps, fans and electric keep-hot	86.0000							0.1387			11.9293 (267)	
Energy for lighting	137.4727							0.1443			19.8416 (268)	
Energy saving/generation technologies												
PV Unit electricity used in dwelling	-450.1551							0.1338			-60.2481	
PV Unit electricity exported	-470.1850							0.1255			-59.0237	
Total											-119.2718 (269)	
Total CO2, kg/year											909.9266 (272)	
EPC Target Carbon Dioxide Emission Rate (TER)											16.2900 (273)	
13a. Primary energy - Individual heating systems including micro-CHP												
	Energy							Primary energy factor			Primary energy	
	kWh/year							kg CO2/kWh			kWh/year	
Space heating - main system 1	2295.9288							1.1300			2594.3995 (275)	
Total CO2 associated with community systems											0.0000 (473)	
Water heating (other fuel)	2453.7262							1.1300			2772.7106 (278)	
Space and water heating											5367.1101 (279)	
Pumps, fans and electric keep-hot	86.0000							1.5128			130.1008 (281)	
Energy for lighting	137.4727							1.5338			210.8601 (282)	
Energy saving/generation technologies												
PV Unit electricity used in dwelling	-450.1551							1.4946			-672.8029	
PV Unit electricity exported	-470.1850							0.4608			-216.6498	
Total											-889.4527 (283)	
Total Primary energy kWh/year											4818.6184 (286)	
Target Primary Energy Rate (TPER)											86.2600 (287)	

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Plot Reference	D1 - semi				Issued on Date	25/03/2026	
Assessment Reference	D1 - semi			Plot Type Ref	D1 - semi		
Plot Address					SAP Version	10.2	
SAP Rating	83 B	DER	3.58	TER	11.94		
Environmental	97 A	% DER < TER				70.02	
CO ₂ Emissions (t/year)	0.29	DFEE	44.09	TFEE	43.10		
Compliance Check	See BREL	% DFEE < TFEE				-2.28	
% DPER < TPER	39.90	DPER	37.51	TPER	62.41		
Assessor Details	Miss Alicja Kreglewska				Assessor ID	L728-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	45.9700 (1b)	x 2.5000 (2b)	= 114.9250 (1b) - (3b)
First floor	46.0100 (1c)	x 2.5000 (2c)	= 115.0250 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.9800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	229.9500 (5)

2. Ventilation rate

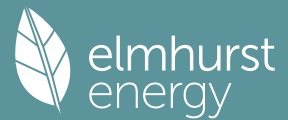
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1388 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												79.2000 (23c)
Effective ac	0.2809	0.2774	0.2740	0.2566	0.2532	0.2358	0.2358	0.2323	0.2427	0.2532	0.2601	0.2670 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			21.7000	0.8687	18.8514		(27)
Door			2.4200	1.2000	2.9040		(26)
Ground floor			45.9700	0.1000	4.5970	110.0000	5056.7000 (28a)
External Wall 1	135.3800	24.1200	111.2600	0.1800	20.0268	70.0000	7788.2003 (29a)
Plane roof	46.0100		46.0100	0.0900	4.1409	9.0000	414.0900 (30)
Total net area of external elements Aum (A, m ²)			227.3600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		50.5201		(33)
Main dwelling							
Party Wall			24.0500	0.0000	0.0000	140.0000	3366.9999 (32)
Internal Wall 1			183.0500			9.0000	1647.4500 (32c)
Internal Floor 1			46.0100			18.0000	828.1800 (32d)
Internal Ceiling 1			45.9700			9.0000	413.7300 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	19515.3503 (34)

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

212.1695 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	0.0000	0.0600	0.0000
E7 Party floor between dwellings (in blocks of flats)	17.1000	0.1270	2.1717
E16 Corner (normal)	0.0000	0.0250	0.0000
E18 Party wall between dwellings	0.0000	0.1000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	0.0000	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	0.0000	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	0.0000	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	0.0000	0.1000	0.0000
E25 Staggered party wall between dwellings	11.4000	0.1200	1.3680
E2 Other lintels (including other steel lintels)	13.2900	0.0170	0.2259
E3 Sill	12.2800	0.0300	0.3684
E4 Jamb	38.0000	0.1200	4.5600
E16 Corner (normal)	0.0000	0.1300	0.0000
E17 Corner (inverted - internal area greater than external area)	0.0000	0.0000	0.0000
E18 Party wall between dwellings	0.0000	0.0900	0.0000
E25 Staggered party wall between dwellings	0.0000	0.0900	0.0000
P1 Party wall - Ground floor	4.2400	0.0500	0.2120
E5 Ground floor (normal)	23.7600	0.1000	2.3760
E5 Ground floor (normal)	0.0000	0.2300	0.0000
E14 Flat roof	0.0000	0.1600	0.0000
E15 Flat roof with parapet	0.0000	0.3000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	4.2000	0.0300	0.1260
E6 Intermediate floor within a dwelling	23.7400	0.1400	3.3236
E10 Eaves (insulation at ceiling level)	17.7000	0.1200	2.1240
P2 Party wall - Intermediate floor within a dwelling	4.2000	0.0000	0.0000
E12 Gable (insulation at ceiling level)	6.5300	0.1200	0.7836

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

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 68.1593 (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	21.3161	21.0529	20.7897	19.4736	19.2104	17.8943	17.8943	17.6311	18.4207	19.2104	19.7368	20.2633	(38)
Heat transfer coeff	89.4754	89.2122	88.9490	87.6329	87.3697	86.0536	86.0536	85.7903	86.5800	87.3697	87.8961	88.4225	(39)
Average = Sum(39)m / 12 =												87.5671	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9728	0.9699	0.9670	0.9527	0.9499	0.9356	0.9356	0.9327	0.9413	0.9499	0.9556	0.9613	(40)
HLP (average)												0.9520	
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy

2.6519 (42)

Hot water usage for mixer showers

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	68.6828	67.6506	66.1465	63.2688	61.1451	58.7767	57.4305	58.9232	60.5595	63.1024	66.0420	68.4196	(42a)
Hot water usage for baths	29.6591	29.2186	28.5983	27.4546	26.5982	25.6486	25.1357	25.7516	26.4223	27.4384	28.6057	29.5588	(42b)
Hot water usage for other uses	41.7877	40.2682	38.7486	37.2291	35.7095	34.1900	34.1900	35.7095	37.2291	38.7486	40.2682	41.7877	(42c)
Average daily hot water use (litres/day)												128.8107	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	140.1296	137.1374	133.4935	127.9525	123.4528	118.6153	116.7562	120.3844	124.2109	129.2894	134.9158	139.7662	(44)
Energy conte	221.9310	195.2818	205.1745	175.1605	166.1912	145.8513	141.2065	149.0610	153.1644	175.4445	192.2123	218.8401	(45)
Energy content (annual)										Total = Sum(45)m =		2139.5191	

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

33.2897 29.2923 30.7762 26.2741 24.9287 21.8777 21.1810 22.3592 22.9747 26.3167 28.8318 32.8260 (46)

Water storage loss (or HIU loss):

Store volume

150.0000 (47)

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

1.3900 (48)

Temperature factor from Table 2b

0.5400 (49)

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

0.7506 (55)

Total storage loss

23.2686 21.0168 23.2686 22.5180 23.2686 22.5180 23.2686 23.2686 22.5180 23.2686 22.5180 23.2686 (56)

If cylinder contains dedicated solar storage

23.2686 21.0168 23.2686 22.5180 23.2686 22.5180 23.2686 23.2686 22.5180 23.2686 22.5180 23.2686 (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

268.4620 237.3098 251.7055 220.1905 212.7222 190.8813 187.7375 195.5920 198.1944 221.9755 237.2423 265.3711 (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 268.4620 237.3098 251.7055 220.1905 212.7222 190.8813 187.7375 195.5920 198.1944 221.9755 237.2423 265.3711 (64)

Total per year (kWh/year) = Sum(64)m = 2687.3841 (64)

2687 (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

111.0169 98.5536 105.4453 94.2649 92.4834 84.5196 84.1760 86.7876 86.9512 95.5601 99.9346 109.9891 (65)

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

Metabolic gains (Table 5), Watts

(66)m 132.5932 132.5932 132.5932 132.5932 132.5932 132.5932 132.5932 132.5932 132.5932 132.5932 132.5932 132.5932 (66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

122.4010 135.5154 122.4010 126.4810 122.4010 126.4810 122.4010 122.4010 122.4010 126.4810 122.4010 126.4810 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

242.6736 245.1918 238.8460 225.3367 208.2835 192.2559 181.5485 179.0303 185.3761 198.8855 215.9386 231.9662 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

36.2593 36.2593 36.2593 36.2593 36.2593 36.2593 36.2593 36.2593 36.2593 36.2593 36.2593 36.2593 (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)

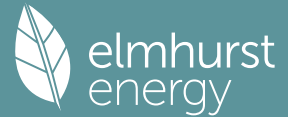
Losses e.g. evaporation (negative values) (Table 5)

-106.0745 -106.0745 -106.0745 -106.0745 -106.0745 -106.0745 -106.0745 -106.0745 -106.0745 -106.0745 -106.0745 -106.0745 (71)

Water heating gains (Table 5)

149.2162 146.6571 141.7276 130.9234 124.3056 117.3883 113.1397 116.6500 120.7655 128.4410 138.7980 147.8348 (72)

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Total internal gains
577.0687 590.1423 565.7525 545.5190 517.7680 498.9031 479.8672 480.8592 495.4005 512.5054 543.9956 564.9800 (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	
East	14.6300		19.6403		0.3800		0.7000		0.7700		52.9671 (76)	
West	7.0700		19.6403		0.3800		0.7000		0.7700		25.5966 (80)	
Solar gains	78.5637	153.6873	253.1010	369.1328	452.3861	463.0976	440.8878	378.7161	294.3670	182.3629	97.9597	64.6070 (83)
Total gains	655.6324	743.8295	818.8536	914.6518	970.1541	962.0008	920.7550	859.5753	789.7675	694.8682	641.9553	629.5869 (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	60.5857	60.7644	60.9443	61.8595	62.0459	62.9948	62.9948	63.1881	62.6118	62.0459	61.6743	61.3071
alpha	5.0390	5.0510	5.0630	5.1240	5.1364	5.1997	5.1997	5.2125	5.1741	5.1364	5.1116	5.0871
util living area	0.9911	0.9823	0.9609	0.8918	0.7550	0.5586	0.4088	0.4548	0.7035	0.9265	0.9820	0.9926 (86)
Living	19.8396	20.0297	20.3081	20.6623	20.8894	20.9815	20.9969	20.9948	20.9422	20.6343	20.1843	19.8145
Non living	19.0535	19.2429	19.5162	19.8581	20.0525	20.1286	20.1365	20.1381	20.1013	19.8420	19.4066	19.0363
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	20.4064	20.0297	20.3081	20.6623	20.8894	20.9815	20.9969	20.9948	20.9422	20.6343	20.1843	19.9804 (87)
Th 2	20.1061	20.1085	20.1109	20.1229	20.1253	20.1374	20.1374	20.1398	20.1325	20.1253	20.1205	20.1157 (88)
util rest of house	0.9887	0.9777	0.9507	0.8655	0.7044	0.4888	0.3299	0.3719	0.6327	0.9024	0.9765	0.9907 (89)
MIT 2	19.5676	19.2429	19.5162	19.8581	20.0525	20.1286	20.1365	20.1381	20.1013	19.8420	19.4066	19.1872 (90)
Living area fraction	19.8064	19.4669	19.7417	20.0871	20.2908	20.3715	20.3815	20.3821	20.3407	20.0675	19.6280	19.4131 (92)
MIT	19.8064	19.4669	19.7417	20.0871	20.2908	20.3715	20.3815	20.3821	20.3407	20.0675	19.6280	0.0000
Temperature adjustment	19.8064	19.4669	19.7417	20.0871	20.2908	20.3715	20.3815	20.3821	20.3407	20.0675	19.6280	19.4131 (93)
adjusted MIT	19.8064	19.4669	19.7417	20.0871	20.2908	20.3715	20.3815	20.3821	20.3407	20.0675	19.6280	19.4131 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9878	0.9736	0.9456	0.8643	0.7146	0.5081	0.3524	0.3955	0.6506	0.9005	0.9725	0.9887 (94)
Useful gains	647.6326	724.1644	774.3242	790.5267	693.2344	488.8027	324.4661	339.9409	513.8366	625.7439	624.3305	622.4767 (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	1387.4445	1299.5458	1177.8357	980.3574	750.5778	496.6549	325.4102	341.6240	540.3229	827.1766	1101.1645	1345.1789 (97)
Space heating kWh	550.4200	386.6563	300.2126	136.6781	42.6635	0.0000	0.0000	0.0000	0.0000	149.8659	343.3205	537.6904 (98a)
Space heating requirement - total per year (kWh/year)												2447.5073
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	550.4200	386.6563	300.2126	136.6781	42.6635	0.0000	0.0000	0.0000	0.0000	149.8659	343.3205	537.6904 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2447.5073
Space heating per m2										(98c) / (4) =		26.6091 (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 %)												311.2356 (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	550.4200	386.6563	300.2126	136.6781	42.6635	0.0000	0.0000	0.0000	0.0000	149.8659	343.3205	537.6904 (98)
Space heating efficiency (main heating system 1)	311.2356	311.2356	311.2356	311.2356	311.2356	0.0000	0.0000	0.0000	0.0000	311.2356	311.2356	311.2356 (210)
Space heating fuel (main heating system)	176.8499	124.2327	96.4583	43.9147	13.7078	0.0000	0.0000	0.0000	0.0000	48.1519	110.3089	172.7599 (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	268.4620	237.3098	251.7055	220.1905	212.7222	190.8813	187.7375	195.5920	198.1944	221.9755	237.2423	265.3711 (64)
Efficiency of water heater	202.5797	202.5797	202.5797	202.5797	202.5797	202.5797	202.5797	202.5797	202.5797	202.5797	202.5797	202.5797 (216)
Fuel for water heating, kWh/month	132.5217	117.1439	124.2501	108.6933	105.0067	94.2253	92.6734	96.5507	97.8353	109.5744	117.1106	130.9959 (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	20.2526	18.2927	20.2526	19.5993	20.2526	19.5993	20.2526	20.2526	19.5993	20.2526	19.5993	20.2526 (231)
Lighting	24.9127	19.9859	17.9951	13.1840	10.1837	8.3201	9.2899	12.0753	15.6847	20.5791	23.2441	25.6051 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-11.3195	-17.8174	-28.5208	-35.4897	-41.2979	-39.5708	-39.0534	-35.1694	-28.8940	-21.6107	-13.0270	-9.5720 (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)												

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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	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												786.3840	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												202.5797	
Water heating fuel used												1326.5813	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.8500)													
mechanical ventilation fans (SFP = 0.8500)												238.4581	(230a)
Total electricity for the above, kWh/year												238.4581	(231)
Electricity for lighting (calculated in Appendix L)												201.0596	(232)

Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-321.3426	(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												2231.1403	(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	786.3840	0.1563	122.9163	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1326.5813	0.1410	187.0399	(264)
Space and water heating			309.9561	(265)
Pumps, fans and electric keep-hot	238.4581	0.1387	33.0771	(267)
Energy for lighting	201.0596	0.1443	29.0191	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-321.3426	0.1326	-42.5997	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-42.5997	(269)
Total CO2, kg/year			329.4526	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.5800	(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	786.3840	1.5786	1241.4243	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1326.5813	1.5213	2018.1931	(278)
Space and water heating			3259.6174	(279)
Pumps, fans and electric keep-hot	238.4581	1.5128	360.7395	(281)
Energy for lighting	201.0596	1.5338	308.3919	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-321.3426	1.4898	-478.7475	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-478.7475	(283)
Total Primary energy kWh/year			3450.0012	(286)
Dwelling Primary energy Rate (DPER)			37.5100	(287)

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

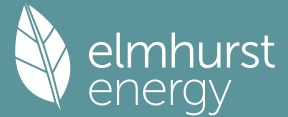
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	45.9700 (1b)	x 2.5000 (2b)	= 114.9250 (1b) - (3b)	
First floor	46.0100 (1c)	x 2.5000 (2c)	= 115.0250 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.9800		(4)	
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 229.9500 (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)

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Number of flues attached to solid fuel boiler
Number of flues attached to other heater
Number of blocked chimneys
Number of intermittent extract fans
Number of passive vents
Number of flueless gas fires

0 * 20 = 0.0000 (6d)
0 * 35 = 0.0000 (6e)
0 * 20 = 0.0000 (6f)
3 * 10 = 30.0000 (7a)
0 * 10 = 0.0000 (7b)
0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 30.0000
Pressure test
Pressure Test Method
Measured/design AP50
Infiltration rate
Number of sides sheltered
Shelter factor
Infiltration rate adjusted to include shelter factor

