HODKINSON

Energy Statement

Chase New Homes

The Barn Hotel

Final

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Executive Summary

The proposed development comprises the demolition of existing Barn Hotel buildings and the new construction of two residential blocks, providing 53 flats, 2 houses, 14 maisonettes and refurbishment of two Grade II listed buildings to provide a total of 3 dwellings. 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 CO_2 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 CO_2 emissions by 13% 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. The proposed improvements will result in approximately 18% CO_2 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 and is not included in a Heat Network Priority Area. 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 and maisonettes,

> Air source heat pumps (ASHP) fitted to the new Gate Houses and refurbished Grade II listed buildings,

> Photovoltaic panels (PV) mounted on flat roofs of the new buildings; total system size 87kWp.

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 over 73%, 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.

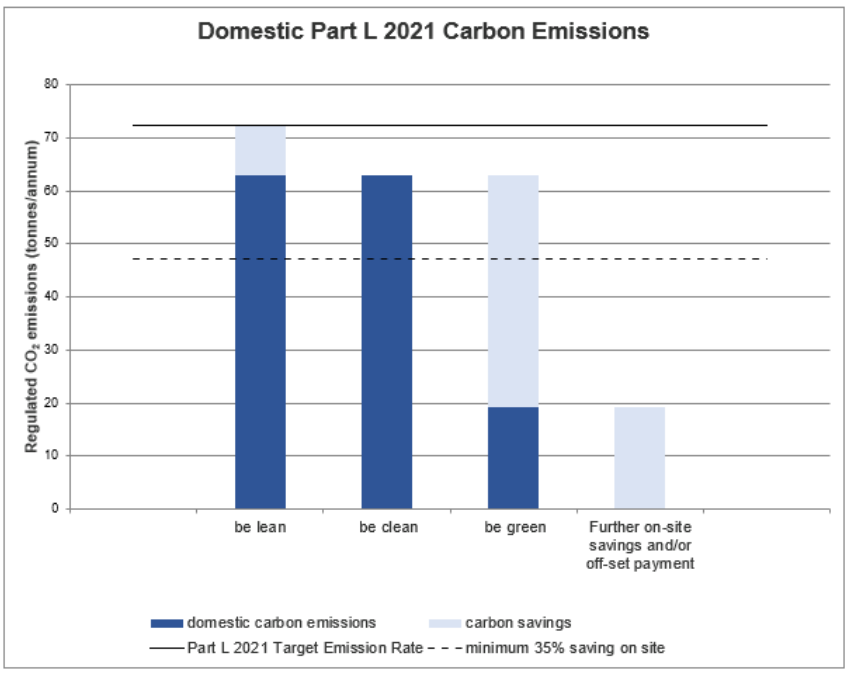

Figure i: Energy hierarchy regulated carbon emissions from the development (new dwellings) (source: GLA carbon emissions reporting spreadsheet)

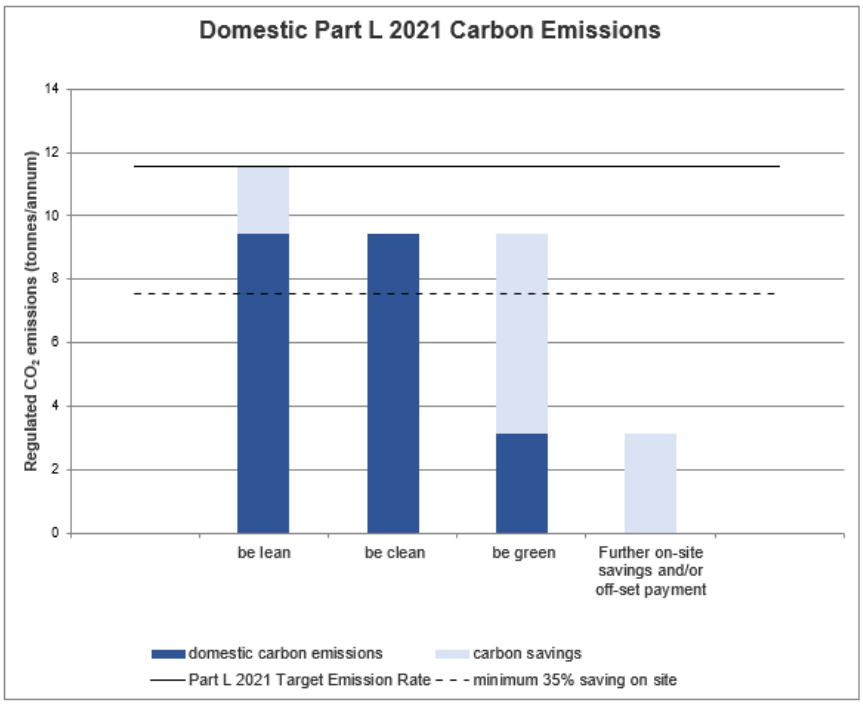

Figure ii: Energy hierarchy regulated carbon emissions from the development (refurbished dwellings) (source: GLA carbon emissions reporting spreadsheet)

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1. INTRODUCTION

1.1 This document has been prepared by Hodkinson Consultancy, a specialist energy and environmental consultancy for planning and development in support of the planning application for the residential development at The Barn Hotel 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 CO_2 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 DMEI 2 and New 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 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 OVERIEW

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 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.

2.5 The proposed description of development is as follows:

"Partial demolition of 1no. Grade II Listed Building and conversion of both (2no.) listed buildings to provide 3no. dwellings. Demolition and redevelopment of the remainder of the site for residential use with associated infrastructure, public open space and landscaping."

Site Location & Proposed Development

2.6 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 2023)

2.7 The proposed development comprises a redevelopment of the site to provide 72 dwellings spread across two apartment blocks, houses, maisonettes and two refurbished Garade II listed buildings. Please refer to the Figure 2 below for the proposed site plan, for context.