Air changes per hour
(5) = 0.1305 (8)
Yes
Blower Door
5.0000 (17)
0.3805 (18)
1 (19)
(20) = 1 - [0.075 x (19)] = 0.9250 (20)
(21) = (18) x (20) = 0.3519 (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	0.4487	0.4399	0.4311	0.3871	0.3783	0.3343	0.3343	0.3255	0.3519	0.3783	0.3959	0.4135	(22b)
Effective ac	0.6007	0.5968	0.5929	0.5749	0.5716	0.5559	0.5559	0.5530	0.5619	0.5716	0.5784	0.5855	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			2.4200	1.0000	2.4200		(26)
TER Opening Type			20.5800	1.1450	23.5649		(27)
Ground floor			45.9700	0.1300	5.9761		(28a)
External Wall 1	135.3800	23.0000	112.3800	0.1800	20.2284		(29a)
Plane roof	46.0100		46.0100	0.1100	5.0611		(30)
Total net area of external elements Aum(A, m2)			227.3600				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 57.2505		(33)
Main dwelling							
Party Wall			24.0500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							212.1695 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	0.0000	0.0700	0.0000
E16 Corner (normal)	17.1000	0.0900	1.5390
E18 Party wall between dwellings	0.0000	0.0600	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	0.0000	0.0200	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	0.0000	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	0.0000	-0.0900	-0.0000
E7 Party floor between dwellings (in blocks of flats)	0.0000	0.0700	0.0000
E25 Staggered party wall between dwellings	11.4000	0.0600	0.6840
E2 Other lintels (including other steel lintels)	13.2900	0.0500	0.6645
E3 Sill	12.2800	0.0500	0.6140
E4 Jamb	38.0000	0.0500	1.9000
E16 Corner (normal)	0.0000	0.0900	0.0000
E17 Corner (inverted - internal area greater than external area)	0.0000	-0.0900	-0.0000
E18 Party wall between dwellings	0.0000	0.0600	0.0000
E25 Staggered party wall between dwellings	0.0000	0.0600	0.0000
P1 Party wall - Ground floor	4.2400	0.0800	0.3392
E5 Ground floor (normal)	23.7600	0.1600	3.8016
E5 Ground floor (normal)	0.0000	0.1600	0.0000
E14 Flat roof	0.0000	0.0800	0.0000
E15 Flat roof with parapet	0.0000	0.5600	0.0000
P4 Party wall - Roof (insulation at ceiling level)	4.2000	0.1200	0.5040
E6 Intermediate floor within a dwelling	23.7400	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	17.7000	0.0600	1.0620
P2 Party wall - Intermediate floor within a dwelling	4.2000	0.0000	0.0000
E12 Gable (insulation at ceiling level)	6.5300	0.0600	0.3918
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			11.5001 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 68.7506 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	45.5809	45.2843	44.9935	43.6278	43.3723	42.1828	42.1828	41.9625	42.6410	43.3723	43.8892	44.4296	(38)
Heat transfer coeff	114.3315	114.0349	113.7441	112.3784	112.1229	110.9334	110.9334	110.7131	111.3916	112.1229	112.6398	113.1802	(39)
Average = Sum(39)m / 12 =												112.3772	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2430	1.2398	1.2366	1.2218	1.2190	1.2061	1.2061	1.2037	1.2110	1.2190	1.2246	1.2305	(40)
HLP (average)												1.2218	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6519 (42)

Hot water usage for mixer showers 68.6828 67.6506 66.1465 63.2688 61.1451 58.7767 57.4305 58.9232 60.5595 63.1024 66.0420 68.4196 (42a)

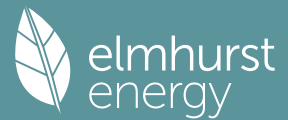
Hot water usage for baths 29.6591 29.2186 28.5983 27.4546 26.5982 25.6486 25.1357 25.7516 26.4223 27.4384 28.6057 29.5588 (42b)

Hot water usage for other uses 41.7877 40.2682 38.7486 37.2291 35.7095 34.1900 34.1900 35.7095 37.2291 38.7486 40.2682 41.7877 (42c)

Average daily hot water use (litres/day) 128.8107 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	140.1296	137.1374	133.4935	127.9525	123.4528	118.6153	116.7562	120.3844	124.2109	129.2894	134.9158	139.7662	(44)
Energy conte	221.9310	195.2818	205.1745	175.1605	166.1912	145.8513	141.2065	149.0610	153.1644	175.4445	192.2123	218.8401	(45)
Energy content (annual)										Total = Sum(45)m =		2139.5191	
Distribution loss (46)m = 0.15 x (45)m													
33.2897 29.2923 30.7762 26.2741 24.9287 21.8777 21.1810 22.3592 22.9747 26.3167 28.8318 32.8260													(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)

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a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage												
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	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												
268.5259	237.3675	251.7694	220.2524	212.7861	190.9432	187.8014	195.6559	198.2562	222.0394	237.3041	265.4350	(62)
WWHRS	-31.3989	-27.7694	-29.0786	-24.0782	-22.4400	-19.2021	-17.9989	-19.1400	-19.8672	-23.4213	-26.5334	(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												
237.1270	209.5981	222.6908	196.1742	190.3461	171.7411	169.8025	176.5159	178.3890	198.6181	210.7707	234.6175	(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												
111.0680	98.5998	105.4964	94.3143	92.5345	84.5690	84.2271	86.8387	87.0006	95.6112	99.9841	110.0402	(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	132.5932	132.5932	132.5932	132.5932	132.5932	132.5932	132.5932	132.5932	132.5932	132.5932	132.5932	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
122.3931	135.5067	122.3931	126.4729	122.3931	126.4729	122.3931	122.3931	126.4729	122.3931	126.4729	122.3931	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
242.6736	245.1918	238.8460	225.3367	208.2835	192.2559	181.5485	179.0303	185.3761	198.8855	215.9386	231.9662	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
36.2593	36.2593	36.2593	36.2593	36.2593	36.2593	36.2593	36.2593	36.2593	36.2593	36.2593	36.2593	(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)												
-106.0745	-106.0745	-106.0745	-106.0745	-106.0745	-106.0745	-106.0745	-106.0745	-106.0745	-106.0745	-106.0745	-106.0745	(71)
Water heating gains (Table 5)												
149.2849	146.7259	141.7963	130.9921	124.3743	117.4570	113.2084	116.7187	120.8342	128.5097	138.8667	147.9035	(72)
Total internal gains												
580.1296	593.2023	568.8134	548.5797	520.8289	498.9638	479.9280	480.9201	495.4612	515.5663	547.0562	568.0408	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d			Gains W
East					13.8700	19.6403	0.6300	0.7000	0.7700			83.2522 (76)
West					6.7100	19.6403	0.6300	0.7000	0.7700			40.2756 (80)
Solar gains	123.5277	241.6465	397.9573	580.3970	711.2983	728.1404	693.2194	595.4652	462.8408	286.7339	154.0246	101.5832 (83)
Total gains	703.6574	834.8488	966.7707	1128.9767	1232.1272	1227.1042	1173.1474	1076.3853	958.3020	802.3002	701.0808	669.6241 (84)

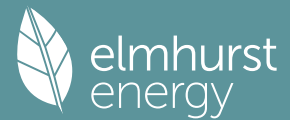
7. Mean internal temperature (heating season)

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	47.4141	47.5375	47.6590	48.2382	48.3481	48.8665	48.8665	48.9638	48.6655	48.3481	48.1262	47.8965
alpha	4.1609	4.1692	4.1773	4.2159	4.2232	4.2578	4.2578	4.2643	4.2444	4.2232	4.2084	4.1931
util living area	0.9900	0.9792	0.9526	0.8752	0.7358	0.5534	0.4102	0.4627	0.7112	0.9251	0.9809	0.9918 (86)
MIT	19.4249	19.6764	20.0528	20.5152	20.8223	20.9596	20.9910	20.9853	20.8862	20.4467	19.8554	19.3889 (87)
Th 2	19.8858	19.8883	19.8908	19.9026	19.9048	19.9152	19.9152	19.9171	19.9112	19.9048	19.9004	19.8957 (88)
util rest of house	0.9872	0.9736	0.9396	0.8431	0.6763	0.4692	0.3119	0.3587	0.6279	0.8979	0.9747	0.9895 (89)
MIT 2	18.0737	18.3933	18.8649	19.4263	19.7596	19.8920	19.9121	19.9116	19.8348	19.3641	18.6315	18.0346 (90)
Living area fraction									FLA = Living area / (4) =			0.2847 (91)
MIT	18.4584	18.7587	19.2031	19.7363	20.0622	20.1960	20.2193	20.2173	20.1342	19.6724	18.9800	18.4202 (92)
Temperature adjustment												0.0000
adjusted MIT	18.4584	18.7587	19.2031	19.7363	20.0622	20.1960	20.2193	20.2173	20.1342	19.6724	18.9800	18.4202 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9821	0.9658	0.9294	0.8376	0.6854	0.4918	0.3399	0.3882	0.6463	0.8909	0.9675	0.9851 (94)
Useful gains	691.0661	806.2623	898.5419	945.6051	844.5542	603.4436	398.7441	417.8246	619.3983	714.7419	678.3179	659.6270 (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	1618.7552	1580.3717	1444.9032	1217.7714	937.5938	620.7794	401.5022	422.6246	672.1536	1017.2186	1338.1606	1609.4494 (97)
Space heating kWh	690.2007	520.2015	406.4928	195.9598	69.2214	0.0000	0.0000	0.0000	0.0000	225.0427	475.0868	706.6678 (98a)
Space heating requirement - total per year (kWh/year)												3288.8736
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	690.2007	520.2015	406.4928	195.9598	69.2214	0.0000	0.0000	0.0000	0.0000	225.0427	475.0868	706.6678 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3288.8736
Space heating per m2										(98c) / (4) =		35.7564 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													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	690.2007	520.2015	406.4928	195.9598	69.2214	0.0000	0.0000	0.0000	0.0000	225.0427	475.0868	706.6678	(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)	747.7798	563.5986	440.4039	212.3074	74.9961	0.0000	0.0000	0.0000	0.0000	243.8166	514.7203	765.6206	(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	237.1270	209.5981	222.6908	196.1742	190.3461	171.7411	169.8025	176.5159	178.3890	198.6181	210.7707	234.6175	(64)
Efficiency of water heater (217)m	86.3108	86.0139	85.3914	84.0573	82.0168	79.8000	79.8000	79.8000	79.8000	84.3406	85.8254	79.8000	(216)
Fuel for water heating, kWh/month	274.7361	243.6792	260.7884	233.3814	232.0819	215.2144	212.7851	221.1979	223.5451	235.4953	245.5808	271.6361	(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	25.4309	20.4016	18.3694	13.4582	10.3955	8.4932	9.4831	12.3265	16.0109	21.0072	23.7276	26.1377	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-42.3676	-59.4079	-84.9381	-94.9701	-101.9482	-94.9683	-93.7550	-88.7032	-79.7624	-67.6354	-46.4473	-36.6640	(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	-24.9415	-52.3473	-103.8327	-155.6597	-205.5609	-206.4722	-204.0795	-172.9480	-126.9456	-74.8108	-33.2811	-19.7357	(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												3563.2433	(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												2870.1217	(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)												205.2418	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2272.1825	(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												4452.4243	(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	3563.2433	0.2100	748.2811	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2870.1217	0.2100	602.7256	(264)
Space and water heating			1351.0067	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	205.2418	0.1443	29.6227	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-891.5676	0.1347	-120.1016	
PV Unit electricity exported	-1380.6149	0.1259	-173.8844	
Total			-293.9860	(269)
Total CO2, kg/year			1098.5727	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.9400	(273)

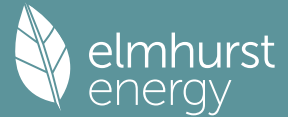
13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3563.2433	1.1300	4026.4649	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2870.1217	1.1300	3243.2376	(278)
Space and water heating			7269.7025	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	205.2418	1.5338	314.8067	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-891.5676	1.4979	-1335.4487	
PV Unit electricity exported	-1380.6149	0.4623	-638.2782	
Total			-1973.7269	(283)
Total Primary energy kWh/year			5740.8831	(286)

Target Primary Energy Rate (TPER)

62.4100 (287)

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Plot Reference	H02 - terrace				Issued on Date	25/03/2026	
Assessment Reference	H02 - terrace			Plot Type Ref	H02 - terrace		
Plot Address					SAP Version	10.2	
SAP Rating	86 B	DER	2.78	TER	9.78		
Environmental	98 A	% DER < TER				71.57	
CO ₂ Emissions (t/year)	0.25	DFEE	31.89	TFEE	34.92		
Compliance Check	See BREL	% DFEE < TFEE				8.68	
% DPER < TPER	42.40	DPER	29.32	TPER	50.90		
Assessor Details	Miss Alicja Kreglewska				Assessor ID	L728-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	51.5600 (1b)	x 2.5000 (2b)	= 128.9000 (1b) - (3b)
First floor	49.6200 (1c)	x 2.5000 (2c)	= 124.0500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	101.1800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 252.9500 (5)

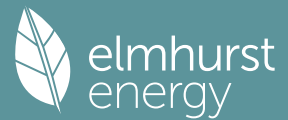
2. Ventilation rate

	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 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	0.1626	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) =												80.1000 (23c)
Effective ac	0.2621	0.2589	0.2557	0.2397	0.2366	0.2206	0.2206	0.2174	0.2270	0.2366	0.2429	0.2493 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			17.1000	0.8687	14.8552		(27)
Door			2.4200	1.2000	2.9040		(26)
Ground floor			51.5600	0.1000	5.1560	110.0000	5671.6000 (28a)
External Wall 1	65.0100	19.5200	45.4900	0.1800	8.1882	70.0000	3184.3001 (29a)
Plane roof	37.7500		37.7500	0.0900	3.3975	9.0000	339.7500 (30)
Flat roof	11.8700		11.8700	0.1100	1.3057	9.0000	106.8300 (30)
Total net area of external elements A _{um} (A _m , m ²)			166.1900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		35.8066		(33)
Main dwelling							
Party Wall			104.4500	0.0000	0.0000	140.0000	14622.9996 (32)
Internal Wall 1			162.8500			9.0000	1465.6501 (32c)
Internal Floor 1			49.6200			18.0000	893.1600 (32d)
Internal Ceiling 1			49.6200			9.0000	446.5800 (32e)

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Heat capacity $C_m = \text{Sum}(A \times k)$

Thermal mass parameter (TMP) = C_m / TFA in $\text{kJ/m}^2\text{K}$

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	0.0000	0.0600	0.0000
E16 Corner (normal)	2.8500	0.1270	0.3619
E18 Party wall between dwellings	19.9500	0.0250	0.4988
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	0.0000	0.1000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	0.0000	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	2.8500	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	0.0000	0.1000	0.0000
E25 Staggered party wall between dwellings	2.8500	0.1200	0.3420
E2 Other lintels (including other steel lintels)	9.9700	0.0170	0.1695
E3 Sill	8.9600	0.0300	0.2688
E4 Jamb	29.4000	0.1200	3.5280
E16 Corner (normal)	0.0000	0.1300	0.0000
E17 Corner (inverted - internal area greater than external area)	0.0000	0.0000	0.0000
E18 Party wall between dwellings	0.0000	0.0900	0.0000
E25 Staggered party wall between dwellings	0.0000	0.0900	0.0000
P1 Party wall - Ground floor	18.6400	0.0500	0.9320
E5 Ground floor (normal)	11.1200	0.1000	1.1120
E5 Ground floor (normal)	0.0000	0.2300	0.0000
E14 Flat roof	0.0000	0.1600	0.0000
E15 Flat roof with parapet	5.0200	0.3000	1.5060
P4 Party wall - Roof (insulation at ceiling level)	18.0100	0.0300	0.5403
E6 Intermediate floor within a dwelling	11.6900	0.1400	1.6366
E10 Eaves (insulation at ceiling level)	5.9400	0.1200	0.7128
P2 Party wall - Intermediate floor within a dwelling	18.0100	0.0000	0.0000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			11.6087 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	47.4153 (37)

Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)\text{m} \times (5)$

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	21.8753	21.6092	21.3431	20.0128	19.7467	18.4163	18.4163	18.1503	18.9485	19.7467	20.2788	20.8110	(38)
Average = Sum(39)m / 12 =	69.2906	69.0245	68.7584	67.4281	67.1620	65.8316	65.8316	65.5656	66.3638	67.1620	67.6941	68.2263	(39)
												67.3616	
HLP	0.6848	0.6822	0.6796	0.6664	0.6638	0.6506	0.6506	0.6480	0.6559	0.6638	0.6690	0.6743	(40)
HLP (average)												0.6658	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

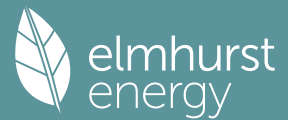
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.7502 (42)
Hot water usage for mixer showers	70.3313	69.2744	67.7342	64.7874	62.6127	60.1875	58.8090	60.3375	62.0130	64.6170	67.6271	70.0619	(42a)
Hot water usage for baths	30.3680	29.9170	29.2819	28.1108	27.2340	26.2617	25.7365	26.3672	27.0539	28.0943	29.2894	30.2653	(42b)
Hot water usage for other uses	42.7946	41.2385	39.6823	38.1261	36.5700	35.0138	35.0138	36.5700	38.1261	39.6823	41.2385	42.7946	(42c)
Average daily hot water use (litres/day)												131.9033	(43)
Daily hot water use	143.4940	140.4299	136.6984	131.0244	126.4166	121.4630	119.5593	123.2746	127.1930	132.3935	138.1550	143.1218	(44)
Energy content (annual)	227.2594	199.9702	210.1003	179.3658	170.1811	149.3529	144.5966	152.6398	156.8417	179.6568	196.8271	224.0942	(45)
Distribution loss (46)m = $0.15 \times (45)\text{m}$	34.0889	29.9955	31.5151	26.9049	25.5272	22.4029	21.6895	22.8960	23.5263	26.9485	29.5241	33.6141	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3900	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7506	(55)
Total storage loss	23.2686	21.0168	23.2686	22.5180	23.2686	22.5180	23.2686	23.2686	22.5180	23.2686	22.5180	23.2686	(56)
If cylinder contains dedicated solar storage	23.2686	21.0168	23.2686	22.5180	23.2686	22.5180	23.2686	23.2686	22.5180	23.2686	22.5180	23.2686	(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	273.7904	241.9982	256.6313	224.3958	216.7121	194.3829	191.1276	199.1708	201.8717	226.1878	241.8571	270.6252	(62)
WVHRS	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	273.7904	241.9982	256.6313	224.3958	216.7121	194.3829	191.1276	199.1708	201.8717	226.1878	241.8571	270.6252	(64)
Total per year (kWh/year)												2738.7509	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month	112.7885	100.1125	107.0832	95.6631	93.8100	85.6838	85.3032	87.9775	88.1739	96.9607	101.4690	111.7361	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	137.5092	137.5092	137.5092	137.5092	137.5092	137.5092	137.5092	137.5092	137.5092	137.5092	137.5092	137.5092	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	134.4715	148.8791	134.4715	138.9539	134.4715	138.9539	134.4715	134.4715	138.9539	134.4715	138.9539	134.4715	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	258.2214	260.9009	254.1486	239.7737	221.6280	204.5735	193.1801	190.5006	197.2529	211.6278	229.7736	246.8280	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.7509	36.7509	36.7509	36.7509	36.7509	36.7509	36.7509	36.7509	36.7509	36.7509	36.7509	36.7509	(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)	-110.0074	-110.0074	-110.0074	-110.0074	-110.0074	-110.0074	-110.0074	-110.0074	-110.0074	-110.0074	-110.0074	-110.0074	(71)
Water heating gains (Table 5)	151.5975	148.9769	143.9290	132.8654	126.0887	119.0053	114.6548	118.2494	122.4637	130.3235	140.9292	150.1830	(72)

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Total internal gains
608.5431 623.0098 596.8018 575.8458 546.4409 526.7855 506.5591 507.4742 522.9232 540.6755 573.9094 595.7352 (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	
East	10.9700		19.6403		0.3800		0.7000		0.7700		39.7163 (76)	
West	6.1300		19.6403		0.3800		0.7000		0.7700		22.1933 (80)	
Solar gains	61.9096	121.1084	199.4483	290.8834	356.4885	364.9295	347.4277	298.4353	231.9666	143.7053	77.1940	50.9115 (83)
Total gains	670.4528	744.1182	796.2501	866.7292	902.9295	891.7149	853.9869	805.9094	754.8898	684.3808	651.1034	646.6467 (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	107.1609	107.5740	107.9903	110.1209	110.5572	112.7914	112.7914	113.2491	111.8869	110.5572	109.6881	108.8326
alpha	8.1441	8.1716	8.1994	8.3414	8.3705	8.5194	8.5194	8.5499	8.4591	8.3705	8.3125	8.2555
util living area	0.9950	0.9872	0.9635	0.8640	0.6817	0.4721	0.3392	0.3742	0.6031	0.9022	0.9851	0.9961 (86)
Living	20.4593	20.5841	20.7462	20.9258	20.9899	20.9996	21.0000	21.0000	20.9971	20.9102	20.6685	20.4449
Non living	19.8618	19.9867	20.1449	20.3161	20.3670	20.3845	20.3846	20.3870	20.3786	20.3082	20.0804	19.8556
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	20.7234	20.5841	20.7462	20.9258	20.9899	20.9996	21.0000	21.0000	20.9971	20.9102	20.6685	20.5225 (87)
Th 2	20.3543	20.3566	20.3589	20.3706	20.3729	20.3846	20.3846	20.3870	20.3800	20.3729	20.3683	20.3636 (88)
util rest of house	0.9935	0.9835	0.9534	0.8356	0.6392	0.4269	0.2917	0.3244	0.5505	0.8737	0.9800	0.9949 (89)
MIT 2	20.1023	19.9867	20.1449	20.3161	20.3670	20.3845	20.3846	20.3870	20.3786	20.3082	20.0804	19.9267 (90)
Living area fraction	20.3161	20.1923	20.3518	20.5260	20.5814	20.5962	20.5964	20.5979	20.5914	20.5154	20.2828	20.1317 (92)
MIT	20.3161	20.1923	20.3518	20.5260	20.5814	20.5962	20.5964	20.5979	20.5914	20.5154	20.2828	20.1317 (93)
Temperature adjustment												0.0000
adjusted MIT	20.3161	20.1923	20.3518	20.5260	20.5814	20.5962	20.5964	20.5979	20.5914	20.5154	20.2828	20.1317 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9934	0.9823	0.9532	0.8430	0.6535	0.4424	0.3081	0.3415	0.5685	0.8807	0.9792	0.9944 (94)
Useful gains	666.0285	730.9735	759.0168	730.6647	590.0605	394.5240	263.0814	275.2206	429.1796	602.7180	637.5741	643.0178 (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	1109.7618	1055.5423	952.4279	783.9161	596.4904	394.7366	263.0894	275.2392	430.7957	665.9357	892.3971	1086.9634 (97)
Space heating kWh	330.1375	218.1102	143.8979	38.3410	4.7838	0.0000	0.0000	0.0000	0.0000	47.0339	183.4726	330.2955 (98a)
Space heating requirement - total per year (kWh/year)												1296.0725
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	330.1375	218.1102	143.8979	38.3410	4.7838	0.0000	0.0000	0.0000	0.0000	47.0339	183.4726	330.2955 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1296.0725
Space heating per m2										(98c) / (4) =		12.8096 (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 %)												319.5519 (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	330.1375	218.1102	143.8979	38.3410	4.7838	0.0000	0.0000	0.0000	0.0000	47.0339	183.4726	330.2955 (98)
Space heating efficiency (main heating system 1)	319.5519	319.5519	319.5519	319.5519	319.5519	0.0000	0.0000	0.0000	0.0000	319.5519	319.5519	319.5519 (210)
Space heating fuel (main heating system)	103.3126	68.2550	45.0312	11.9983	1.4970	0.0000	0.0000	0.0000	0.0000	14.7187	57.4156	103.3621 (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	273.7904	241.9982	256.6313	224.3958	216.7121	194.3829	191.1276	199.1708	201.8717	226.1878	241.8571	270.6252 (64)
Efficiency of water heater (217)m	204.6228	204.6228	204.6228	204.6228	204.6228	204.6228	204.6228	204.6228	204.6228	204.6228	204.6228	204.6228 (216)
Fuel for water heating, kWh/month	133.8025	118.2655	125.4168	109.6631	105.9081	94.9957	93.4048	97.3356	98.6555	110.5389	118.1966	132.2556 (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	19.9850	18.0509	19.9850	19.3403	19.9850	19.3403	19.9850	19.9850	19.3403	19.9850	19.3403	19.9850 (231)
Lighting	27.3694	21.9568	19.7696	14.4841	11.1879	9.1406	10.2060	13.2661	17.2314	22.6085	25.5363	28.1301 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-7.3343	-12.6794	-22.7153	-31.1317	-38.4615	-37.7963	-37.0228	-32.0986	-24.4561	-16.1852	-8.7066	-6.0382 (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	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												405.5906	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												204.6228	
Water heating fuel used												1338.4388	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)													
mechanical ventilation fans (SFP = 0.7625)												235.3067	(230a)
Total electricity for the above, kWh/year												235.3067	(231)
Electricity for lighting (calculated in Appendix L)												220.8870	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-274.6260	(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												1925.5970	(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	405.5906	0.1580	64.0834 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1338.4388	0.1410	188.7264 (264)
Space and water heating			252.8098 (265)
Pumps, fans and electric keep-hot	235.3067	0.1387	32.6399 (267)
Energy for lighting	220.8870	0.1443	31.8808 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-274.6260	0.1309	-35.9523
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-35.9523 (269)
Total CO2, kg/year			281.3783 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.7800 (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	405.5906	1.5849	642.8127 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1338.4388	1.5214	2036.2875 (278)
Space and water heating			2679.1002 (279)
Pumps, fans and electric keep-hot	235.3067	1.5128	355.9720 (281)
Energy for lighting	220.8870	1.5338	338.8038 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-274.6260	1.4836	-407.4407
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-407.4407 (283)
Total Primary energy kWh/year			2966.4353 (286)
Dwelling Primary energy Rate (DPER)			29.3200 (287)

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

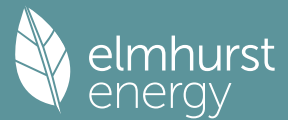
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	51.5600 (1b)	x 2.5000 (2b)	= 128.9000 (1b) - (3b)
First floor	49.6200 (1c)	x 2.5000 (2c)	= 124.0500 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	101.1800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 252.9500 (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)

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Number of flues attached to solid fuel boiler
Number of flues attached to other heater
Number of blocked chimneys
Number of intermittent extract fans
Number of passive vents
Number of flueless gas fires

0 * 20 = 0.0000 (6d)
0 * 35 = 0.0000 (6e)
0 * 20 = 0.0000 (6f)
4 * 10 = 40.0000 (7a)
0 * 10 = 0.0000 (7b)
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) = 0.1581 (8)
Pressure test Yes
Pressure Test Method Blower Door
Measured/design AP50 5.0000 (17)
Infiltration rate 0.4081 (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) = 0.3469 (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													
Effective ac	0.4423	0.4336	0.4250	0.3816	0.3729	0.3296	0.3296	0.3209	0.3469	0.3729	0.3903	0.4076	(22b)
	0.5978	0.5940	0.5903	0.5728	0.5695	0.5543	0.5543	0.5515	0.5602	0.5695	0.5762	0.5831	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			2.4200	1.0000	2.4200		(26)
TER Opening Type			17.1000	1.1450	19.5802		(27)
Ground floor			51.5600	0.1300	6.7028		(28a)
External Wall 1	65.0100	19.5200	45.4900	0.1800	8.1882		(29a)
Plane roof	37.7500		37.7500	0.1100	4.1525		(30)
Flat roof	11.8700		11.8700	0.1100	1.3057		(30)
Total net area of external elements Aum(A, m2)			166.1900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.3494		(33)
Main dwelling							
Party Wall			104.4500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							264.1912 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	0.0000	0.0700	0.0000
E16 Corner (normal)	2.8500	0.0900	0.2565
E18 Party wall between dwellings	19.9500	0.0600	1.1970
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	0.0000	0.0200	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	0.0000	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0900	-0.2565
E7 Party floor between dwellings (in blocks of flats)	0.0000	0.0700	0.0000
E25 Staggered party wall between dwellings	2.8500	0.0600	0.1710
E2 Other lintels (including other steel lintels)	9.9700	0.0500	0.4985
E3 Sill	8.9600	0.0500	0.4480
E4 Jamb	29.4000	0.0500	1.4700
E16 Corner (normal)	0.0000	0.0900	0.0000
E17 Corner (inverted - internal area greater than external area)	0.0000	-0.0900	-0.0000
E18 Party wall between dwellings	0.0000	0.0600	0.0000
E25 Staggered party wall between dwellings	0.0000	0.0600	0.0000
P1 Party wall - Ground floor	18.6400	0.0800	1.4912
E5 Ground floor (normal)	11.1200	0.1600	1.7792
E5 Ground floor (normal)	0.0000	0.1600	0.0000
E14 Flat roof	0.0000	0.0800	0.0000
E15 Flat roof with parapet	5.0200	0.5600	2.8112
P4 Party wall - Roof (insulation at ceiling level)	18.0100	0.1200	2.1612
E6 Intermediate floor within a dwelling	11.6900	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	5.9400	0.0600	0.3564
P2 Party wall - Intermediate floor within a dwelling	18.0100	0.0000	0.0000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			12.3837 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 54.7331 (37)

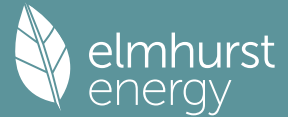
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	49.9022	49.5852	49.2744	47.8146	47.5414	46.2700	46.2700	46.0345	46.7597	47.5414	48.0940	48.6716	(38)
Heat transfer coeff	104.6353	104.3182	104.0074	102.5476	102.2745	101.0030	101.0030	100.7676	101.4928	102.2745	102.8270	103.4047	(39)
Average = Sum(39)m / 12 =												102.5463	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	1.0341	1.0310	1.0279	1.0135	1.0108	0.9983	0.9983	0.9959	1.0031	1.0108	1.0163	1.0220	(40)
HLP (average)												1.0135	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

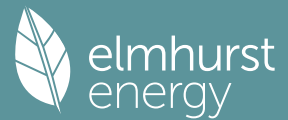
Assumed occupancy													2.7502 (42)
Hot water usage for mixer showers													
	70.3313	69.2744	67.7342	64.7874	62.6127	60.1875	58.8090	60.3375	62.0130	64.6170	67.6271	70.0619	(42a)
Hot water usage for baths													
	30.3680	29.9170	29.2819	28.1108	27.2340	26.2617	25.7365	26.3672	27.0539	28.0943	29.2894	30.2653	(42b)
Hot water usage for other uses													
	42.7946	41.2385	39.6823	38.1261	36.5700	35.0138	35.0138	36.5700	38.1261	39.6823	41.2385	42.7946	(42c)
Average daily hot water use (litres/day)													131.9033 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	143.4940	140.4299	136.6984	131.0244	126.4166	121.4630	119.5593	123.2746	127.1930	132.3935	138.1550	143.1218	(44)
Energy conte	227.2594	199.9702	210.1003	179.3658	170.1811	149.3529	144.5966	152.6398	156.8417	179.6568	196.8271	224.0942	(45)
Energy content (annual)													Total = Sum(45)m = 2190.8859
Distribution loss (46)m = 0.15 x (45)m													
	34.0889	29.9955	31.5151	26.9049	25.5272	22.4029	21.6895	22.8960	23.5263	26.9485	29.5241	33.6141	(46)
Water storage loss (or HIU loss):													
Store volume													150.0000 (47)