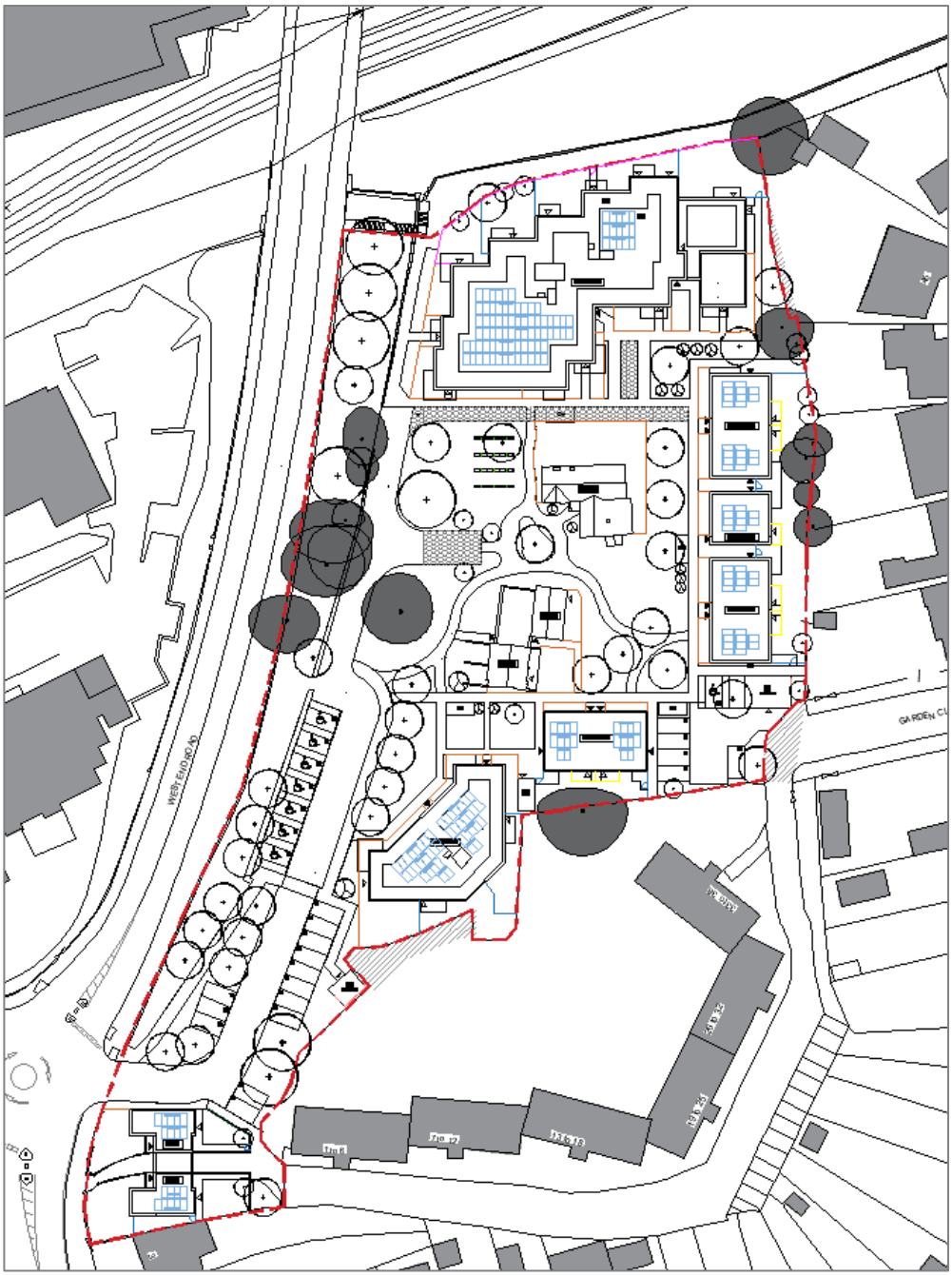

Figure 2: Proposed Block Plan (source: CMYK (Planning & Design) Ltd, August 2024)

3. PLANNING POLICIES & GUIDANCE

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

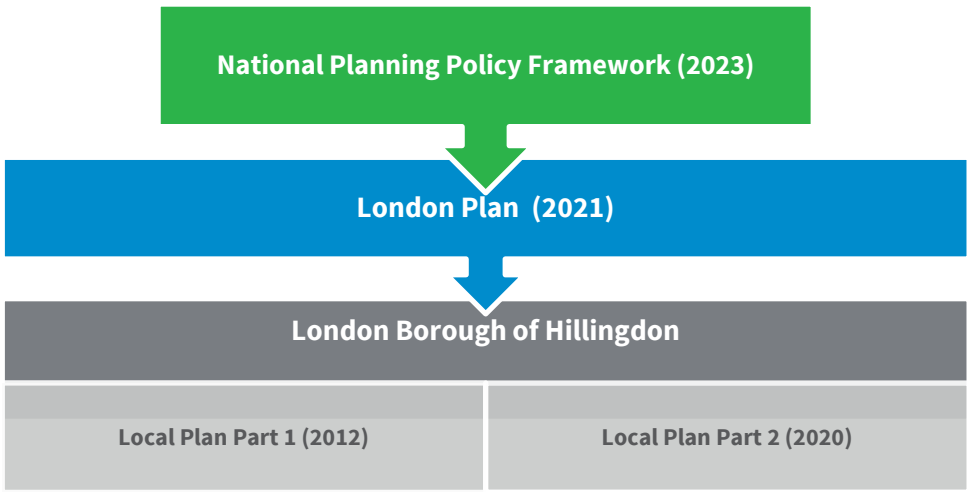

Figure 3: Relevant Kay Planning Policy and Guidance Documents

National Policy: National Planning Policy Framework

3.2 The revised National Planning Policy Framework (NPPF) was published on the 20th December 2023 and sets out the Government's planning policies for England.

3.3 The NPPF provides a framework for achieving sustainable development, which has been summarised as "*meeting the needs of the present without compromising the ability of future generations to meet their own needs*" (Resolution 42/187 of the United 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 The Barn Hotel, have been taken from the document:

> The requirements for the reduction in regulated CO_2 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 Consultation Draft (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, TPER and TFEE 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.

4. BUILDING REGULATIONS BASELINE

Methodology

4.1 This statement first establishes a baseline assessment of the energy demands and associated CO_2 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 CO_2 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 CO_2 emissions of the dwellings. An accredited Design SAP 10 software has been used to support the calculations.

4.4 The energy consumption and CO_2 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 CO_2 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 CO_2 emissions savings achieved through incorporation of passive design and efficient building fabric. This is to demonstrate the CO_2 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, 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 referrable developments. The guidance states that for smaller refurbishments, local boroughs should establish suitable approach to establish CO_2 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 CMYK, dated June 2024.

Baseline Results

4.12 Table 1 below shows the estimated baseline regulated and unregulated CO_2 emissions for the proposed development.

Table 1: Regulated and Unregulated Baseline CO_2 Emissions for the New Dewllings

New dwellings	Regulated CO_2 (tonnes/year)	Unregulated CO_2 (tonnes/year)
Baseline emissions	72.4	13.44

Table 2: Regulated and Unregulated Baseline CO_2 Emissions for the Refurbished Buildings

Refurbished dwellings	Regulated CO2 (tonnes/year)	Unregulated CO_2 (tonnes/year)
Baseline emissions	11.6	0.83

Table 3: Regulated and Unregulated Baseline CO_2 Emissions for the Whole Development

Whole development	Regulated CO2 (tonnes/year)	Unregulated CO_2 (tonnes/year)
Baseline emissions	84	14.27

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.

Table 4: Proposed Specification

Element	New Buildings	Refurbished dwellings
External Wall	0.18 W/m²K	0.30 W/m²K if possible
Walls to unheated spaces	0.20 W/m²K	n/a
Ground Floor	0.10 W/m²K	0.70 W/m²K should strive to improve to 0.25W/m²K if possible.
Flat Roof	0.11 W/m²K	n/a
Sloping Roofs	0.09 W/m²K	0.35W/m²K
Terraces	0.15 W/m²K	n/a

Element	New Buildings	Refurbished dwellings
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	1.00 W/m^{2}K	3.00 W/m^{2}K
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 m^3/m^2hr @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 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 all new dwellings. 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 (September 2024) 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.

CO_2 Emissions Following *Be Lean* Measures

5.22 Table 5 shows the new build part of the development achieves a 13% reduction in CO_2 emissions site-wide through the application of energy efficiency measures. The refurbished dwellings will achieve an 18% energy efficiency improvement over the baseline scenario (Table 6). Overall carbon emissions reduction from the Be Lean measures for the whole development will reach 14%.

Table 5: Reduction in Regulated CO_2 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	72.4	-	-
After *Be Lean* Measures	63.1	**9.4**	**13%**

Table 6: Reduction in Regulated CO_2 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	11.6	-	-
After *Be Lean* Measures	9.4	**2.2**	**18%**

Table 7: Reduction in Regulated CO_2 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	84	-	-
After *Be Lean* Measures	72.5	**11.6**	**14%**

5.23 The Be Lean DER 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 Brunnel University and is outside of a Heat Network Priority Area. 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 Gate 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. Mitsubishi Ecodan 5kW system has been used in the modelling of the listed buildings.

7.6 Exhaust air source heat pumps have been considered. Currently there is only one model available on the market that offers mechanical ventilation with heat recovery and air tempering ('peak lopping') to help mitigate overheating (Nilan Compact P). For this reason, this solution has been discounted on the basis of a high commercial risk. It will be revisited if more models become available at detailed design stage. Ongoing discussion with various manufacturers indicates that new products are likely to be released and approved in Q3-4 of 2025. 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 dwellings 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. This solution is appropriate for well insulated dwellings where hot water demand exceeds space heating demand.

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. Compliance of direct electric space heating system with the Future Homes Standard (Part L 2025) is yet to be determined, pending the development of SAP calculation methodology.

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. Flat roofs of the apartment blocks, maisonettes and the houses are suitable for installation of PV panels.

7.12 An analysis of the available roofs, taking into account services termination, lifts overrun and safe access, confirms that the estimated PV system size is as detailed below:

> Railway Block – 165m^2, i.e. 87 panels @ 0.4kWp each > 35kWp

> Entry Block – 82m^2, i.e. 43 panels @ 0.4kWp each > 17kWp

> Gate Houses – 18m^2 each, i.e. 9 panels per house @ 0.4kWp each > 3.6kWp (7.2kWp total)

> Maisonettes – 10m^2 each, i.e. 5 panels per flat > 2kWp each dwelling (28kWp total)

> Refurbished, Grade II listed buildings – no PVs

> **Total PV system size: 87.2 kWp**

7.13 Please refer to Figure 4 below for indicative layout of PV panels on roofs of all blocks.

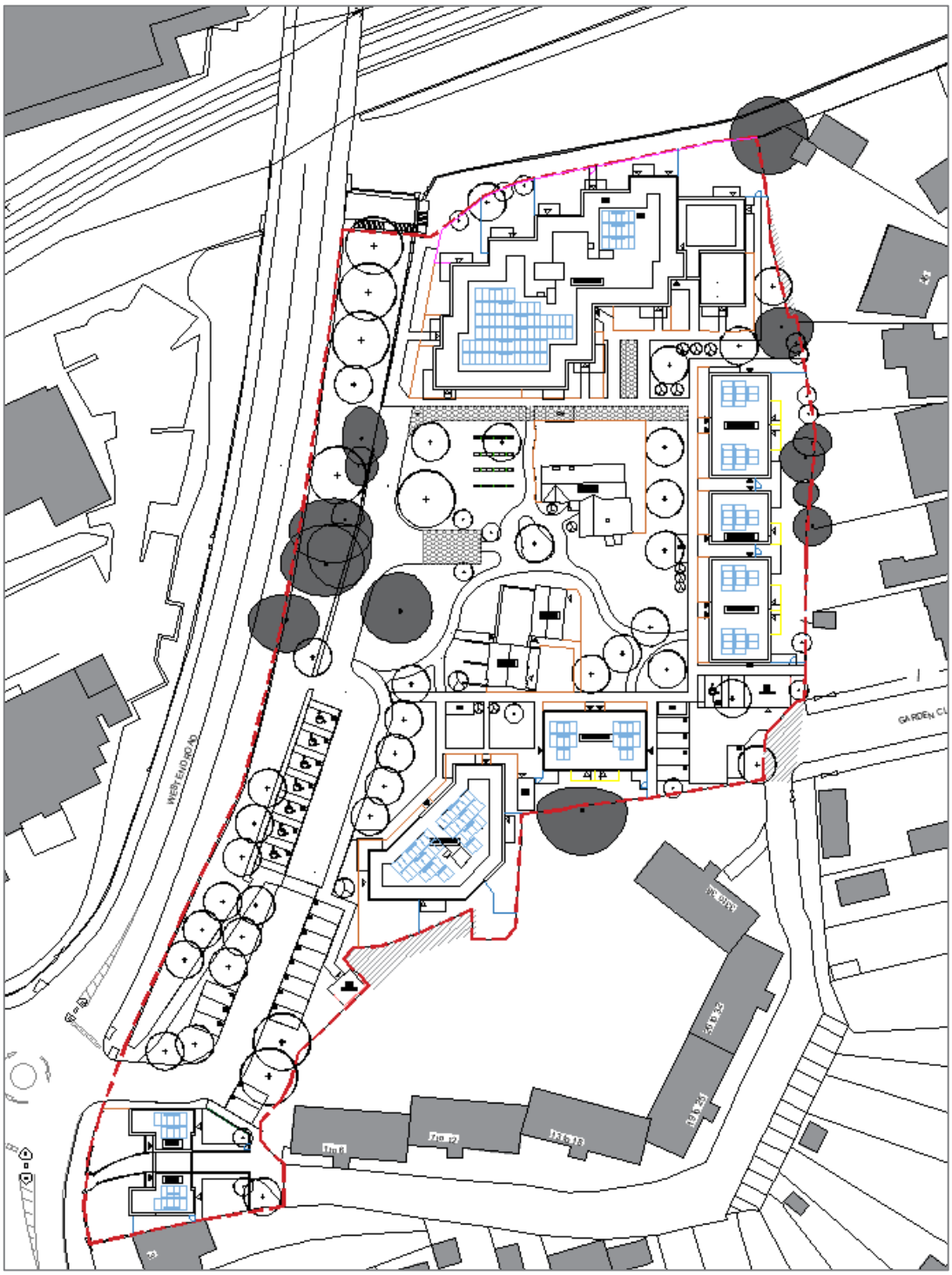

Figure 4: Indicative location of the proposed PV system (source: CMYK (Planning & Design) Ltd)

CO_2 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 73%, as shown in the Table 10 below. Please refer to Appendix C for DER Worksheets and Appendix D 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 CO_2 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	72.4	-	-
After *Be Lean* Measures	63.1	**9.4**	**13%**
After *Be Green* Measures (heat pumps + PV)	19.1	**53.3**	**74%**

Table 9: Reduction in Regulated CO_2 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	11.6	-	-
After *Be Lean* Measures	9.4	**2.2**	**18%**
After *Be Green* Measures (heat pumps)	3.1	**8.5**	**73%**

Table 10: Reduction in Regulated CO_2 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	84	-	-
After *Be Lean* Measures	72.5	**11.6**	**14%**
After *Be Green* Measures	22.2	**61.8**	**73.5%**

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 CO_2 emitted per year over a period of 30 years (or £2,850 per tonne of annual residual CO_2 emissions).

7.25 The estimated offset payment will be in the region of £63,270, 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	84
Savings from 'Be Lean' measures - energy demand reduction	11.6
Savings from 'Be Clean'	0
Savings from 'Be Green'	50.2
Cumulative savings	61.8
Shortfall to 'zero carbon'	22.2
'Zero carbon' offset payment	22.2 x 30 years = 666 666 x £95 = **£63,270**

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.