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a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage												
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	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												
273.8543	242.0560	256.6952	224.4576	216.7760	194.4447	191.1915	199.2347	201.9336	226.2517	241.9189	270.6891	(62)
WWHRS	-32.1526	-28.4360	-29.7765	-24.6561	-22.9786	-19.6630	-18.4309	-19.5994	-20.3441	-23.9834	-27.1703	(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												
241.7017	213.6200	226.9187	199.8015	193.7973	174.7817	172.7606	179.6352	181.5895	202.2682	214.7486	239.1320	(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												
112.8397	100.1587	107.1343	95.7126	93.8611	85.7333	85.3543	88.0286	88.2234	97.0118	101.5185	111.7872	(65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												
												2440.7552 (64)
												2441 (64)
5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts												
(66)m	137.5092	137.5092	137.5092	137.5092	137.5092	137.5092	137.5092	137.5092	137.5092	137.5092	137.5092	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
134.4715	148.8791	134.4715	138.9539	134.4715	138.9539	134.4715	134.4715	138.9539	134.4715	138.9539	134.4715	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
258.2214	260.9009	254.1486	239.7737	221.6280	204.5735	193.1801	190.5006	197.2529	211.6278	229.7736	246.8280	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
36.7509	36.7509	36.7509	36.7509	36.7509	36.7509	36.7509	36.7509	36.7509	36.7509	36.7509	36.7509	(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)												
-110.0074	-110.0074	-110.0074	-110.0074	-110.0074	-110.0074	-110.0074	-110.0074	-110.0074	-110.0074	-110.0074	-110.0074	(71)
Water heating gains (Table 5)												
151.6662	149.0457	143.9977	132.9342	126.1574	119.0740	114.7235	118.3181	122.5324	130.3922	140.9979	150.2517	(72)
Total internal gains	611.6119	626.0785	599.8705	578.9145	549.5096	526.8542	506.6278	507.5429	522.9920	543.7442	576.9781	(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												
East	10.9700											
West	6.1300											
Solar gains	102.6397	200.7850	330.6642	482.2541	591.0205	605.0146	575.9986	494.7743	384.5762	238.2483	127.9796	(83)
Total gains	714.2515	826.8635	930.5348	1061.1686	1140.5301	1131.8688	1082.6265	1002.3172	907.5682	781.9925	704.9577	(84)
7. Mean internal temperature (heating season)												
Temperature during heating periods in the living area from Table 9, Th1 (C)												
Utilisation factor for gains for living area, nil,m (see Table 9a)												21.0000 (85)
Jan												
Feb												
Mar												
Apr												
May												
Jun												
Jul												
Aug												
Sep												
Oct												
Nov												
Dec												
tau	70.9631	71.1788	71.3915	72.4077	72.6011	73.5150	73.5150	73.6868	73.1603	72.6011	72.2110	(86)
alpha	5.7309	5.7453	5.7594	5.8272	5.8401	5.9010	5.9010	5.9125	5.8774	5.8401	5.8141	(87)
util living area	0.9965	0.9913	0.9753	0.9113	0.7665	0.5619	0.4092	0.4598	0.7255	0.9500	0.9916	(88)
MIT	19.9282	20.1096	20.3778	20.7156	20.9201	20.9892	20.9986	20.9973	20.9564	20.6667	20.2419	(89)
Th 2	20.0550	20.0576	20.0601	20.0721	20.0743	20.0848	20.0848	20.0867	20.0808	20.0743	20.0698	(90)
util rest of house	0.9953	0.9883	0.9670	0.8841	0.7101	0.4857	0.3248	0.3700	0.6466	0.9283	0.9883	(91)
MIT 2	18.8099	19.0425	19.3814	19.7956	20.0122	20.0792	20.0844	20.0858	20.0538	19.7502	19.2213	(92)
Living area fraction												
MIT	19.1947	19.4097	19.7243	20.1122	20.3246	20.3923	20.3990	20.3995	20.3644	20.0656	19.5725	(93)
Temperature adjustment												
adjusted MIT	19.1947	19.4097	19.7243	20.1122	20.3246	20.3923	20.3990	20.3995	20.3644	20.0656	19.5725	(94)
8. Space heating requirement												
Utilisation	0.9938	0.9857	0.9633	0.8855	0.7262	0.5117	0.3539	0.4010	0.6722	0.9280	0.9859	(95)
Useful gains	709.8058	815.0325	896.3955	939.6172	828.2222	579.2291	383.1644	401.9154	610.0604	725.7166	695.0024	(96)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	(97)
Heat loss rate W	1558.5144	1513.6300	1375.4279	1149.7853	882.0780	585.0443	383.7089	403.0203	635.7952	968.0881	1282.5096	(98)
Space heating kWh	631.4391	469.4575	356.4001	151.3210	40.0687	0.0000	0.0000	0.0000	0.0000	180.3244	423.0052	(99)
Space heating requirement - total per year (kWh/year)												
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	(100)
Solar heating contribution - total per year (kWh/year)												
Space heating kWh	631.4391	469.4575	356.4001	151.3210	40.0687	0.0000	0.0000	0.0000	0.0000	180.3244	423.0052	(101)
Space heating requirement after solar contribution - total per year (kWh/year)												
Space heating per m2												
(98c) / (4) =												

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												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	631.4391	469.4575	356.4001	151.3210	40.0687	0.0000	0.0000	0.0000	0.0000	180.3244	423.0052	646.0552	(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)	684.1161	508.6213	386.1323	163.9447	43.4114	0.0000	0.0000	0.0000	0.0000	195.3677	458.2938	699.9515	(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	241.7017	213.6200	226.9187	199.8015	193.7973	174.7817	172.7606	179.6352	181.5895	202.2682	214.7486	239.1320	(64)
Efficiency of water heater (217)m	86.1116	85.7747	85.0678	83.4448	81.2102	79.8000	79.8000	79.8000	79.8000	83.8032	85.5511	79.8000	(216)
Fuel for water heating, kWh/month	280.6843	249.0478	266.7505	239.4416	238.6367	219.0247	216.4920	225.1068	227.5558	241.3610	251.0181	277.4975	(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	27.9405	22.4149	20.1822	14.7863	11.4214	9.3314	10.4190	13.5430	17.5910	23.0803	26.0691	28.7171	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-46.9064	-65.4547	-93.1245	-103.5804	-110.7202	-102.9552	-101.6313	-96.3872	-87.0329	-74.2667	-51.3077	-40.6287	(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	-28.5876	-59.8900	-118.6010	-177.5262	-234.1824	-235.1409	-232.4201	-197.0810	-144.8110	-85.5011	-38.1157	-22.6293	(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												3139.8387	(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												2932.6170	(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)												225.4960	(232)
Energy saving/generation technologies (Appendices M, N and Q)													
PV generation												-2548.4822	(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												3835.4695	(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	3139.8387	0.2100	659.3661	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2932.6170	0.2100	615.8496	(264)
Space and water heating			1275.2157	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	225.4960	0.1443	32.5460	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-973.9959	0.1348	-131.3129	
PV Unit electricity exported	-1574.4863	0.1260	-198.3725	
Total			-329.6854	(269)
Total CO2, kg/year			990.0056	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.7800	(273)

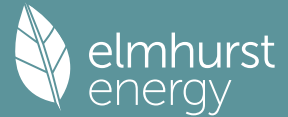
13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3139.8387	1.1300	3548.0178	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2932.6170	1.1300	3313.8572	(278)
Space and water heating			6861.8750	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	225.4960	1.5338	345.8733	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-973.9959	1.4983	-1459.3189	
PV Unit electricity exported	-1574.4863	0.4625	-728.1697	
Total			-2187.4887	(283)
Total Primary energy kWh/year			5150.3604	(286)

Target Primary Energy Rate (TPER)

50.9000 (287)

Full SAP Calculation Printout



Plot Reference	K107 - Mid				Issued on Date	25/03/2026	
Assessment Reference	2b4p-72-Mid			Plot Type Ref	2b4p-72-Mid		
Plot Address					SAP Version	10.2	
SAP Rating	87 B		DER	2.95		TER	10.32
Environmental	98 A		% DER < TER				71.41
CO ₂ Emissions (t/year)	0.17		DFEE	23.19		TFEE	23.12
Compliance Check	See BREL		% DFEE < TFEE				-0.29
% DPER < TPER	43.82		DPER	30.59		TPER	54.45
Assessor Details	Miss Alicja Kreglewska				Assessor ID	L728-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	72.1700 (1b)	2.5000 (2b)	180.4250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.1700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	180.4250 (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
Main dwelling							
Window			16.0000	0.8687	13.8996		(27)
Door			1.8400	1.0000	1.8400		(26)
External Wall 1	51.2700	16.0000	35.2700	0.1800	6.3486	70.0000	2468.9000 (29a)
Corridor Wall	4.3900	1.8400	2.5500	0.2000	0.5100	70.0000	178.5000 (29a)
Total net area of external elements Aum(A, m ²)			55.6600				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 22.5982		(33)
Main dwelling							
Party Wall 1			60.7300	0.0000	0.0000	140.0000	8502.1999 (32)
Party Floor 1			72.1700			80.0000	5773.6000 (32d)
Party Ceiling 1			72.1700			100.0000	7217.0000 (32b)
Internal Wall 1			122.5000			9.0000	1102.5000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	25242.7000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							349.7672 (35)
List of Thermal Bridges							

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K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	27.2400	0.0600	1.6344
E16 Corner (normal)	5.7000	0.1270	0.7239
E18 Party wall between dwellings	5.7000	0.0250	0.1425
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	8.7400	0.1000	0.8740
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	42.6200	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	2.8500	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	3.0800	0.1000	0.3080
E25 Staggered party wall between dwellings	0.0000	0.1200	0.0000
E2 Other lintels (including other steel lintels)	8.9700	0.0170	0.1525
E3 Sill	8.0700	0.0300	0.2421
E4 Jamb	23.2800	0.1200	2.7936
E16 Corner (normal)	0.0000	0.1300	0.0000
E17 Corner (inverted - internal area greater than external area)	0.0000	0.0000	0.0000
E18 Party wall between dwellings	0.0000	0.0900	0.0000
E25 Staggered party wall between dwellings	5.7000	0.0900	0.5130
P1 Party wall - Ground floor	0.0000	0.0500	0.0000
E5 Ground floor (normal)	0.0000	0.1000	0.0000
E5 Ground floor (normal)	0.0000	0.2300	0.0000
E14 Flat roof	0.0000	0.1600	0.0000
E15 Flat roof with parapet	0.0000	0.3000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	0.0000	0.0300	0.0000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			7.3840 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss		(33) + (36) + (36a) =	29.9822 (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	15.3353	15.1456	14.9558	14.0068	13.8171	12.8681	12.8681	12.6784	13.2477	13.8171	14.1966	14.5762 (38)
Average = Sum(39)m / 12 =	45.3175	45.1278	44.9380	43.9890	43.7993	42.8503	42.8503	42.6606	43.2299	43.7993	44.1788	44.5584 (39)
												43.9416

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.6279	0.6253	0.6227	0.6095	0.6069	0.5937	0.5937	0.5911	0.5990	0.6069	0.6121	0.6174 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

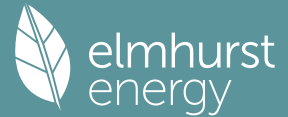
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2976 (42)
Hot water usage for mixer showers												
62.7434	61.8005	60.4265	57.7976	55.8575	53.6940	52.4642	53.8278	55.3226	57.6456	60.3310	62.5030 (42a)	
Hot water usage for baths												
27.1049	26.7024	26.1355	25.0903	24.3077	23.4399	22.9711	23.5340	24.1469	25.0755	26.1422	27.0133 (42b)	
Hot water usage for other uses												
38.1601	36.7724	35.3848	33.9971	32.6095	31.2219	31.2219	32.6095	33.9971	35.3848	36.7724	38.1601 (42c)	
Average daily hot water use (litres/day)												117.6689 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
128.0084	125.2753	121.9468	116.8851	112.7747	108.3557	106.6572	109.9713	113.4666	118.1059	123.2456	127.6764 (44)	
Energy content (annual)	202.7341	178.3904	187.4277	160.0098	151.8164	133.2360	128.9926	136.1675	139.9157	160.2686	175.5860	199.9104 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1954.4552
30.4101	26.7586	28.1142	24.0015	22.7725	19.9854	19.3489	20.4251	20.9874	24.0403	26.3379	29.9866 (46)	
Water storage loss (or HIU loss):												
Store volume												200.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.1700 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.6318 (55)
Total storage loss	19.5858	17.6904	19.5858	18.9540	19.5858	18.9540	19.5858	19.5858	18.9540	19.5858	18.9540	19.5858 (56)
If cylinder contains dedicated solar storage	19.5858	17.6904	19.5858	18.9540	19.5858	18.9540	19.5858	19.5858	18.9540	19.5858	18.9540	19.5858 (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	222.3199	196.0808	207.0135	178.9638	171.4022	152.1900	148.5784	155.7533	158.8697	179.8544	194.5400	219.4962 (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	222.3199	196.0808	207.0135	178.9638	171.4022	152.1900	148.5784	155.7533	158.8697	179.8544	194.5400	219.4962 (64)
12Total per year (kWh/year)												Total per year (kWh/year) = Sum(64)m = 2185.0622 (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	67.4091	59.3148	62.3197	53.2033	50.4790	44.3010	42.8900	45.2757	46.5220	53.2893	58.3823	66.4702 (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	114.8817	114.8817	114.8817	114.8817	114.8817	114.8817	114.8817	114.8817	114.8817	114.8817	114.8817	114.8817 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	102.0539	112.9883	102.0539	105.4557	102.0539	105.4557	102.0539	102.0539	105.4557	102.0539	105.4557	102.0539 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	202.3078	204.4071	199.1169	187.8546	173.6380	160.2765	151.3501	149.2508	154.5410	165.8033	180.0198	193.3814 (68)
Pumps, fans	34.4882	34.4882	34.4882	34.4882	34.4882	34.4882	34.4882	34.4882	34.4882	34.4882	34.4882	34.4882 (69)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Water heating gains (Table 5)	-91.9053	-91.9053	-91.9053	-91.9053	-91.9053	-91.9053	-91.9053	-91.9053	-91.9053	-91.9053	-91.9053	-91.9053 (71)
Total internal gains	90.6036	88.2661	83.7631	73.8934	67.8481	61.5291	57.6479	60.8544	64.6139	71.6254	81.0866	89.3417 (72)
	452.4298	463.1259	442.3983	424.6682	401.0045	384.7258	368.5164	369.6236	382.0751	396.9471	424.0266	442.2415 (73)

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6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W
South					7.2300	46.7521	0.3800		0.7000		62.3095 (78)
West					8.7700	19.6403	0.3800		0.7000		31.7513 (80)
Solar gains	94.0608	164.1592	232.2797	296.1005	335.9267	334.4938	322.1381	292.8568	254.7571	183.7686	79.9518 (83)
Total gains	546.4906	627.2851	674.6780	720.7687	736.9312	719.2196	690.6545	662.4804	636.8322	580.7156	522.1933 (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	154.7273	155.3780	156.0342	159.4002	160.0908	163.6361	163.6361	164.3640	162.1993	160.0908	158.7154	157.3634
alpha	11.3152	11.3585	11.4023	11.6267	11.6727	11.9091	11.9091	11.9576	11.8133	11.6727	11.5810	11.4909
util living area												
	0.9929	0.9692	0.9024	0.7327	0.5525	0.3813	0.2730	0.2962	0.4684	0.7740	0.9672	0.9951 (86)
MIT	20.7393	20.8556	20.9479	20.9949	20.9998	21.0000	21.0000	21.0000	21.0000	20.9926	20.8850	20.7209 (87)
Th 2	20.4049	20.4073	20.4096	20.4214	20.4238	20.4356	20.4356	20.4380	20.4309	20.4238	20.4191	20.4144 (88)
util rest of house												
	0.9902	0.9597	0.8799	0.6996	0.5184	0.3477	0.2380	0.2600	0.4297	0.7350	0.9554	0.9932 (89)
MIT 2	20.1753	20.2882	20.3714	20.4183	20.4237	20.4356	20.4356	20.4380	20.4309	20.4196	20.3277	20.1659 (90)
Living area fraction												
MIT	20.3799	20.4940	20.5805	20.6275	20.6327	20.6404	20.6404	20.6419	20.6373	20.6275	20.5299	20.3672 (92)
Temperature adjustment												0.3000
adjusted MIT	20.6799	20.7940	20.8805	20.9275	20.9327	20.9404	20.9404	20.9419	20.9373	20.9275	20.8299	20.6672 (93)

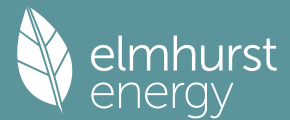
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9916	0.9662	0.8981	0.7286	0.5485	0.3777	0.2693	0.2925	0.4641	0.7692	0.9641	0.9941 (94)
Useful gains	541.8764	606.0697	605.9495	525.1333	404.2187	271.6850	185.9859	193.7587	295.5588	446.6836	518.1700	519.1276 (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	742.2955	717.2614	646.2310	529.0777	404.3843	271.6866	185.9860	193.7588	295.5771	452.3353	606.5691	733.7535 (97)
Space heating kWh	149.1118	74.7208	29.9694	2.8400	0.1232	0.0000	0.0000	0.0000	0.0000	4.2049	63.6473	159.6817 (98a)
Space heating requirement - total per year (kWh/year)												484.2992
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	149.1118	74.7208	29.9694	2.8400	0.1232	0.0000	0.0000	0.0000	0.0000	4.2049	63.6473	159.6817 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												484.2992
Space heating per m2										(98c) / (4) =		6.7105 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Fraction of main heating from main system 2												0.0000 (203)
Fraction of total heating from main system 1												1.0000 (204)
Fraction of total heating from main system 2												0.0000 (205)
Efficiency of main space heating system 1 (in %)												100.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	149.1118	74.7208	29.9694	2.8400	0.1232	0.0000	0.0000	0.0000	0.0000	4.2049	63.6473	159.6817 (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)	149.1118	74.7208	29.9694	2.8400	0.1232	0.0000	0.0000	0.0000	0.0000	4.2049	63.6473	159.6817 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Space heating fuel used, main system 2												0.0000 (213)
Water heating												
Water heating requirement	222.3199	196.0808	207.0135	178.9638	171.4022	152.1900	148.5784	155.7533	158.8697	179.8544	194.5400	219.4962 (64)
Efficiency of water heater												254.8850 (216)
(217)m	254.8850	254.8850	254.8850	254.8850	254.8850	254.8850	254.8850	254.8850	254.8850	254.8850	254.8850	254.8850 (217)
Fuel for water heating, kWh/month	87.2236	76.9291	81.2184	70.2135	67.2469	59.7093	58.2923	61.1073	62.3300	70.5629	76.3246	86.1158 (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	14.7223	13.2976	14.7223	14.2474	14.7223	14.2474	14.7223	14.7223	14.2474	14.7223	14.2474	14.7223 (231)
Lighting	20.7714	16.6636	15.0037	10.9923	8.4908	6.9371	7.7456	10.0680	13.0774	17.1582	19.3802	21.3487 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-7.2726	-12.4159	-21.8507	-29.5068	-36.2036	-35.4619	-34.7381	-30.2917	-23.2977	-15.5872	-8.5511	-5.9999 (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)