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.

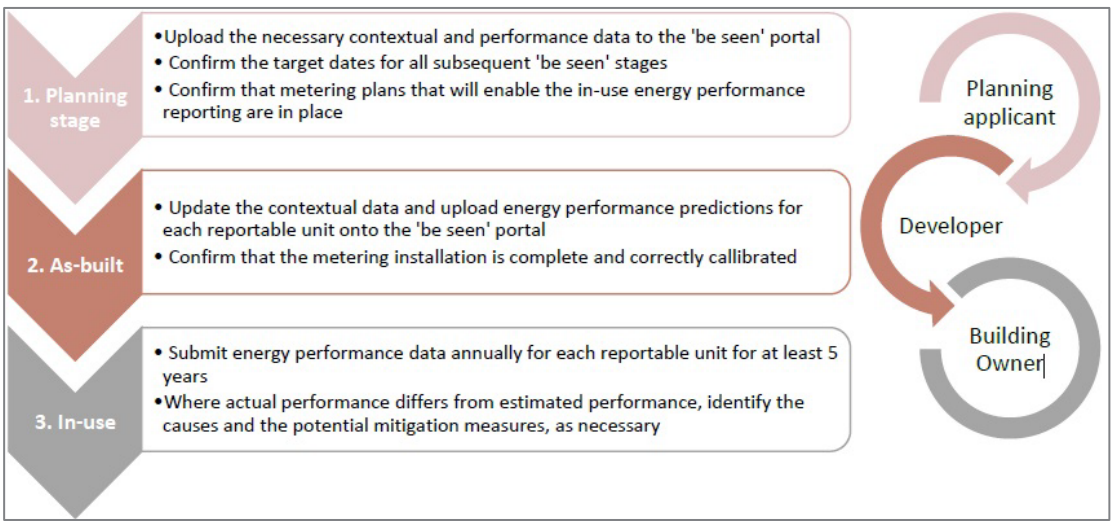

Figure 5: 'Be Seen' reporting stages, processes and responsibilities (source: 'Be Seen' Energy Reporting Guidance)

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) > Other fuels consumption (kWh) > District heating/cooling consumption(kWh) (if applicable)
Renewable energy	> Energy generation (kWh)
Carbon emissions	> Carbon emissions estimates (tonnes CO_2/m2) for residential and non-residential uses separately as well as the whole development > Carbon shortfall for the entire development (tonnes CO_2) > 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 CO_2 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 CO_2 emissions by 13% 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 18% CO_2 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 and is not included in a Heat Network Priority Area. 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 and maisonettes,

> Air source heat pumps (ASHP) fitted to the new Gate Houses and refurbished Grade II listed buildings,

> Photovoltaic panels (PV) mounted on flat roofs of the new buildings; total system size 87kWp.

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 73%, 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
DER Worksheets Baseline and Be Lean (TER & DER)

Appendix C
Hot water heat pump datasheet

Appendix D
DER Worksheets Be Green

Appendix E
GLA carbon emissions spreadsheet summary for new and refurbished dwellings

Appendix A
Baseline specification for listed buildings

Baseline specification for listed buildings			
Element	**Surveyed Data**	**Assumed baseline specification [W/m2K]**	**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/m2K.
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/m2K).
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.

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Appendix B

DER Worksheets Baseline and Be Lean (TER & DER)

Full SAP Calculation Printout

Property Reference	B1_00_2B__Copy	**Issued on Date**	29/08/2024
Assessment Reference	B1_00_2B_GF_Copy_Copy	**Prop Type Ref**	
Property			

SAP Rating	83 B	**DER**	14.86	**TER**	15.50
Environmental	89 B	**% DER < TER**			4.13
CO_2 Emissions (t/year)	0.87	**DFEE**	39.44	**TFEE**	40.47
Compliance Check	See BREL	**% DFEE < TFEE**			2.56
% DPER < TPER	-2.28	**DPER**	85.08	**TPER**	83.18

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

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		62.5700	(1b)	x 3.1500	(2b) =	197.0955	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.5700						
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		197.0955	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(21)

	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) =	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)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Window (Uw = 0.90)			17.2800	0.8687	15.0116			(27)
Door			1.9500	1.0000	1.9500			(26)
Heatloss Floor 1			62.5700	0.1000	6.2570	0.0000	0.0000	(28a)
External Wall 1	50.1200	17.2800	32.8400	0.1800	5.9112	0.0000	0.0000	(29a)
Corrido Wall	5.0000	1.9500	3.0500	0.2000	0.6100	0.0000	0.0000	(29a)
Total net area of external elements Aum(A, m2)			117.6900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.7398			(33)
Party Wall 1			44.8200	0.0000	0.0000	20.0000	896.4000	(32)
Party Ceiling 1			62.5700			100.0000	6257.0000	(32b)
Internal Wall 1			50.0000			9.0000	450.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 7603.4000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	121.5183	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E5 Ground floor (normal)	15.9100	0.1000	1.5910	
E7 Party floor between dwellings (in blocks of flats)	10.3600	0.0580	0.6009	
E5 Ground floor (normal)	1.5900	0.2600	0.4134	
E7 Party floor between dwellings (in blocks of flats)	1.5900	0.1100	0.1749	
E16 Corner (normal)	3.1500	0.1270	0.4001	
E18 Party wall between dwellings	3.1500	0.0250	0.0788	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.5500	0.1000	0.5550	
P1 Party wall - Ground floor	14.2300	0.0500	0.7115	
E2 Other lintels (including other steel lintels)	9.1900	0.0170	0.1562	
E3 Sill	8.2500	0.0300	0.2475	
E4 Jamb	25.0600	0.1200	3.0072	
E25 Staggered party wall between dwellings	9.4500	0.2000	1.8900	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.8264 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 39.5662 (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	17.0449	16.8376	16.6303	15.5937	15.3864	14.3498	14.3498	14.1425	14.7644	15.3864	15.8010	16.2157	(38)
Heat transfer coeff	56.6111	56.4038	56.1965	55.1599	54.9526	53.9160	53.9160	53.7087	54.3306	54.9526	55.3672	55.7819	(39)
Average = Sum(39)m / 12 =												55.1081	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9048	0.9015	0.8981	0.8816	0.8783	0.8617	0.8617	0.8584	0.8683	0.8783	0.8849	0.8915	(40)
HLP (average)												0.8807	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.0533 (42)
Hot water usage for mixer showers

58.6465	57.7651	56.4808	54.0236	52.2102	50.1879	49.0385	50.3130	51.7102	53.8815	56.3915	58.4218	(42a)

Hot water usage for baths

25.3431	24.9667	24.4367	23.4595	22.7277	21.9163	21.4780	22.0043	22.5774	23.4456	24.4430	25.2575	(42b)

Hot water usage for other uses

35.6577	34.3611	33.0644	31.7678	30.4711	29.1745	29.1745	30.4711	31.7678	33.0644	34.3611	35.6577	(42c)

Average daily hot water use (litres/day) 109.9833 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	119.6473	117.0930	113.9820	109.2508	105.4090	101.2787	99.6909	102.7885	106.0553	110.3915	115.1956	119.3370	(44)
Energy conte	189.4921	166.7388	175.1861	149.5589	141.9008	124.5340	120.5676	127.2736	130.7768	149.8003	164.1173	186.8528	(45)
Energy content (annual)										Total = Sum(45)m =		1826.7991	
Distribution loss (46)m = 0.15 x (45)m	28.4238	25.0108	26.2779	22.4338	21.2851	18.6801	18.0851	19.0910	19.6165	22.4700	24.6176	28.0279	(46)
Water storage 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	236.0231	208.7668	221.7171	194.5889	188.4318	169.5640	167.0986	173.8046	175.8068	196.3313	209.1473	233.3838	(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	236.0231	208.7668	221.7171	194.5889	188.4318	169.5640	167.0986	173.8046	175.8068	196.3313	209.1473	233.3838	(64)
										Total per year (kWh/year) = Sum(64)m =		2374.6641	(64)
12Total per year (kWh/year)												2375	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	100.2309	89.0631	95.4742	85.7523	84.4068	77.4315	77.3135	79.5433	79.5073	87.0334	90.5930	99.3534	(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	102.6644	102.6644	102.6644	102.6644	102.6644	102.6644	102.6644	102.6644	102.6644	102.6644	102.6644	102.6644	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	90.4760	100.1699	90.4760	93.4919	90.4760	93.4919	90.4760	90.4760	93.4919	90.4760	93.4919	90.4760	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	179.3789	181.2403	176.5496	166.5638	153.9585	142.1113	134.1966	132.3352	137.0258	147.0117	159.6170	171.4642	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.2664	33.2664	33.2664	33.2664	33.2664	33.2664	33.2664	33.2664	33.2664	33.2664	33.2664	33.2664	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-82.1315	-82.1315	-82.1315	-82.1315	-82.1315	-82.1315	-82.1315	-82.1315	-82.1315	-82.1315	-82.1315	-82.1315	(71)
Water heating gains (Table 5)	134.7190	132.5343	128.3255	119.1005	113.4500	107.5438	103.9160	106.9130	110.4268	116.9804	125.8236	133.5395	(72)
Total internal gains	461.3732	470.7438	452.1505	435.9555	414.6839	396.9463	382.3880	383.5236	394.7439	411.2674	435.7318	452.2790	(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	6.7600	46.7521	0.3800	0.7000	0.7700	58.2589	(78)
West	10.5200	19.6403	0.3800	0.7000	0.7700	38.0871	(80)

Solar gains	96.3460	169.9195	244.2409	316.3187	362.4571	362.2627	348.3355	314.3105	269.6691	191.3201	116.5468	81.6620	(83)
Total gains	557.7193	640.6633	696.3914	752.2742	777.1410	759.2090	730.7235	697.8340	664.4130	602.5876	552.2786	533.9411	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	37.3081	37.4453	37.5834	38.2897	38.4341	39.1731	39.1731	39.3243	38.8741	38.4341	38.1463	37.8628	
alpha	3.4872	3.4964	3.5056	3.5526	3.5623	3.6115	3.6115	3.6216	3.5916	3.5623	3.5431	3.5242	
util living area	0.9282	0.8901	0.8348	0.7315	0.5983	0.4397	0.3209	0.3487	0.5303	0.7597	0.8881	0.9357	(86)
MIT	19.6653	19.9447	20.2697	20.6316	20.8548	20.9645	20.9912	20.9881	20.9288	20.6420	20.1232	19.6287	(87)
Th 2	20.1635	20.1663	20.1691	20.1832	20.1860	20.2002	20.2002	20.2030	20.1945	20.1860	20.1804	20.1747	(88)
util rest of house	0.9184	0.8762	0.8145	0.7013	0.5570	0.3890	0.2640	0.2903	0.4770	0.7256	0.8717	0.9269	(89)
MIT 2	18.6186	18.9649	19.3629	19.8007	20.0507	20.1734	20.1953	20.1961	20.1370	19.8244	19.2017	18.5813	(90)
Living area fraction									fLA = Living area / (4) =			0.4680	(91)
MIT	19.1084	19.4234	19.7872	20.1895	20.4270	20.5436	20.5678	20.5668	20.5075	20.2070	19.6329	19.0715	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.9584	19.2734	19.6372	20.0395	20.2770	20.3936	20.4178	20.4168	20.3575	20.0570	19.4829	18.9215	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9014	0.8590	0.8002	0.6957	0.5617	0.4015	0.2796	0.3061	0.4881	0.7198	0.8555	0.9105	(94)
Useful gains	502.7252	550.3080	557.2474	523.3375	436.5397	304.8025	204.3123	213.6025	324.2882	433.7354	472.4887	486.1562	(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	829.8282	810.7141	738.2666	614.4545	471.3272	312.3672	205.8397	215.7345	339.9744	519.6848	685.6065	821.1906	(97)
Space heating kWh	243.3646	174.9929	134.6782	65.6043	25.8819	0.0000	0.0000	0.0000	0.0000	63.9463	153.4448	249.2656	(98a)
Space heating requirement - total per year (kWh/year)												1111.1786	
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	243.3646	174.9929	134.6782	65.6043	25.8819	0.0000	0.0000	0.0000	0.0000	63.9463	153.4448	249.2656	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1111.1786	
Space heating per m2											(98c) / (4) =	17.7590	(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 %)	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	243.3646	174.9929	134.6782	65.6043	25.8819	0.0000	0.0000	0.0000	0.0000	63.9463	153.4448	249.2656	(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)	274.0592	197.0641	151.6647	73.8787	29.1463	0.0000	0.0000	0.0000	0.0000	72.0116	172.7982	280.7045	(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	236.0231	208.7668	221.7171	194.5889	188.4318	169.5640	167.0986	173.8046	175.8068	196.3313	209.1473	233.3838	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.1286	83.6667	82.9780	81.8927	80.7888	79.8000	79.8000	79.8000	79.8000	81.8378	83.3761	84.2077	(217)
Fuel for water heating, kWh/month	280.5505	249.5219	267.1998	237.6144	233.2399	212.4862	209.3967	217.8003	220.3093	239.9029	250.8481	277.1526	(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	22.8761	20.6623	22.8761	22.1382	22.8761	22.1382	22.8761	22.8761	22.1382	22.8761	22.1382	22.8761	(231)
Lighting	18.5132	14.8519	13.3725	9.7973	7.5677	6.1829	6.9035	8.9734	11.6556	15.2928	17.2732	19.0277	(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	1251.3272	(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	2896.0226	(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)	183.3481	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	269.3481	(231)
Electricity for lighting (calculated in Appendix L)	149.4118	(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	4566.1097	(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	1251.3272	0.2100	262.7787	(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)	2896.0226	0.2100	608.1648	(264)
Space and water heating			870.9435	(265)
Pumps, fans and electric keep-hot	269.3481	0.1387	37.3619	(267)
Energy for lighting	149.4118	0.1443	21.5647	(268)
Total CO2, kg/year			929.8701	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			14.8600	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1251.3272	1.1300	1413.9997	(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)	2896.0226	1.1300	3272.5056	(278)
Space and water heating			4686.5053	(279)
Pumps, fans and electric keep-hot	269.3481	1.5128	407.4698	(281)
Energy for lighting	149.4118	1.5338	229.1727	(282)
Total Primary energy kWh/year			5323.1479	(286)
Dwelling Primary energy Rate (DPER)			85.0800	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	62.5700	(1b)	x 3.1500	(2b) =	197.0955	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.5700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	197.0955	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)
Number of flues attached to other heater	0 * 35 = 0.0000	(6e)
Number of blocked chimneys	0 * 20 = 0.0000	(6f)
Number of intermittent extract fans	2 * 10 = 20.0000	(7a)
Number of passive vents	0 * 10 = 0.0000	(7b)
Number of flueless gas fires	0 * 40 = 0.0000	(7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1015	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3515	(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) = 0.2988	(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													
	0.3809	0.3734	0.3660	0.3286	0.3212	0.2838	0.2838	0.2763	0.2988	0.3212	0.3361	0.3510	(22b)
Effective ac	0.5725	0.5697	0.5670	0.5540	0.5516	0.5403	0.5403	0.5382	0.5446	0.5516	0.5565	0.5616	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.9500	1.0000	1.9500			(26)
TER Opening Type (Uw = 1.20)			13.6900	1.1450	15.6756			(27)
Heatloss Floor 1			62.5700	0.1300	8.1341			(28a)
External Wall 1	50.1200	13.6900	36.4300	0.1800	6.5574			(29a)
Corrido Wall	5.0000	1.9500	3.0500	0.1800	0.5490			(29a)
Total net area of external elements Aum(A, m2)			117.6900					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.8661			(33)
Party Wall 1			44.8200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 101.5183 (35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
	E5 Ground floor (normal)	15.9100	0.1600	2.5456
	E7 Party floor between dwellings (in blocks of flats)	10.3600	0.0700	0.7252
	E5 Ground floor (normal)	1.5900	0.1600	0.2544
	E7 Party floor between dwellings (in blocks of flats)	1.5900	0.0700	0.1113
	E16 Corner (normal)	3.1500	0.0900	0.2835
	E18 Party wall between dwellings	3.1500	0.0600	0.1890
	E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.5500	0.0200	0.1110
	P1 Party wall - Ground floor	14.2300	0.0800	1.1384
	E2 Other lintels (including other steel lintels)	9.1900	0.0500	0.4595
	E3 Sill	8.2500	0.0500	0.4125
	E4 Jamb	25.0600	0.0500	1.2530
	E25 Staggered party wall between dwellings	9.4500	0.0600	0.5670