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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	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													484.2992	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													254.8850	
Water heating fuel used													857.2737	(219)
Space cooling fuel													0.0000	(221)
Electricity for pumps and fans:														
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)														
mechanical ventilation fans (SFP = 0.7875)													173.3433	(230a)
Total electricity for the above, kWh/year													173.3433	(231)
Electricity for lighting (calculated in Appendix L)													167.6369	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-261.1774	(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													1421.3757	(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	484.2992	0.1600	77.4790 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	857.2737	0.1413	121.1119 (264)
Space and water heating			198.5909 (265)
Pumps, fans and electric keep-hot	173.3433	0.1387	24.0449 (267)
Energy for lighting	167.6369	0.1443	24.1952 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-261.1774	0.1311	-34.2489
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-34.2489 (269)
Total CO2, kg/year			212.5820 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.9500 (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	484.2992	1.5921	771.0440 (275)
Space heating - main system 2	0.0000	0.0000	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	857.2737	1.5224	1305.1177 (278)
Space and water heating			2076.1617 (279)
Pumps, fans and electric keep-hot	173.3433	1.5128	262.2338 (281)
Energy for lighting	167.6369	1.5338	257.1270 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-261.1774	1.4844	-387.7031
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-387.7031 (283)
Total Primary energy kWh/year			2207.8193 (286)
Dwelling Primary energy Rate (DPER)			30.5900 (287)

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

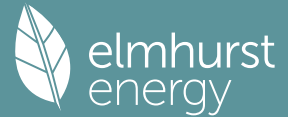
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	72.1700 (1b)	x 2.5000 (2b)	= 180.4250 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.1700		(4)
Dwelling volume		(3a) + (3b) + (3c) + (3d) + (3e) ... (3n) =	180.4250 (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)

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Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 30.0000 / (5) = 0.1663 (8)

Pressure test Yes

Pressure Test Method Blower Door

Measured/design AP50 5.0000 (17)

Infiltration rate 0.4163 (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) = 0.3538 (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	0.4511	0.4423	0.4334	0.3892	0.3804	0.3361	0.3361	0.3273	0.3538	0.3804	0.3981	0.4158 (22b)
Effective ac	0.6018	0.5978	0.5939	0.5757	0.5723	0.5565	0.5565	0.5536	0.5626	0.5723	0.5792	0.5864 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			1.8400	1.0000	1.8400		(26)
TER Opening Type			16.0000	1.1450	18.3206		(27)
External Wall 1	51.2700	16.0000	35.2700	0.1800	6.3486		(29a)
Corridor Wall	4.3900	1.8400	2.5500	0.1800	0.4590		(29a)
Total net area of external elements Aum(A, m2)			55.6600				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 26.9682		(33)
Main dwelling							
Party Wall 1			60.7300	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							349.7672 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	27.2400	0.0700	1.9068
E16 Corner (normal)	5.7000	0.0900	0.5130
E18 Party wall between dwellings	5.7000	0.0600	0.3420
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	8.7400	0.0200	0.1748
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	42.6200	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0900	-0.2565
E7 Party floor between dwellings (in blocks of flats)	3.0800	0.0700	0.2156
E25 Staggered party wall between dwellings	0.0000	0.0600	0.0000
E2 Other lintels (including other steel lintels)	8.9700	0.0500	0.4485
E3 Sill	8.0700	0.0500	0.4035
E4 Jamb	23.2800	0.0500	1.1640
E16 Corner (normal)	0.0000	0.0900	0.0000
E17 Corner (inverted - internal area greater than external area)	0.0000	-0.0900	-0.0000
E18 Party wall between dwellings	0.0000	0.0600	0.0000
E25 Staggered party wall between dwellings	5.7000	0.0600	0.3420
P1 Party wall - Ground floor	0.0000	0.0800	0.0000
E5 Ground floor (normal)	0.0000	0.1600	0.0000
E5 Ground floor (normal)	0.0000	0.1600	0.0000
E14 Flat roof	0.0000	0.0800	0.0000
E15 Flat roof with parapet	0.0000	0.5600	0.0000
P4 Party wall - Roof (insulation at ceiling level)	0.0000	0.1200	0.0000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			5.2537 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	32.2219 (37)

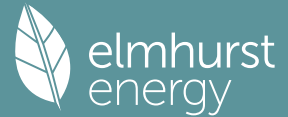
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	35.8291	35.5938	35.3632	34.2800	34.0773	33.1339	33.1339	32.9592	33.4973	34.0773	34.4873	34.9159 (38)
Heat transfer coeff	68.0510	67.8157	67.5851	66.5019	66.2992	65.3558	65.3558	65.1811	65.7192	66.2992	66.7092	67.1378 (39)
Average = Sum(39)m / 12 =												66.5009
HLP	0.9429	0.9397	0.9365	0.9215	0.9187	0.9056	0.9056	0.9032	0.9106	0.9187	0.9243	0.9303 (40)
HLP (average)												0.9214
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2976 (42)
Hot water usage for mixer showers	62.7434	61.8005	60.4265	57.7976	55.8575	53.6940	52.4642	53.8278	55.3226	57.6456	60.3310	62.5030 (42a)	
Hot water usage for baths	27.1049	26.7024	26.1355	25.0903	24.3077	23.4399	22.9711	23.5340	24.1469	25.0755	26.1422	27.0133 (42b)	
Hot water usage for other uses	38.1601	36.7724	35.3848	33.9971	32.6095	31.2219	31.2219	32.6095	33.9971	35.3848	36.7724	38.1601 (42c)	
Average daily hot water use (litres/day)												117.6689 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.0084	125.2753	121.9468	116.8851	112.7747	108.3557	106.6572	109.9713	113.4666	118.1059	123.2456	127.6764 (44)	
Energy content (annual)	202.7341	178.3904	187.4277	160.0098	151.8164	133.2360	128.9926	136.1675	139.9157	160.2686	175.5860	199.9104 (45)	
Distribution loss (46)m = 0.15 x (45)m	30.4101	26.7586	28.1142	24.0015	22.7725	19.9854	19.3489	20.4251	20.9874	24.0403	26.3379	29.9866 (46)	
Water storage loss (or HIU loss):													
Store volume												150.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)	
Temperature factor from Table 2b												0.5400 (49)	
Enter (49) or (54) in (55)												0.7527 (55)	
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)	
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)	
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)	
Total heat required for water heating calculated for each month	249.3290	220.4761	234.0226	205.1016	198.4113	178.3278	175.5875	182.7624	185.0076	206.8635	220.6778	246.5053 (62)	

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WVHRS	-28.6837	-25.3681	-26.5640	-21.9960	-20.4995	-17.5416	-16.4424	-17.4849	-18.1492	-21.3959	-24.2390	-28.1525 (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	220.6453	195.1081	207.4586	183.1056	177.9118	160.7862	159.1451	165.2775	166.8584	185.4676	196.4389	218.3528 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =											2236.5559 (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	104.6850	92.9834	99.5956	89.2767	87.7549	80.3744	80.1660	82.5516	82.5954	90.5652	94.4558	103.7461 (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	114.8817	114.8817	114.8817	114.8817	114.8817	114.8817	114.8817	114.8817	114.8817	114.8817	114.8817	114.8817 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	102.0539	112.9883	102.0539	105.4557	102.0539	105.4557	102.0539	102.0539	105.4557	102.0539	105.4557	102.0539 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	202.3078	204.4071	199.1169	187.8546	173.6380	160.2765	151.3501	149.2508	154.5410	165.8033	180.0198	193.3814 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4882	34.4882	34.4882	34.4882	34.4882	34.4882	34.4882	34.4882	34.4882	34.4882	34.4882	34.4882 (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)	-91.9053	-91.9053	-91.9053	-91.9053	-91.9053	-91.9053	-91.9053	-91.9053	-91.9053	-91.9053	-91.9053	-91.9053 (71)
Water heating gains (Table 5)	140.7056	138.3681	133.8651	123.9955	117.9501	111.6312	107.7500	110.9565	114.7159	121.7274	131.1886	139.4437 (72)
Total internal gains	505.5318	516.2280	495.5004	477.7703	454.1066	434.8278	418.6185	419.7256	432.1771	450.0491	477.1287	495.3435 (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	
South				7.2300	46.7521	0.6300	0.7000		0.7700		103.3025 (78)	
West				8.7700	19.6403	0.6300	0.7000		0.7700		52.6403 (80)	
Solar gains	155.9429	272.1586	385.0953	490.9035	556.9311	554.5555	534.0710	485.5257	422.3605	304.6690	188.0850	132.5517 (83)
Total gains	661.4747	788.3866	880.5957	968.6737	1011.0376	989.3833	952.6894	905.2514	854.5376	754.7181	665.2137	627.8953 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	103.0383	103.3958	103.7486	105.4385	105.7608	107.2875	107.2875	107.5751	106.6943	105.7608	105.1108	104.4398
alpha	7.8692	7.8931	7.9166	8.0292	8.0507	8.1525	8.1525	8.1717	8.1130	8.0507	8.0074	7.9627
util living area	0.9940	0.9775	0.9292	0.7917	0.6054	0.4225	0.3018	0.3312	0.5292	0.8453	0.9792	0.9958 (86)
MIT	20.4433	20.6265	20.8118	20.9559	20.9947	20.9997	21.0000	21.0000	20.9985	20.9399	20.6784	20.4146 (87)
Th 2	20.1312	20.1339	20.1366	20.1493	20.1517	20.1628	20.1628	20.1648	20.1585	20.1517	20.1469	20.1418 (88)
util rest of house	0.9916	0.9692	0.9070	0.7478	0.5521	0.3674	0.2444	0.2711	0.4654	0.7978	0.9699	0.9940 (89)
MIT 2	19.5026	19.7324	19.9530	20.1138	20.1484	20.1627	20.1628	20.1648	20.1578	20.1050	19.8102	19.4751 (90)
Living area fraction	19.8438	20.0568	20.2646	20.4193	20.4554	20.4663	20.4665	20.4678	20.4628	20.4079	20.1251	19.8159 (91)
MIT	19.8438	20.0568	20.2646	20.4193	20.4554	20.4663	20.4665	20.4678	20.4628	20.4079	20.1251	19.8159 (92)
Temperature adjustment	19.8438	20.0568	20.2646	20.4193	20.4554	20.4663	20.4665	20.4678	20.4628	20.4079	20.1251	19.8159 (93)

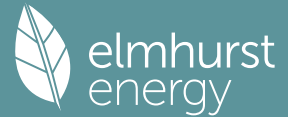
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9905	0.9683	0.9106	0.7623	0.5713	0.3874	0.2652	0.2929	0.4886	0.8130	0.9697	0.9932 (94)
Ext temp.	655.2146	763.3868	801.8998	738.3839	577.6209	383.2945	252.6922	265.1333	417.5098	613.6149	645.0264	623.6031 (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	1057.7714	1027.8660	930.2807	766.0560	580.4775	383.3978	252.6959	265.1415	418.1584	650.2531	868.8960	1048.4207 (97)
Space heating requirement - total per year (kWh/year)	299.5023	177.7300	95.5153	19.9239	2.1253	0.0000	0.0000	0.0000	0.0000	27.2588	161.1861	316.0643 (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)	299.5023	177.7300	95.5153	19.9239	2.1253	0.0000	0.0000	0.0000	0.0000	27.2588	161.1861	316.0643 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	299.5023	177.7300	95.5153	19.9239	2.1253	0.0000	0.0000	0.0000	0.0000	27.2588	161.1861	1099.3061 (99)
Space heating per m2	(98c) / (4) =											15.2322 (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

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Space heating efficiency (main heating system 1)	299.5023	177.7300	95.5153	19.9239	2.1253	0.0000	0.0000	0.0000	0.0000	27.2588	161.1861	316.0643 (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)	324.4878	192.5569	103.4836	21.5860	2.3026	0.0000	0.0000	0.0000	0.0000	29.5329	174.6328	342.4316 (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 requirement	220.6453	195.1081	207.4586	183.1056	177.9118	160.7862	159.1451	165.2775	166.8584	185.4676	196.4389	218.3528 (64)
Efficiency of water heater (217)m	84.7456	83.8512	82.4339	80.6017	79.8956	79.8000	79.8000	79.8000	79.8000	80.8500	83.6198	79.8000 (216)
Fuel for water heating, kWh/month	260.3619	232.6838	251.6666	227.1735	222.6804	201.4865	199.4299	207.1147	209.0957	229.3971	234.9192	84.8883 (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	257.2237 (219)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	0.0000 (221)
Lighting	21.2048	17.0113	15.3168	11.2217	8.6680	7.0818	7.9072	10.2781	13.3502	17.5162	19.7845	7.3041 (231)
Electricity generated by PVs (Appendix M) (negative quantity)	-19.3182	-28.6117	-43.1825	-51.0617	-57.2666	-54.2617	-53.5990	-49.5022	-42.6658	-33.8094	-21.7213	21.7941 (232)
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	-16.5450 (233a)
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 (234a)
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 (235a)
Electricity generated by PVs (Appendix M) (negative quantity)	-7.0995	-15.2504	-30.9070	-47.3065	-63.4259	-64.0490	-63.2963	-53.1917	-38.4638	-22.0985	-9.5708	0.0000 (235c)
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 (233b)
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 (234b)
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)
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												1191.0142 (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												2733.2329 (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)												171.1348 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-891.7957 (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												3289.5861 (238)

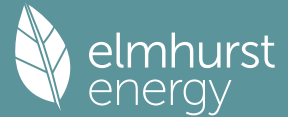
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1191.0142	0.2100	250.1130 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2733.2329	0.2100	573.9789 (264)
Space and water heating			824.0919 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	171.1348	0.1443	24.7000 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-471.5453	0.1336	-62.9799
PV Unit electricity exported	-420.2504	0.1253	-52.6764
Total			-115.6563 (269)
Total CO2, kg/year			745.0649 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.3200 (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	1191.0142	1.1300	1345.8460 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2733.2329	1.1300	3088.5532 (278)
Space and water heating			4434.3992 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	171.1348	1.5338	262.4922 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-471.5453	1.4936	-704.2809
PV Unit electricity exported	-420.2504	0.4601	-193.3476
Total			-897.6285 (283)
Total Primary energy kWh/year			3929.3637 (286)
Target Primary Energy Rate (TPER)			54.4500 (287)

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Plot Reference	K108 - Mid				Issued on Date	25/03/2026	
Assessment Reference	1b2p-50-Mid			Plot Type Ref	1b2p-50-Mid		
Plot Address					SAP Version	10.2	
SAP Rating	88 B		DER	2.95		TER	12.26
Environmental	98 A		% DER < TER				75.94
CO ₂ Emissions (t/year)	0.12		DFEE	22.46		TFEE	22.93
Compliance Check	See BREL		% DFEE < TFEE				2.07
% DPER < TPER	52.87		DPER	30.74		TPER	65.23
Assessor Details	Miss Alicja Kreglewska				Assessor ID	L728-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	49.9700 (1b)	2.5000 (2b)	124.9250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.9700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	124.9250 (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	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)

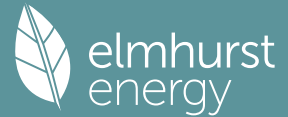
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	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
Main dwelling							
Window			8.7700	0.8687	7.6187		(27)
Door			1.8400	1.0000	1.8400		(26)
External Wall 1	23.4800	8.7700	14.7100	0.1800	2.6478	70.0000	1029.7000 (29a)
Corridor Wall	14.1400	1.8400	12.3000	0.2000	2.4600	70.0000	861.0000 (29a)
Total net area of external elements Aum(A, m ²)			37.6200				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	14.5665	(33)
Main dwelling							
Party Wall 1			44.1200	0.0000	0.0000	140.0000	6176.7999 (32)
Party Floor 1			49.9700			80.0000	3997.6000 (32d)
Party Ceiling 1			49.9700			100.0000	4997.0000 (32b)
Internal Wall 1			80.8500			9.0000	727.6500 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17789.7498 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		356.0086 (35)
List of Thermal Bridges		