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		8.0504	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	40.9165	(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	37.2393	37.0560	36.8764	36.0329	35.8751	35.1403	35.1403	35.0043	35.4233	35.8751	36.1943	36.5281	(38)
Heat transfer coeff	78.1557	77.9725	77.7929	76.9494	76.7915	76.0568	76.0568	75.9207	76.3398	76.7915	77.1108	77.4446	(39)
Average = Sum(39)m / 12 =												76.9486	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2491	1.2462	1.2433	1.2298	1.2273	1.2155	1.2155	1.2134	1.2201	1.2273	1.2324	1.2377	(40)
HLP (average)												1.2298	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0533	(42)
Hot water usage for mixer showers													
	58.6465	57.7651	56.4808	54.0236	52.2102	50.1879	49.0385	50.3130	51.7102	53.8815	56.3915	58.4218	(42a)
Hot water usage for baths													
	25.3431	24.9667	24.4367	23.4595	22.7277	21.9163	21.4780	22.0043	22.5774	23.4456	24.4430	25.2575	(42b)
Hot water usage for other uses													
	35.6577	34.3611	33.0644	31.7678	30.4711	29.1745	29.1745	30.4711	31.7678	33.0644	34.3611	35.6577	(42c)
Average daily hot water use (litres/day)												109.9833	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	119.6473	117.0930	113.9820	109.2508	105.4090	101.2787	99.6909	102.7885	106.0553	110.3915	115.1956	119.3370	(44)
Energy conte	189.4921	166.7388	175.1861	149.5589	141.9008	124.5340	120.5676	127.2736	130.7768	149.8003	164.1173	186.8528	(45)
Energy content (annual)										Total = Sum(45)m =		1826.7991	
Distribution loss (46)m = 0.15 x (45)m													
	28.4238	25.0108	26.2779	22.4338	21.2851	18.6801	18.0851	19.0910	19.6165	22.4700	24.6176	28.0279	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	236.0870	208.8245	221.7810	194.6508	188.4957	169.6258	167.1625	173.8685	175.8687	196.3952	209.2091	233.4477	(62)
WWHRS	-26.8107	-23.7116	-24.8294	-20.5598	-19.1610	-16.3962	-15.3688	-16.3432	-16.9641	-19.9988	-22.6562	-26.3142	(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													
	209.2763	185.1129	196.9516	174.0910	169.3348	153.2296	151.7937	157.5253	158.9046	176.3964	186.5529	207.1335	(64)
										Total per year (kWh/year) = Sum(64)m =		2126.3025	(64)
12Total per year (kWh/year)												2126	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month													
	100.2821	89.1092	95.5253	85.8018	84.4579	77.4810	77.3646	79.5944	79.5568	87.0845	90.6425	99.4045	(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	102.6644	102.6644	102.6644	102.6644	102.6644	102.6644	102.6644	102.6644	102.6644	102.6644	102.6644	102.6644	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	90.5242	100.2233	90.5242	93.5417	90.5242	93.5417	90.5242	90.5242	93.5417	90.5242	93.5417	90.5242	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													

	179.3789	181.2403	176.5496	166.5638	153.9585	142.1113	134.1966	132.3352	137.0258	147.0117	159.6170	171.4642 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	33.2664	33.2664	33.2664	33.2664	33.2664	33.2664	33.2664	33.2664	33.2664	33.2664	33.2664	33.2664 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
	-82.1315	-82.1315	-82.1315	-82.1315	-82.1315	-82.1315	-82.1315	-82.1315	-82.1315	-82.1315	-82.1315	-82.1315 (71)
Water heating gains (Table 5)												
	134.7877	132.6030	128.3942	119.1692	113.5187	107.6125	103.9847	106.9817	110.4955	117.0491	125.8923	133.6082 (72)
Total internal gains												
	461.4901	470.8659	452.2674	436.0740	414.8008	397.0648	382.5049	383.6405	394.8624	411.3843	435.8503	452.3959 (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	5.3600	46.7521	0.6300	0.7000	0.7700	76.5839	(78)
West	8.3300	19.6403	0.6300	0.7000	0.7700	49.9993	(80)