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	Length	Psi-value	Total
K1 Element	9.6200	0.0600	0.5772
E7 Party floor between dwellings (in blocks of flats)	0.0000	0.1270	0.0000
E16 Corner (normal)	5.7000	0.0250	0.1425
E18 Party wall between dwellings	6.8600	0.1000	0.6860
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	30.9600	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	0.0000	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	9.9200	0.1000	0.9920
E7 Party floor between dwellings (in blocks of flats)	0.0000	0.1200	0.0000
E25 Staggered party wall between dwellings	4.9500	0.0170	0.0842
E2 Other lintels (including other steel lintels)	4.0500	0.0300	0.1215
E3 Sill	12.4800	0.1200	1.4976
E4 Jamb	0.0000	0.1300	0.0000
E16 Corner (normal)	0.0000	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	0.0000	0.0000	0.0000
E18 Party wall between dwellings	2.8500	0.0900	0.2565
E25 Staggered party wall between dwellings	2.8500	0.0900	0.2565
P1 Party wall - Ground floor	0.0000	0.0500	0.0000
E5 Ground floor (normal)	0.0000	0.1000	0.0000
E5 Ground floor (normal)	0.0000	0.2300	0.0000
E14 Flat roof	0.0000	0.1600	0.0000
E15 Flat roof with parapet	0.0000	0.3000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	0.0000	0.0300	0.0000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			4.6139 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss		(33) + (36) + (36a) =	19.1805 (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	10.0268	9.9069	9.7871	9.1881	9.0683	8.4692	8.4692	8.3494	8.7088	9.0683	9.3079	9.5475 (38)
Average = Sum(39)m / 12 =	29.2072	29.0874	28.9676	28.3686	28.2487	27.6497	27.6497	27.5299	27.8893	28.2487	28.4884	28.7280 (39)
												28.3386

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.5845	0.5821	0.5797	0.5677	0.5653	0.5533	0.5533	0.5509	0.5581	0.5653	0.5701	0.5749 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

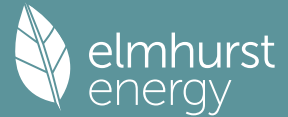
4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.6892 (42)
Hot water usage for mixer showers	52.5421	51.7525	50.6019	48.4004	46.7758	44.9640	43.9342	45.0761	46.3278	48.2731	50.5219	52.3408	(42a)
Hot water usage for baths	22.7181	22.3807	21.9055	21.0295	20.3735	19.6462	19.2533	19.7251	20.2388	21.0171	21.9112	22.6413	(42b)
Hot water usage for other uses	31.9293	30.7682	29.6071	28.4461	27.2850	26.1240	26.1240	27.2850	28.4461	29.6071	30.7682	31.9293	(42c)
Average daily hot water use (litres/day)												98.5319	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy content (annual)	107.1894	104.9014	102.1146	97.8760	94.4343	90.7341	89.3114	92.0862	95.0127	98.8973	103.2013	106.9113	(44)
Distribution loss (46)m = 0.15 x (45)m	169.7619	149.3782	156.9463	133.9873	127.1267	111.5682	108.0144	114.0219	117.1601	134.2028	147.0291	167.3973	(45)
Water storage loss (or HIU loss):										Total = Sum(45)m =		1636.5943	
Store volume	25.4643	22.4067	23.5419	20.0981	19.0690	16.7352	16.2022	17.1033	17.5740	20.1304	22.0544	25.1096	(46)
a) If manufacturer declared loss factor is known (kWh/day):												200.0000	(47)
Temperature factor from Table 2b												1.1700	(48)
Enter (49) or (54) in (55)												0.5400	(49)
Total storage loss												0.6318	(55)
If cylinder contains dedicated solar storage	19.5858	17.6904	19.5858	18.9540	19.5858	18.9540	19.5858	19.5858	18.9540	19.5858	18.9540	19.5858	(56)
Primary loss	19.5858	17.6904	19.5858	18.9540	19.5858	18.9540	19.5858	19.5858	18.9540	19.5858	18.9540	19.5858	(57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Total heat required for water heating calculated for each month	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	189.3477	167.0686	176.5321	152.9413	146.7125	130.5222	127.6002	133.6077	136.1141	153.7886	165.9831	186.9831	(62)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
Solar input	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
Output from w/h	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)	189.3477	167.0686	176.5321	152.9413	146.7125	130.5222	127.6002	133.6077	136.1141	153.7886	165.9831	186.9831	(64)
Electric shower(s)								Total per year (kWh/year) = Sum(64)m =				1867.2013	(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)
Heat gains from water heating, kWh/month								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				0.0000	(64a)
	56.4458	49.6682	52.1846	44.5508	42.2696	37.0964	35.9148	37.9123	38.9557	44.6224	48.8872	55.6596	(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	84.4609	84.4609	84.4609	84.4609	84.4609	84.4609	84.4609	84.4609	84.4609	84.4609	84.4609	84.4609 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	76.1249	84.2812	76.1249	78.6624	76.1249	78.6624	76.1249	76.1249	78.6624	76.1249	78.6624	76.1249 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	147.1560	148.6831	144.8350	136.6430	126.3020	116.5830	110.0901	108.5631	112.4111	120.6031	130.9441	140.6631 (68)
Pumps, fans	31.4461	31.4461	31.4461	31.4461	31.4461	31.4461	31.4461	31.4461	31.4461	31.4461	31.4461	31.4461 (69)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Water heating gains (Table 5)	-67.5687	-67.5687	-67.5687	-67.5687	-67.5687	-67.5687	-67.5687	-67.5687	-67.5687	-67.5687	-67.5687	-67.5687 (71)
Total internal gains	75.8680	73.9111	70.1407	61.8761	56.8140	51.5228	48.2726	50.9574	54.1052	59.9764	67.8989	74.8113 (72)
	347.4873	355.2135	339.4388	325.5198	307.5793	295.1065	282.8258	283.9836	293.5170	305.0427	325.8436	339.9376 (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
West				8.7700	19.6403		0.3800		0.7000	0.7700	31.7513 (80)
Solar gains	31.7513	62.1123	102.2901	149.1841	182.8307	187.1597	178.1837	153.0572	118.9677	73.7015	26.1107 (83)
Total gains	379.2386	417.3259	441.7290	474.7038	490.4099	482.2662	461.0095	437.0408	412.4846	378.7442	366.0483 (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	169.1909	169.8878	170.5904	174.1928	174.9316	178.7216	178.7216	179.4994	177.1861	174.9316	173.4602	172.0134
alpha	12.2794	12.3259	12.3727	12.6129	12.6621	12.9148	12.9148	12.9666	12.8124	12.6621	12.5640	12.4676
util living area	0.9895	0.9665	0.8998	0.7197	0.5356	0.3669	0.2639	0.2898	0.4665	0.7685	0.9576	0.9921 (86)
MIT	20.8041	20.8869	20.9607	20.9972	20.9999	21.0000	21.0000	21.0000	21.0000	20.9952	20.9197	20.7917 (87)
Th 2	20.4440	20.4461	20.4483	20.4591	20.4613	20.4722	20.4722	20.4744	20.4678	20.4613	20.4570	20.4526 (88)
util rest of house	0.9857	0.9563	0.8775	0.6888	0.5046	0.3367	0.2322	0.2567	0.4305	0.7315	0.9435	0.9892 (89)
MIT 2	20.2739	20.3537	20.4197	20.4575	20.4613	20.4722	20.4722	20.4744	20.4678	20.4586	20.3947	20.2699 (90)
Living area fraction									fLA = Living area / (4) =			0.4939 (91)
MIT	20.5358	20.6170	20.6869	20.7240	20.7273	20.7329	20.7329	20.7340	20.7307	20.7237	20.6540	20.5276 (92)
Temperature adjustment												0.3000
adjusted MIT	20.8358	20.9170	20.9869	21.0240	21.0273	21.0329	21.0329	21.0340	21.0307	21.0237	20.9540	20.8276 (93)

8. Space heating requirement

Utilisation	0.9885	0.9651	0.8993	0.7211	0.5372	0.3688	0.2659	0.2919	0.4686	0.7701	0.9565	0.9913 (94)
Useful gains	374.8795	402.7689	397.2383	342.2933	263.4381	177.8666	122.5675	127.5727	193.2852	291.6610	349.5501	362.8627 (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	482.9642	465.8935	419.6503	343.9413	263.4849	177.8669	122.5675	127.5727	193.2914	294.4555	394.6764	477.6783 (97)
Space heating kWh	80.4150	42.4198	16.6746	1.1866	0.0348	0.0000	0.0000	0.0000	0.0000	2.0791	32.4909	85.4228 (98a)
Space heating requirement - total per year (kWh/year)												260.7235
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	80.4150	42.4198	16.6746	1.1866	0.0348	0.0000	0.0000	0.0000	0.0000	2.0791	32.4909	85.4228 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												260.7235
Space heating per m2										(98c) / (4) =		5.2176 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Fraction of main heating from main system 2												0.0000 (203)
Fraction of total heating from main system 1												1.0000 (204)
Fraction of total heating from main system 2												0.0000 (205)
Efficiency of main space heating system 1 (in %)												100.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	80.4150	42.4198	16.6746	1.1866	0.0348	0.0000	0.0000	0.0000	0.0000	2.0791	32.4909	85.4228 (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)	80.4150	42.4198	16.6746	1.1866	0.0348	0.0000	0.0000	0.0000	0.0000	2.0791	32.4909	85.4228 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Space heating fuel used, main system 2												0.0000 (213)
Water heating												
Water heating requirement	189.3477	167.0686	176.5321	152.9413	146.7125	130.5222	127.6002	133.6077	136.1141	153.7886	165.9831	186.9831 (64)
Efficiency of water heater												254.8850 (216)
(217)m	254.8850	254.8850	254.8850	254.8850	254.8850	254.8850	254.8850	254.8850	254.8850	254.8850	254.8850	254.8850 (217)
Fuel for water heating, kWh/month	74.2875	65.5466	69.2595	60.0041	57.5603	51.2083	50.0619	52.4188	53.4022	60.3365	65.1208	73.3598 (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	10.1936	9.2071	10.1936	9.8648	10.1936	9.8648	10.1936	10.1936	9.8648	10.1936	9.8648	10.1936 (231)
Lighting	15.4940	12.4298	11.1917	8.1995	6.3335	5.1746	5.7777	7.5100	9.7548	12.7988	14.4562	15.9246 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-7.0941	-12.0049	-20.9133	-27.9275	-33.9719	-33.1604	-32.4989	-28.5224	-22.1481	-15.0107	-8.3101	-5.8640 (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)												

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(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												260.7235	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												254.8850	
Water heating fuel used												732.5662	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)													
mechanical ventilation fans (SFP = 0.7875)												120.0217	(230a)
Total electricity for the above, kWh/year												120.0217	(231)
Electricity for lighting (calculated in Appendix L)												125.0451	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-247.4261	(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												990.9304	(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	260.7235	0.1601	41.7331	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	732.5662	0.1412	103.4560	(264)
Space and water heating			145.1891	(265)
Pumps, fans and electric keep-hot	120.0217	0.1387	16.6485	(267)
Energy for lighting	125.0451	0.1443	18.0479	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-247.4261	0.1313	-32.4901	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-32.4901	(269)
Total CO2, kg/year			147.3954	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.9500	(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	260.7235	1.5924	415.1785	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	732.5662	1.5222	1115.1209	(278)
Space and water heating			1530.2993	(279)
Pumps, fans and electric keep-hot	120.0217	1.5128	181.5688	(281)
Energy for lighting	125.0451	1.5338	191.7984	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-247.4261	1.4851	-367.4571	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-367.4571	(283)
Total Primary energy kWh/year			1536.2094	(286)
Dwelling Primary energy Rate (DPER)			30.7400	(287)

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

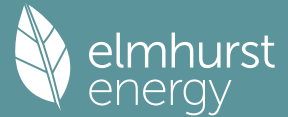
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling	49.9700	2.5000	124.9250	(1b) - (3b)
Ground floor				
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	49.9700			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	124.9250	(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)

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Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 20.0000 / (5) = 0.1601 (8)
Pressure test Yes
Pressure Test Method Blower Door
Measured/design AP50 5.0000 (17)
Infiltration rate 0.4101 (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) = 0.3178 (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	0.4052	0.3973	0.3893	0.3496	0.3417	0.3019	0.3019	0.2940	0.3178	0.3417	0.3576	0.3734 (22b)
	0.5821	0.5789	0.5758	0.5611	0.5584	0.5456	0.5456	0.5432	0.5505	0.5584	0.5639	0.5697 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Opaque door			1.8400	1.0000	1.8400		(26)
TER Opening Type			8.7700	1.1450	10.0420		(27)
External Wall 1	23.4800	8.7700	14.7100	0.1800	2.6478		(29a)
Corridor Wall	14.1400	1.8400	12.3000	0.1800	2.2140		(29a)
Total net area of external elements Aum(A, m2)			37.6200				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 16.7438		(33)
Main dwelling							
Party Wall 1			44.1200	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 356.0086 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element	9.6200	0.0700	0.6734
E7 Party floor between dwellings (in blocks of flats)	0.0000	0.0900	0.0000
E16 Corner (normal)	5.7000	0.0600	0.3420
E18 Party wall between dwellings	6.8600	0.0200	0.1372
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	30.9600	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	0.0000	-0.0900	-0.0000
E17 Corner (inverted - internal area greater than external area)	9.9200	0.0700	0.6944
E7 Party floor between dwellings (in blocks of flats)	0.0000	0.0600	0.0000
E25 Staggered party wall between dwellings	4.9500	0.0500	0.2475
E2 Other lintels (including other steel lintels)	4.0500	0.0500	0.2025
E3 Sill	12.4800	0.0500	0.6240
E4 Jamb	0.0000	0.0900	0.0000
E16 Corner (normal)	0.0000	-0.0900	-0.0000
E17 Corner (inverted - internal area greater than external area)	2.8500	0.0600	0.1710
E18 Party wall between dwellings	2.8500	0.0600	0.1710
E25 Staggered party wall between dwellings	0.0000	0.0800	0.0000
P1 Party wall - Ground floor	0.0000	0.1600	0.0000
E5 Ground floor (normal)	0.0000	0.1600	0.0000
E5 Ground floor (normal)	0.0000	0.0800	0.0000
E14 Flat roof	0.0000	0.5600	0.0000
E15 Flat roof with parapet	0.0000	0.1200	0.0000
P4 Party wall - Roof (insulation at ceiling level)			

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.2630 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 20.0068 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)
(38)m Jan 23.9974 Feb 23.8660 Mar 23.7371 Apr 23.1320 May 23.0188 Jun 22.4917 Jul 22.4917 Aug 22.3941 Sep 22.6948 Oct 23.0188 Nov 23.2478 Dec 23.4873 (38)
Heat transfer coeff 44.0042 43.8727 43.7439 43.1388 43.0256 42.4985 42.4985 42.4009 42.7015 43.0256 43.2546 43.4941 (39)
Average = Sum(39)m / 12 = 43.1382

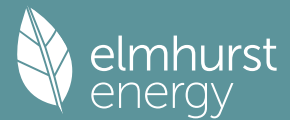
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.8806	0.8780	0.8754	0.8633	0.8610	0.8505	0.8505	0.8485	0.8545	0.8610	0.8656	0.8704 (40)
HLP (average)												0.8633
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.6892 (42)
Hot water usage for mixer showers	52.5421	51.7525	50.6019	48.4004	46.7758	44.9640	43.9342	45.0761	46.3278	48.2731	50.5219	52.3408 (42a)
Hot water usage for baths	22.7181	22.3807	21.9055	21.0295	20.3735	19.6462	19.2533	19.7251	20.2388	21.0171	21.9112	22.6413 (42b)
Hot water usage for other uses	31.9293	30.7682	29.6071	28.4461	27.2850	26.1240	26.1240	27.2850	28.4461	29.6071	30.7682	31.9293 (42c)
Average daily hot water use (litres/day)												98.5319 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	107.1894	104.9014	102.1146	97.8760	94.4343	90.7341	89.3114	92.0862	95.0127	98.8973	103.2013	106.9113 (44)
Energy conte	169.7619	149.3782	156.9463	133.9873	127.1267	111.5682	108.0144	114.0219	117.1601	134.2028	147.0291	167.3973 (45)
Energy content (annual)										Total = Sum(45)m = 1636.5943		
Distribution loss (46)m = 0.15 x (45)m	25.4643	22.4067	23.5419	20.0981	19.0690	16.7352	16.2022	17.1033	17.5740	20.1304	22.0544	25.1096 (46)
Water storage loss (or HIU loss):												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage												
Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Total heat required for water heating calculated for each month	216.3568	191.4639	203.5412	179.0792	173.7216	156.6600	154.6093	160.6168	162.2520	180.7977	192.1210	213.9922 (62)
WWHRS	-24.0201	-21.2435	-22.2450	-18.4197	-17.1665	-14.6895	-13.7691	-14.6421	-15.1984	-17.9172	-20.2980	-23.5752 (63a)

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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	192.3367	170.2204	181.2962	160.6594	156.5551	141.9705	140.8402	145.9748	147.0536	162.8805	171.8230	190.4170 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =											1962.0273 (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	93.7217	83.3368	89.4606	80.6243	79.5456	73.1699	73.1907	75.1882	75.0292	81.8983	84.9607	92.9355 (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	84.4609	84.4609	84.4609	84.4609	84.4609	84.4609	84.4609	84.4609	84.4609	84.4609	84.4609	84.4609	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.1249	84.2812	76.1249	78.6624	76.1249	78.6624	76.1249	76.1249	78.6624	76.1249	78.6624	76.1249	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	147.1560	148.6831	144.8350	136.6430	126.3020	116.5830	110.0901	108.5631	112.4111	120.6031	130.9441	140.6631	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4461	31.4461	31.4461	31.4461	31.4461	31.4461	31.4461	31.4461	31.4461	31.4461	31.4461	31.4461	(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)	-67.5687	-67.5687	-67.5687	-67.5687	-67.5687	-67.5687	-67.5687	-67.5687	-67.5687	-67.5687	-67.5687	-67.5687	(71)
Water heating gains (Table 5)	125.9701	124.0131	120.2427	111.9781	106.9161	101.6248	98.3746	101.0594	104.2072	110.0784	118.0009	124.9133	(72)
Total internal gains	400.5893	408.3156	392.5409	378.6218	360.6813	345.2085	332.9279	334.0857	343.6190	358.1447	378.9457	393.0396	(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	
West				8.7700	19.6403	0.6300		0.7000		0.7700	52.6403 (80)	
Solar gains	52.6403	102.9757	169.5863	247.3315	303.1140	310.2911	295.4098	253.7527	197.2359	122.1893	65.6363	43.2889 (83)
Total gains	453.2296	511.2913	562.1272	625.9533	663.7953	655.4997	628.3377	587.8383	540.8549	480.3340	444.5820	436.3285 (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	112.2984	112.6348	112.9665	114.5511	114.8526	116.2769	116.2769	116.5445	115.7241	114.8526	114.2444	113.6155
alpha	8.4866	8.5090	8.5311	8.6367	8.6568	8.7518	8.7518	8.7696	8.7149	8.6568	8.6163	8.5744
util living area	0.9936	0.9815	0.9406	0.7990	0.5998	0.4148	0.2976	0.3318	0.5435	0.8619	0.9795	0.9951 (86)
MIT	20.5254	20.6587	20.8238	20.9635	20.9967	20.9999	21.0000	21.0000	20.9989	20.9441	20.7229	20.5047 (87)
Th 2	20.1840	20.1863	20.1885	20.1988	20.2008	20.2098	20.2098	20.2115	20.2063	20.2008	20.1968	20.1927 (88)
util rest of house	0.9910	0.9744	0.9211	0.7569	0.5496	0.3637	0.2442	0.2749	0.4817	0.8174	0.9705	0.9931 (89)
MIT 2	19.6493	19.8171	20.0149	20.1695	20.1987	20.2097	20.2098	20.2115	20.2058	20.1569	19.9072	19.6306 (90)
Living area fraction	fLA = Living area / (4) = 0.4939 (91)											
MIT	20.0820	20.2328	20.4144	20.5616	20.5928	20.6000	20.6001	20.6009	20.5975	20.5457	20.3101	20.0623 (92)
Temperature adjustment	0.0000											
adjusted MIT	20.0820	20.2328	20.4144	20.5616	20.5928	20.6000	20.6001	20.6009	20.5975	20.5457	20.3101	20.0623 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9905	0.9749	0.9270	0.7765	0.5743	0.3889	0.2705	0.3030	0.5122	0.8377	0.9720	0.9927	(94)
Ext temp.	448.9453	498.4636	521.0986	486.0396	381.2364	254.9507	169.9958	178.1192	277.0504	402.3764	432.1121	433.1338	(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	694.4738	672.6906	608.6711	503.0688	382.6185	254.9908	169.9972	178.1227	277.4531	427.9184	571.3967	689.9165	(97)
Space heating requirement - total per year (kWh/year)	182.6732	117.0806	65.1539	12.2610	1.0283	0.0000	0.0000	0.0000	0.0000	19.0033	100.2849	191.0463	(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)	182.6732	117.0806	65.1539	12.2610	1.0283	0.0000	0.0000	0.0000	0.0000	19.0033	100.2849	191.0463	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												688.5314	
Space heating per m ²												13.7789	(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	182.6732	117.0806	65.1539	12.2610	1.0283	0.0000	0.0000	0.0000	0.0000	19.0033	100.2849	191.0463	(98)
Space heating efficiency (main heating system 1)													

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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)	197.9125	126.8478	70.5893	13.2838	1.1141	0.0000	0.0000	0.0000	0.0000	20.5886	108.6510	206.9841 (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 requirement	192.3367	170.2204	181.2962	160.6594	156.5551	141.9705	140.8402	145.9748	147.0536	162.8805	171.8230	190.4170 (64)
Efficiency of water heater (217)m	83.9443	83.2379	81.9970	80.3776	79.8528	79.8000	79.8000	79.8000	79.8000	80.6541	82.8964	79.8000 (216)
Fuel for water heating, kWh/month	229.1242	204.4985	221.1009	199.8808	196.0546	177.9079	176.4915	182.9258	184.2777	201.9495	207.2743	84.0672 (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 (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	15.8173	12.6892	11.4252	8.3706	6.4657	5.2825	5.8982	7.6667	9.9583	13.0659	14.7579	16.2569 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-13.5393	-20.1410	-30.5362	-36.2890	-40.8763	-38.8191	-38.3696	-35.3648	-30.3558	-23.9006	-15.2621	-11.5876 (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)	-4.7521	-10.2288	-20.7629	-31.8205	-42.6903	-43.0983	-42.5679	-35.7398	-25.8178	-14.8096	-6.4044	-3.7392 (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												745.9712 (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												2407.9913 (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)												127.6543 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-617.4731 (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												2750.1437 (238)

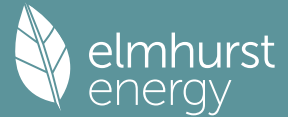
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	745.9712	0.2100	156.6540 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2407.9913	0.2100	505.6782 (264)
Space and water heating			662.3321 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	127.6543	0.1443	18.4245 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-335.0416	0.1335	-44.7119
PV Unit electricity exported	-282.4316	0.1253	-35.3951
Total			-80.1070 (269)
Total CO2, kg/year			612.5788 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.2600 (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	745.9712	1.1300	842.9475 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2407.9913	1.1300	2721.0302 (278)
Space and water heating			3563.9777 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	127.6543	1.5338	195.8004 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-335.0416	1.4932	-500.2676
PV Unit electricity exported	-282.4316	0.4600	-129.9169
Total			-630.1846 (283)
Total Primary energy kWh/year			3259.6943 (286)
Target Primary Energy Rate (TPER)			65.2300 (287)

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Plot Reference	KG04 - GF				Issued on Date	25/03/2026	
Assessment Reference	2b4p-72-GF			Plot Type Ref	2b4p-72-GF		
Plot Address					SAP Version	10.2	
SAP Rating	84 B	DER	3.92	TER	12.33		
Environmental	97 A	% DER < TER				68.21	
CO ₂ Emissions (t/year)	0.22	DFEE	30.22	TFEE	32.31		
Compliance Check	See BREL	% DFEE < TFEE				6.47	
% DPER < TPER	38.08	DPER	40.40	TPER	65.25		
Assessor Details	Miss Alicja Kreglewska				Assessor ID	L728-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	72.1700 (1b)	2.5000 (2b)	180.4250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.1700		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	180.4250 (5)

2. Ventilation rate

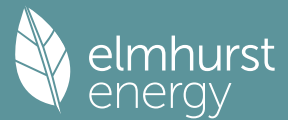
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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
Main dwelling							
Window			16.0000	0.8687	13.8996		(27)
Door			1.8400	1.0000	1.8400		(26)
Ground floor			72.1700	0.1000	7.2170	110.0000	7938.7000 (28a)
External Wall 1	51.3000	16.0000	35.3000	0.1800	6.3540	70.0000	2470.9999 (29a)
Corridor Wall	4.3900	1.8400	2.5500	0.2000	0.5100	70.0000	178.5000 (29a)
Total net area of external elements Aum(A, m ²)			127.8600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8206		(33)
Main dwelling							
Party Wall 1			60.7000	0.0000	0.0000	140.0000	8498.0001 (32)
Party Ceiling 1			72.1700			100.0000	7217.0000 (32b)
Internal Wall 1			122.5000			9.0000	1102.5000 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		27405.7000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							379.7381 (35)
List of Thermal Bridges							

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K1 Element	Length	Psi-value	Total									
E7 Party floor between dwellings (in blocks of flats)	13.6200	0.0600	0.8172									
E16 Corner (normal)	5.7000	0.1270	0.7239									
E18 Party wall between dwellings	5.7000	0.0250	0.1425									
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.3700	0.1000	0.4370									
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	21.3100	0.0000	0.0000									
E17 Corner (inverted - internal area greater than external area)	2.8500	0.0000	0.0000									
E7 Party floor between dwellings (in blocks of flats)	1.5400	0.1000	0.1540									
E25 Staggered party wall between dwellings	0.0000	0.1200	0.0000									
E2 Other lintels (including other steel lintels)	8.9700	0.0170	0.1525									
E3 Sill	8.0700	0.0300	0.2421									
E4 Jamb	23.2800	0.1200	2.7936									
E16 Corner (normal)	0.0000	0.1300	0.0000									
E17 Corner (inverted - internal area greater than external area)	0.0000	0.0000	0.0000									
E18 Party wall between dwellings	0.0000	0.0900	0.0000									
E25 Staggered party wall between dwellings	5.7000	0.0900	0.5130									
P1 Party wall - Ground floor	21.3100	0.0500	1.0655									
E5 Ground floor (normal)	17.9900	0.1000	1.7990									
E5 Ground floor (normal)	1.5400	0.2300	0.3542									
E14 Flat roof	0.0000	0.1600	0.0000									
E15 Flat roof with parapet	0.0000	0.3000	0.0000									
P4 Party wall - Roof (insulation at ceiling level)	0.0000	0.0300	0.0000									
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			9.1945 (36)									
Point Thermal bridges			(36a) = 0.0000									
Total fabric heat loss		(33) + (36) + (36a) =	39.0151 (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	15.3353	15.1456	14.9558	14.0068	13.8171	12.8681	12.8681	12.6784	13.2477	13.8171	14.1966	14.5762 (38)
Heat transfer coeff												
	54.3504	54.1607	53.9709	53.0219	52.8322	51.8832	51.8832	51.6935	52.2628	52.8322	53.2117	53.5913 (39)
Average = Sum(39)m / 12 =												52.9745
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.7531	0.7505	0.7478	0.7347	0.7321	0.7189	0.7189	0.7163	0.7242	0.7321	0.7373	0.7426 (40)
HLP (average)												0.7340
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

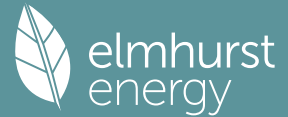
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2976 (42)
Hot water usage for mixer showers	62.7434	61.8005	60.4265	57.7976	55.8575	53.6940	52.4642	53.8278	55.3226	57.6456	60.3310	62.5030	(42a)
Hot water usage for baths	27.1049	26.7024	26.1355	25.0903	24.3077	23.4399	22.9711	23.5340	24.1469	25.0755	26.1422	27.0133	(42b)
Hot water usage for other uses	38.1601	36.7724	35.3848	33.9971	32.6095	31.2219	31.2219	32.6095	33.9971	35.3848	36.7724	38.1601	(42c)
Average daily hot water use (litres/day)													117.6689 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy content (annual)	128.0084	125.2753	121.9468	116.8851	112.7747	108.3557	106.6572	109.9713	113.4666	118.1059	123.2456	127.6764	(44)
Distribution loss (46)m = 0.15 x (45)m	202.7341	178.3904	187.4277	160.0098	151.8164	133.2360	128.9926	136.1675	139.9157	160.2686	175.5860	199.9104	(45)
Water storage loss (or HIU loss):	Total = Sum(45)m = 1954.4552												
Store volume	30.4101	26.7586	28.1142	24.0015	22.7725	19.9854	19.3489	20.4251	20.9874	24.0403	26.3379	29.9866	(46)
a) If manufacturer declared loss factor is known (kWh/day):	200.0000 (47)												
Temperature factor from Table 2b	1.1700 (48)												
Enter (49) or (54) in (55)	0.5400 (49)												
Total storage loss	0.6318 (55)												
If cylinder contains dedicated solar storage	19.5858	17.6904	19.5858	18.9540	19.5858	18.9540	19.5858	19.5858	18.9540	19.5858	18.9540	19.5858	(56)
Primary loss	19.5858	17.6904	19.5858	18.9540	19.5858	18.9540	19.5858	19.5858	18.9540	19.5858	18.9540	19.5858	(57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Total heat required for water heating calculated for each month	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	222.3199	196.0808	207.0135	178.9638	171.4022	152.1900	148.5784	155.7533	158.8697	179.8544	194.5400	219.4962	(62)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
Solar input	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
Output from w/h	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)	222.3199	196.0808	207.0135	178.9638	171.4022	152.1900	148.5784	155.7533	158.8697	179.8544	194.5400	219.4962	(64)
Electric shower(s)	Total per year (kWh/year) = Sum(64)m = 2185.0622 (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	67.4091	59.3148	62.3197	53.2033	50.4790	44.3010	42.8900	45.2757	46.5220	53.2893	58.3823	66.4702	(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	114.8817	114.8817	114.8817	114.8817	114.8817	114.8817	114.8817	114.8817	114.8817	114.8817	114.8817	114.8817 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	102.0539	112.9883	102.0539	105.4557	102.0539	105.4557	102.0539	102.0539	105.4557	102.0539	105.4557	102.0539 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	202.3078	204.4071	199.1169	187.8546	173.6380	160.2765	151.3501	149.2508	154.5410	165.8033	180.0198	193.3814 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4882	34.4882	34.4882	34.4882	34.4882	34.4882	34.4882	34.4882	34.4882	34.4882	34.4882	34.4882 (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)	-91.9053	-91.9053	-91.9053	-91.9053	-91.9053	-91.9053	-91.9053	-91.9053	-91.9053	-91.9053	-91.9053	-91.9053 (71)
Water heating gains (Table 5)	90.6036	88.2661	83.7631	73.8934	67.8481	61.5291	57.6479	60.8544	64.6139	71.6254	81.0866	89.3417 (72)
Total internal gains	452.4298	463.1259	442.3983	424.6682	401.0045	384.7258	368.5164	369.6236	382.0751	396.9471	424.0266	442.2415 (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	
South	7.2300		46.7521		0.3800	0.7000	0.7700	62.3095	(78)
West	8.7700		19.6403		0.3800	0.7000	0.7700	31.7513	(80)
Solar gains	94.0608	164.1592	232.2797	296.1005	335.9267	334.4938	254.7571	183.7686	113.4481
Total gains	546.4906	627.2851	674.6780	720.7687	736.9312	719.2196	636.8322	580.7156	537.4747

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	140.0668	140.5577	141.0519	143.5763	144.0920	146.7274	146.7274	147.2661	145.6618	144.0920	143.0642	142.0509
alpha	10.3378	10.3705	10.4035	10.5718	10.6061	10.7818	10.7818	10.8177	10.7108	10.6061	10.5376	10.4701
util living area	0.9979	0.9906	0.9639	0.8515	0.6637	0.4616	0.3305	0.3589	0.5657	0.8864	0.9903	0.9986 (86)
MIT	20.5978	20.7217	20.8531	20.9690	20.9975	21.0000	21.0000	21.0000	20.9996	20.9614	20.7693	20.5788 (87)
Th 2	20.2942	20.2965	20.2988	20.3103	20.3126	20.3242	20.3242	20.3265	20.3195	20.3126	20.3080	20.3034 (88)
util rest of house	0.9969	0.9865	0.9502	0.8150	0.6160	0.4129	0.2798	0.3064	0.5102	0.8473	0.9854	0.9979 (89)
MIT 2	19.9339	20.0577	20.1836	20.2907	20.3114	20.3242	20.3242	20.3265	20.3194	20.2891	20.1153	19.9233 (90)
Living area fraction									fLA = Living area / (4) =			0.3628 (91)
MIT	20.1748	20.2985	20.4265	20.5368	20.5603	20.5693	20.5693	20.5708	20.5662	20.5330	20.3525	20.1611 (92)
Temperature adjustment												0.3000
adjusted MIT	20.4748	20.5985	20.7265	20.8368	20.8603	20.8693	20.8693	20.8708	20.8662	20.8330	20.6525	20.4611 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9972	0.9884	0.9590	0.8433	0.6541	0.4522	0.3207	0.3489	0.5548	0.8776	0.9881	0.9981 (94)
Useful gains	544.9660	620.0353	647.0357	607.8130	482.0231	325.2374	221.5058	231.1095	353.3293	509.6436	531.0786	521.2087 (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	879.1051	850.2426	767.8147	632.9117	483.9590	325.2717	221.5065	231.1112	353.6181	540.6303	721.1542	871.4523 (97)
Space heating kWh	248.5995	154.6993	89.8596	18.0710	1.4403	0.0000	0.0000	0.0000	0.0000	23.0542	136.8544	260.5813 (98a)
Space heating requirement - total per year (kWh/year)												933.1595
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	248.5995	154.6993	89.8596	18.0710	1.4403	0.0000	0.0000	0.0000	0.0000	23.0542	136.8544	260.5813 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												933.1595
Space heating per m2										(98c) / (4) =		12.9300 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Fraction of main heating from main system 2												0.0000 (203)
Fraction of total heating from main system 1												1.0000 (204)
Fraction of total heating from main system 2												0.0000 (205)
Efficiency of main space heating system 1 (in %)												100.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	248.5995	154.6993	89.8596	18.0710	1.4403	0.0000	0.0000	0.0000	0.0000	23.0542	136.8544	260.5813 (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)	248.5995	154.6993	89.8596	18.0710	1.4403	0.0000	0.0000	0.0000	0.0000	23.0542	136.8544	260.5813 (211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Space heating fuel used, main system 2												0.0000 (213)
Water heating												
Water heating requirement	222.3199	196.0808	207.0135	178.9638	171.4022	152.1900	148.5784	155.7533	158.8697	179.8544	194.5400	219.4962 (64)
Efficiency of water heater												254.8850 (216)
(217)m	254.8850	254.8850	254.8850	254.8850	254.8850	254.8850	254.8850	254.8850	254.8850	254.8850	254.8850	254.8850 (217)
Fuel for water heating, kWh/month	87.2236	76.9291	81.2184	70.2135	67.2469	59.7093	58.2923	61.1073	62.3300	70.5629	76.3246	86.1158 (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	14.7223	13.2976	14.7223	14.2474	14.7223	14.2474	14.7223	14.7223	14.2474	14.7223	14.2474	14.7223 (231)
Lighting	20.7714	16.6636	15.0037	10.9923	8.4908	6.9371	7.7456	10.0680	13.0774	17.1582	19.3802	21.3487 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-7.3512	-12.6283	-22.2888	-29.7659	-36.2388	-35.4619	-34.7381	-30.2917	-23.2977	-15.7064	-8.6684	-6.0590 (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)