Solar gains	126.5832	223.2340	320.8468	415.4960	476.0751	475.8102	457.5216	412.8479	354.2377	251.3412	153.1213	107.2925	(83)
Total gains	588.0734	694.0998	773.1142	851.5700	890.8759	872.8751	840.0264	796.4883	749.1001	662.7255	588.9716	559.6885	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	22.5760	22.6291	22.6813	22.9299	22.9771	23.1990	23.1990	23.2406	23.1130	22.9771	22.8819	22.7833	
alpha	2.5051	2.5086	2.5121	2.5287	2.5318	2.5466	2.5466	2.5494	2.5409	2.5318	2.5255	2.5189	
util living area													
	0.9206	0.8844	0.8342	0.7478	0.6340	0.4939	0.3745	0.4067	0.5835	0.7801	0.8870	0.9282	(86)
MIT	18.6143	18.9945	19.4884	20.0750	20.5302	20.8241	20.9365	20.9199	20.7172	20.1139	19.2744	18.5497	(87)
Th 2	19.8809	19.8832	19.8855	19.8962	19.8982	19.9076	19.9076	19.9093	19.9040	19.8982	19.8942	19.8899	(88)
util rest of house													
	0.9094	0.8690	0.8121	0.7143	0.5849	0.4252	0.2896	0.3206	0.5161	0.7430	0.8693	0.9181	(89)
MIT 2	17.1439	17.6161	18.2252	18.9368	19.4602	19.7756	19.8740	19.8643	19.6755	19.0037	17.9815	17.0688	(90)
Living area fraction										fLA = Living area / (4) =		0.4680	(91)
MIT	17.8320	18.2612	18.8163	19.4694	19.9609	20.2663	20.3712	20.3583	20.1630	19.5232	18.5865	17.7618	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.8320	18.2612	18.8163	19.4694	19.9609	20.2663	20.3712	20.3583	20.1630	19.5232	18.5865	17.7618	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8830	0.8413	0.7872	0.6999	0.5878	0.4486	0.3265	0.3571	0.5330	0.7287	0.8433	0.8926	(94)
Useful gains	519.2643	583.9660	608.5820	596.0559	523.7007	391.5748	274.3097	284.4162	399.2417	482.9421	496.6508	499.5716	(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													
	1057.6020	1041.8027	958.1213	813.3083	634.3666	430.9594	286.8264	300.5169	462.8455	685.2261	885.7331	1050.2901	(97)
Space heating kWh													
	400.5233	307.6663	260.0573	156.4217	82.3354	0.0000	0.0000	0.0000	0.0000	150.4993	280.1392	409.7345	(98a)
Space heating requirement - total per year (kWh/year)												2047.3770	
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													
	400.5233	307.6663	260.0573	156.4217	82.3354	0.0000	0.0000	0.0000	0.0000	150.4993	280.1392	409.7345	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2047.3770	
Space heating per m2											(98c) / (4) =	32.7214	(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													
	400.5233	307.6663	260.0573	156.4217	82.3354	0.0000	0.0000	0.0000	0.0000	150.4993	280.1392	409.7345	(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)													
	433.9364	333.3329	281.7522	169.4710	89.2041	0.0000	0.0000	0.0000	0.0000	163.0545	303.5094	443.9161	(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													
	209.2763	185.1129	196.9516	174.0910	169.3348	153.2296	151.7937	157.5253	158.9046	176.3964	186.5529	207.1335	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.4910	85.1908	84.6840	83.8206	82.5367	79.8000	79.8000	79.8000	79.8000	83.7058	84.9693	85.5598	(217)
Fuel for water heating, kWh/month													
	244.7933	217.2923	232.5723	207.6948	205.1629	192.0171	190.2176	197.4002	199.1285	210.7337	219.5532	242.0920	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	18.8091	15.0894	13.5863	9.9539	7.6887	6.2817	7.0139	9.1169	11.8420	15.5373	17.5494	19.3319	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-11.8876	-18.0136	-27.8088	-33.6604	-38.4466	-36.6884	-36.2485	-33.1423	-28.0646	-21.6189	-13.5083	-10.1370	(233a)

Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-3.3816	-7.3382	-15.0140	-23.1952	-31.3121	-31.6936	-31.3155	-26.2135	-18.8273	-10.6951	-4.5782	-2.6573 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	2218.1766	(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	2558.6580	(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)	151.8006	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-515.4465	(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	4499.1887	(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	2218.1766	0.2100	465.8171	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2558.6580	0.2100	537.3182	(264)
Space and water heating			1003.1353	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	151.8006	0.1443	21.9095	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-309.2250	0.1331	-41.1572	
PV Unit electricity exported	-206.2215	0.1251	-25.7951	
Total			-66.9524	(269)
Total CO2, kg/year			970.0217	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.5000	(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	2218.1766	1.1300	2506.5396	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2558.6580	1.1300	2891.2835	(278)
Space and water heating			5397.8231	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	151.8006	1.5338	232.8368	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-309.2250	1.4918	-461.3088	
PV Unit electricity exported	-206.2215	0.4591	-94.6779	
Total			-555.9867	(283)
Total Primary energy kWh/year			5204.7741	(286)
Target Primary Energy Rate (TPER)			83.1800	(287)

Full SAP Calculation Printout

Property Reference	B1_02_2B__Copy	**Issued on Date**	29/08/2024
Assessment Reference	B1_02_2B_MF_Copy_Copy	**Prop Type Ref**	
Property			

SAP Rating	85 B	**DER**	12.38	**TER**	13.54
Environmental	90 B	**% DER < TER**			8.57
CO_2 Emissions (t/year)	0.81	**DFEE**	34.19	**TFEE**	33.78
Compliance Check	See BREL	**% DFEE < TFEE**			-1.21
% DPER < TPER	1.76	**DPER**	71.31	**TPER**	72.59

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

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		71.0300 (1b)	x	3.1500 (2b)	=	223.7445	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.0300						
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	223.7445	(5)