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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	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													933.1595	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													254.8850	
Water heating fuel used													857.2737	(219)
Space cooling fuel													0.0000	(221)
Electricity for pumps and fans:														
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)														
mechanical ventilation fans (SFP = 0.7875)													173.3433	(230a)
Total electricity for the above, kWh/year													173.3433	(231)
Electricity for lighting (calculated in Appendix L)													167.6369	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-262.4963	(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													1868.9171	(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	933.1595	0.1587	148.0715 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	857.2737	0.1413	121.1119 (264)
Space and water heating			269.1835 (265)
Pumps, fans and electric keep-hot	173.3433	0.1387	24.0449 (267)
Energy for lighting	167.6369	0.1443	24.1952 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-262.4963	0.1312	-34.4480
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-34.4480 (269)
Total CO2, kg/year			282.9755 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.9200 (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	933.1595	1.5873	1481.2475 (275)
Space heating - main system 2	0.0000	0.0000	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	857.2737	1.5224	1305.1177 (278)
Space and water heating			2786.3652 (279)
Pumps, fans and electric keep-hot	173.3433	1.5128	262.2338 (281)
Energy for lighting	167.6369	1.5338	257.1270 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-262.4963	1.4848	-389.7598
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-389.7598 (283)
Total Primary energy kWh/year			2915.9662 (286)
Dwelling Primary energy Rate (DPER)			40.4000 (287)

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

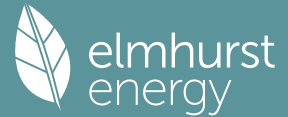
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	72.1700 (1b)	x 2.5000 (2b)	= 180.4250 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.1700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 180.4250 (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)

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Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 30.0000 / (5) = 0.1663 (8)
Pressure test Yes
Pressure Test Method Blower Door
Measured/design AP50 5.0000 (17)
Infiltration rate 0.4163 (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) = 0.3538 (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	0.4511	0.4423	0.4334	0.3892	0.3804	0.3361	0.3361	0.3273	0.3538	0.3804	0.3981	0.4158	(22b)
Effective ac	0.6018	0.5978	0.5939	0.5757	0.5723	0.5565	0.5565	0.5536	0.5626	0.5723	0.5792	0.5864	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8400	1.0000	1.8400			(26)
TER Opening Type			16.0000	1.1450	18.3206			(27)
Ground floor			72.1700	0.1300	9.3821			(28a)
External Wall 1	51.3000	16.0000	35.3000	0.1800	6.3540			(29a)
Corridor Wall	4.3900	1.8400	2.5500	0.1800	0.4590			(29a)
Total net area of external elements Aum(A, m2)			127.8600					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 36.3557			(33)
Main dwelling								
Party Wall 1			60.7000	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							379.7381	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	13.6200	0.0700	0.9534	
E16 Corner (normal)	5.7000	0.0900	0.5130	
E18 Party wall between dwellings	5.7000	0.0600	0.3420	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	4.3700	0.0200	0.0874	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	21.3100	0.0000	0.0000	
E17 Corner (inverted - internal area greater than external area)	2.8500	-0.0900	-0.2565	
E7 Party floor between dwellings (in blocks of flats)	1.5400	0.0700	0.1078	
E25 Staggered party wall between dwellings	0.0000	0.0600	0.0000	
E2 Other lintels (including other steel lintels)	8.9700	0.0500	0.4485	
E3 Sill	8.0700	0.0500	0.4035	
E4 Jamb	23.2800	0.0500	1.1640	
E16 Corner (normal)	0.0000	0.0900	0.0000	
E17 Corner (inverted - internal area greater than external area)	0.0000	-0.0900	-0.0000	
E18 Party wall between dwellings	0.0000	0.0600	0.0000	
E25 Staggered party wall between dwellings	5.7000	0.0600	0.3420	
P1 Party wall - Ground floor	21.3100	0.0800	1.7048	
E5 Ground floor (normal)	17.9900	0.1600	2.8784	
E5 Ground floor (normal)	1.5400	0.1600	0.2464	
E14 Flat roof	0.0000	0.0800	0.0000	
E15 Flat roof with parapet	0.0000	0.5600	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	0.0000	0.1200	0.0000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.9347	(36)
Point Thermal bridges			(36a) = 0.0000	
Total fabric heat loss			(33) + (36) + (36a) = 45.2904	(37)

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

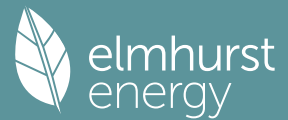
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	35.8291	35.5938	35.3632	34.2800	34.0773	33.1339	33.1339	32.9592	33.4973	34.0773	34.4873	34.9159	(38)
Average = Sum(39)m / 12 =	81.1195	80.8842	80.6536	79.5704	79.3677	78.4243	78.4243	78.2496	78.7877	79.3677	79.7777	80.2063	(39)
												79.5694	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1240	1.1207	1.1176	1.1025	1.0997	1.0867	1.0867	1.0842	1.0917	1.0997	1.1054	1.1114	(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													2.2976	(42)
Hot water usage for mixer showers														
62.7434	61.8005	60.4265	57.7976	55.8575	53.6940	52.4642	53.8278	55.3226	57.6456	60.3310	62.5030	62.5030	(42a)	
Hot water usage for baths														
27.1049	26.7024	26.1355	25.0903	24.3077	23.4399	22.9711	23.5340	24.1469	25.0755	26.1422	27.0133	27.0133	(42b)	
Hot water usage for other uses														
38.1601	36.7724	35.3848	33.9971	32.6095	31.2219	31.2219	32.6095	33.9971	35.3848	36.7724	38.1601	38.1601	(42c)	
Average daily hot water use (litres/day)													117.6689	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
128.0084	125.2753	121.9468	116.8851	112.7747	108.3557	106.6572	109.9713	113.4666	118.1059	123.2456	127.6764	127.6764	(44)	
Energy conte	202.7341	178.3904	187.4277	160.0098	151.8164	133.2360	128.9926	136.1675	139.9157	160.2686	175.5860	199.9104	(45)	
Energy content (annual)										Total = Sum(45)m =	1954.4552			
Distribution loss (46)m = 0.15 x (45)m														
30.4101	26.7586	28.1142	24.0015	22.7725	19.9854	19.3489	20.4251	20.9874	24.0403	26.3379	29.9866	29.9866	(46)	
Water storage loss (or HIU loss):														
Store volume													150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):													1.3938	(48)
Temperature factor from Table 2b													0.5400	(49)
Enter (49) or (54) in (55)													0.7527	(55)
Total storage loss														
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	(56)	
If cylinder contains dedicated solar storage														
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	(57)	
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	(59)	
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)	
Total heat required for water heating calculated for each month														

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WWHRS	249.3290	220.4761	234.0226	205.1016	198.4113	178.3278	175.5875	182.7624	185.0076	206.8635	220.6778	246.5053 (62)
PV diverter	-28.6837	-25.3681	-26.5640	-21.9960	-20.4995	-17.5416	-16.4424	-17.4849	-18.1492	-21.3959	-24.2390	-28.1525 (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)	220.6453	195.1081	207.4586	183.1056	177.9118	160.7862	159.1451	165.2775	166.8584	185.4676	196.4389	218.3528 (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	104.6850	92.9834	99.5956	89.2767	87.7549	80.3744	80.1660	82.5516	82.5954	90.5652	94.4558	103.7461 (65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												2236.5559 (64)
2237 (64)												

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.8817	114.8817	114.8817	114.8817	114.8817	114.8817	114.8817	114.8817	114.8817	114.8817	114.8817	114.8817	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	102.0539	112.9883	102.0539	105.4557	102.0539	105.4557	102.0539	102.0539	105.4557	102.0539	105.4557	102.0539	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	202.3078	204.4071	199.1169	187.8546	173.6380	160.2765	151.3501	149.2508	154.5410	165.8033	180.0198	193.3814	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4882	34.4882	34.4882	34.4882	34.4882	34.4882	34.4882	34.4882	34.4882	34.4882	34.4882	34.4882	(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)	-91.9053	-91.9053	-91.9053	-91.9053	-91.9053	-91.9053	-91.9053	-91.9053	-91.9053	-91.9053	-91.9053	-91.9053	(71)
Water heating gains (Table 5)	140.7056	138.3681	133.8651	123.9955	117.9501	111.6312	107.7500	110.9565	114.7159	121.7274	131.1886	139.4437	(72)
Total internal gains	505.5318	516.2280	495.5004	477.7703	454.1066	434.8278	418.6185	419.7256	432.1771	450.0491	477.1287	495.3435	(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						
South				7.2300	46.7521	0.6300		0.7000	0.7700	103.3025 (78)					
West				8.7700	19.6403	0.6300		0.7000	0.7700	52.6403 (80)					
Solar gains				155.9429	272.1586	385.0953	490.9035	556.9311	554.5555	534.0710	485.5257	422.3605	304.6690	188.0850	132.5517 (83)
Total gains				661.4747	788.3866	880.5957	968.6737	1011.0376	989.3833	952.6894	905.2514	854.5376	754.7181	665.2137	627.8953 (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	93.8454	94.1184	94.3875	95.6725	95.9168	97.0706	97.0706	97.2874	96.6229	95.9168	95.4238	94.9139
alpha	7.2564	7.2746	7.2925	7.3782	7.3945	7.4714	7.4714	7.4858	7.4415	7.3945	7.3616	7.3276
util living area	0.9972	0.9896	0.9655	0.8779	0.7093	0.5057	0.3621	0.3974	0.6280	0.9164	0.9906	0.9980 (86)
MIT	20.2654	20.4481	20.6623	20.8809	20.9778	20.9983	20.9999	20.9998	20.9926	20.8582	20.5233	20.2370 (87)
Th 2	19.9813	19.9839	19.9865	19.9988	20.0011	20.0117	20.0117	20.0137	20.0076	20.0011	19.9964	19.9916 (88)
util rest of house	0.9958	0.9848	0.9506	0.8362	0.6418	0.4285	0.2808	0.3123	0.5420	0.8758	0.9854	0.9970 (89)
MIT 2	19.1495	19.3821	19.6464	19.8993	19.9875	20.0111	20.0117	20.0137	20.0045	19.8852	19.4889	19.1215 (90)
Living area fraction	19.5543	19.7688	20.0149	20.2554	20.3467	20.3693	20.3702	20.3714	20.3629	20.2381	19.8641	19.5262 (91)
MIT	19.5543	19.7688	20.0149	20.2554	20.3467	20.3693	20.3702	20.3714	20.3629	20.2381	19.8641	19.5262 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5543	19.7688	20.0149	20.2554	20.3467	20.3693	20.3702	20.3714	20.3629	20.2381	19.8641	19.5262 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9950	0.9835	0.9511	0.8478	0.6659	0.4566	0.3103	0.3432	0.5733	0.8867	0.9845	0.9964 (94)	
Useful gains	658.1855	775.4113	837.5618	821.2798	673.2062	451.7389	295.6412	310.6913	489.9036	669.2257	654.8802	625.6507 (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	1237.4233	1202.6490	1090.0282	903.5534	686.2727	452.4501	295.6738	310.7595	493.4402	764.9569	1018.2929	1229.2557 (97)	
Space heating kWh	430.9529	287.1037	187.8350	59.2370	9.7215	0.0000	0.0000	0.0000	0.0000	71.2240	261.6571	449.0821 (98a)	
Space heating requirement - total per year (kWh/year)	1756.8134												
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	430.9529	287.1037	187.8350	59.2370	9.7215	0.0000	0.0000	0.0000	0.0000	71.2240	261.6571	449.0821 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)	1756.8134												
Space heating per m2	(98c) / (4) = 24.3427 (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	

Full SAP Calculation Printout



Space heating requirement	430.9529	287.1037	187.8350	59.2370	9.7215	0.0000	0.0000	0.0000	0.0000	71.2240	261.6571	449.0821 (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)	466.9046	311.0550	203.5049	64.1788	10.5325	0.0000	0.0000	0.0000	0.0000	77.1658	283.4855	486.5462 (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	220.6453	195.1081	207.4586	183.1056	177.9118	160.7862	159.1451	165.2775	166.8584	185.4676	196.4389	218.3528 (64)
Efficiency of water heater	85.5334	84.9247	83.8376	81.8272	80.2213	79.8000	79.8000	79.8000	79.8000	82.1091	84.7035	79.8000 (216)
Fuel for water heating, kWh/month	257.9638	229.7425	247.4529	223.7712	221.7764	201.4865	199.4299	207.1147	209.0957	225.8795	231.9135	85.6401 (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	254.9655 (219)
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	0.0000 (221)
Lighting	21.2048	17.0113	15.3168	11.2217	8.6680	7.0818	7.9072	10.2781	13.3502	17.5162	19.7845	7.0685 (231)
Electricity generated by PVs (Appendix M) (negative quantity)												21.7941 (232)
(233a)m	-19.3182	-28.6117	-43.1825	-51.0617	-57.2666	-54.2617	-53.5990	-49.5022	-42.6658	-33.8094	-21.7213	-16.5450 (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	-7.0995	-15.2504	-30.9070	-47.3065	-63.4259	-64.0490	-63.2963	-53.1917	-38.4638	-22.0985	-9.5708	-5.5910 (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												1903.3731 (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												2710.5922 (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)												171.1348 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-891.7957 (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												3979.3043 (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	1903.3731	0.2100	399.7084 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2710.5922	0.2100	569.2244 (264)
Space and water heating			968.9327 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	171.1348	0.1443	24.7000 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-471.5453	0.1336	-62.9799
PV Unit electricity exported	-420.2504	0.1253	-52.6764
Total			-115.6563 (269)
Total CO2, kg/year			889.9057 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.3300 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1903.3731	1.1300	2150.8116 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2710.5922	1.1300	3062.9692 (278)
Space and water heating			5213.7808 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	171.1348	1.5338	262.4922 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-471.5453	1.4936	-704.2809
PV Unit electricity exported	-420.2504	0.4601	-193.3476
Total			-897.6285 (283)
Total Primary energy kWh/year			4708.7453 (286)
Target Primary Energy Rate (TPER)			65.2500 (287)

Appendix E

Sitewide GLA carbon emissions spreadsheet summary

Residential

Table 1: Carbon Dioxide Emissions after each stage of the Energy Hierarchy for residential buildings

	Carbon Dioxide Emissions for residential buildings (Tonnes CO ₂ per annum)	
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	71.7	97.7
After energy demand reduction (be lean)	63.0	97.7
After heat network connection (be clean)	63.0	97.7
After renewable energy (be green)	22.8	97.7

Table 2: Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for residential buildings

	Regulated residential carbon dioxide savings	
	(Tonnes CO ₂ per annum)	(%)
Be lean: savings from energy demand reduction	8.7	12%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	40.3	56%
Cumulative on site savings	49.0	68%
Annual savings from off-set payment	22.8	-
	(Tonnes CO ₂)	
Cumulative savings for off-set payment	683	-
Cash in-lieu contribution (£)	64,889	

*carbon price is based on GLA recommended price of £95 per tonne of carbon dioxide unless Local Planning Authority price is inputted in the 'Development Information' tab

Domestic Part L 2021 Carbon Emissions