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2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000	/ (5) =	0.0000 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			3.0000 (17)
Infiltration rate			0.1500 (18)
Number of sides sheltered			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) =		80.1000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2477	0.2448	0.2419	0.2274	0.2245	0.2099	0.2099	0.2070	0.2157	0.2245	0.2303	0.2361	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Window (Uw = 0.90)			10.3800	0.8687	9.0174			(27)
Door			2.0900	1.0000	2.0900			(26)
External Wall 1	31.9700	10.3800	21.5900	0.1800	3.8862	0.0000	0.0000	(29a)
Corridor Wall	37.9800	2.0900	35.8900	0.2000	7.1780	0.0000	0.0000	(29a)
Total net area of external elements Aum(A, m2)			69.9500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		22.1716			(33)
Party Wall 1			46.5600	0.0000	0.0000	20.0000	931.2000	(32)
Party Floor 1			71.0300			80.0000	5682.4000	(32d)
Party Ceiling 1			71.0300			100.0000	7103.0000	(32b)
Internal Wall 1			50.0000			9.0000	450.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	14166.6000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		199.4453 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E7 Party floor between dwellings (in blocks of flats)	9.0800	0.0580	0.5266	
E7 Party floor between dwellings (in blocks of flats)	24.1200	0.1100	2.6532	
E16 Corner (normal)	6.3000	0.1270	0.8001	
E18 Party wall between dwellings	12.6000	0.0250	0.3150	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	11.2200	0.1000	1.1220	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	29.5600	0.0000	0.0000	
E17 Corner (inverted - internal area greater than external area)	6.3000	0.0000	0.0000	
E2 Other lintels (including other steel lintels)	6.0000	0.0170	0.1020	
E3 Sill	4.9900	0.0300	0.1497	
E4 Jamb	16.6200	0.1200	1.9944	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				7.6630 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	29.8346 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	18.2905	18.0759	17.8613	16.7884	16.5738	15.5009	15.5009	15.2863	15.9300	16.5738	17.0030	17.4321	(38)
Heat transfer coeff	48.1251	47.9105	47.6959	46.6230	46.4084	45.3355	45.3355	45.1209	45.7647	46.4084	46.8376	47.2668	(39)
Average = Sum(39)m / 12 =												46.5694	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6775	0.6745	0.6715	0.6564	0.6534	0.6383	0.6383	0.6352	0.6443	0.6534	0.6594	0.6654	(40)
HLP (average)												0.6556	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2709	(42)
Hot water usage for mixer showers	62.2947	61.3585	59.9943	57.3842	55.4580	53.3099	52.0890	53.4428	54.9269	57.2333	59.8994	62.0560	(42a)
Hot water usage for baths	26.9120	26.5123	25.9495	24.9117	24.1346	23.2730	22.8076	23.3665	23.9750	24.8970	25.9561	26.8210	(42b)
Hot water usage for other uses	37.8860	36.5083	35.1306	33.7530	32.3753	30.9976	30.9976	32.3753	33.7530	35.1306	36.5083	37.8860	(42c)
Average daily hot water use (litres/day)												116.8270	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.0926	124.3791	121.0744	116.0488	111.9679	107.5805	105.8941	109.1846	112.6548	117.2609	122.3639	126.7629	(44)
Energy conte	201.2836	177.1141	186.0868	158.8651	150.7303	132.2828	128.0698	135.1933	138.9147	159.1219	174.3298	198.4801	(45)
Energy content (annual)											Total = Sum(45)m =	1940.4723	
Distribution loss (46)m = 0.15 x (45)m	30.1925	26.5671	27.9130	23.8298	22.6095	19.8424	19.2105	20.2790	20.8372	23.8683	26.1495	29.7720	(46)
Water storage 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	247.8146	219.1421	232.6178	203.8951	197.2613	177.3128	174.6008	181.7243	183.9447	205.6529	219.3598	245.0111	(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	247.8146	219.1421	232.6178	203.8951	197.2613	177.3128	174.6008	181.7243	183.9447	205.6529	219.3598	245.0111	(64)
										Total per year (kWh/year) = Sum(64)m =		2488.3373	(64)
12Total per year (kWh/year)												2488	(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	104.1516	92.5129	99.0987	88.8466	87.3426	80.0080	79.8080	82.1766	82.2131	90.1328	93.9886	103.2194	(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	113.5434	113.5434	113.5434	113.5434	113.5434	113.5434	113.5434	113.5434	113.5434	113.5434	113.5434	113.5434	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	107.0601	118.5308	107.0601	110.6287	107.0601	110.6287	107.0601	107.0601	110.6287	107.0601	110.6287	107.0601	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	199.6890	201.7611	196.5394	185.4229	171.3904	158.2017	149.3909	147.3188	152.5405	163.6570	177.6895	190.8782	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3543	34.3543	34.3543	34.3543	34.3543	34.3543	34.3543	34.3543	34.3543	34.3543	34.3543	34.3543	(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)	-90.8348	-90.8348	-90.8348	-90.8348	-90.8348	-90.8348	-90.8348	-90.8348	-90.8348	-90.8348	-90.8348	-90.8348	(71)
Water heating gains (Table 5)	139.9887	137.6679	133.1971	123.3981	117.3960	111.1223	107.2688	110.4524	114.1849	121.1463	130.5398	138.7358	(72)
Total internal gains	506.8008	518.0229	496.8596	479.5128	455.9095	437.0158	420.7828	421.8942	434.4172	451.9264	478.9211	496.7371	(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	10.3800	10.6334	0.3800	0.7000	0.7700	20.3462	(74)

Solar gains	20.3462	38.8827	66.0712	106.1273	142.9632	153.0463	142.8883	113.3636	79.4390	46.2848	25.0997	16.9616	(83)
Total gains	527.1470	556.9056	562.9308	585.6401	598.8726	590.0621	563.6711	535.2579	513.8562	498.2111	504.0208	513.6987	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	81.7695	82.1358	82.5053	84.4040	84.7942	86.8010	86.8010	87.2138	85.9870	84.7942	84.0173	83.2544	
alpha	6.4513	6.4757	6.5004	6.6269	6.6529	6.7867	6.7867	6.8143	6.7325	6.6529	6.6012	6.5503	
util living area	0.9763	0.9630	0.9379	0.8521	0.6959	0.4897	0.3537	0.3874	0.6054	0.8551	0.9514	0.9788	(86)
MIT	20.4216	20.5293	20.6721	20.8690	20.9701	20.9976	20.9998	20.9996	20.9905	20.8860	20.6552	20.4154	(87)
Th 2	20.3607	20.3634	20.3661	20.3795	20.3822	20.3957	20.3957	20.3984	20.3903	20.3822	20.3768	20.3715	(88)
util rest of house	0.9714	0.9556	0.9256	0.8267	0.6562	0.4443	0.3052	0.3369	0.5552	0.8256	0.9406	0.9744	(89)
MIT 2	19.6909	19.8272	20.0052	20.2477	20.3566	20.3941	20.3956	20.3982	20.3836	20.2720	19.9957	19.6920	(90)
Living area fraction										fLA = Living area / (4) =		0.2992	(91)
MIT	19.9095	20.0372	20.2047	20.4335	20.5401	20.5747	20.5763	20.5781	20.5652	20.4557	20.1930	19.9084	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.7595	19.8872	20.0547	20.2835	20.3901	20.4247	20.4263	20.4281	20.4152	20.3057	20.0430	19.7584	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9658	0.9491	0.9186	0.8224	0.6568	0.4465	0.3077	0.3394	0.5573	0.8216	0.9339	0.9692	(94)
Useful gains	509.1231	528.5604	517.1167	481.6569	393.3225	263.4402	173.4288	181.6761	286.3541	409.3506	470.7187	497.8765	(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	743.9883	718.0447	646.5040	530.7353	403.2954	264.0639	173.4692	181.7525	289.0114	450.4275	606.2190	735.3964	(97)
Space heating kWh	174.7396	127.3334	96.2641	35.3364	7.4198	0.0000	0.0000	0.0000	0.0000	30.5612	97.5602	176.7148	(98a)
Space heating requirement - total per year (kWh/year)												745.9296	
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	174.7396	127.3334	96.2641	35.3364	7.4198	0.0000	0.0000	0.0000	0.0000	30.5612	97.5602	176.7148	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												745.9296	
Space heating per m2											(98c) / (4) =	10.5016	(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	174.7396	127.3334	96.2641	35.3364	7.4198	0.0000	0.0000	0.0000	0.0000	30.5612	97.5602	176.7148	(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)	196.7789	143.3935	108.4055	39.7933	8.3557	0.0000	0.0000	0.0000	0.0000	34.4157	109.8651	199.0031	(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	247.8146	219.1421	232.6178	203.8951	197.2613	177.3128	174.6008	181.7243	183.9447	205.6529	219.3598	245.0111	(64)
Efficiency of water heater												79.8000	(216)
(217)m	83.2909	82.8874	82.2397	81.0128	80.0943	79.8000	79.8000	79.8000	79.8000	80.8603	82.3699	83.3393	(217)
Fuel for water heating, kWh/month	297.5291	264.3855	282.8535	251.6825	246.2864	222.1965	218.7980	227.7247	230.5071	254.3311	266.3105	293.9922	(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	21.1597	19.1120	21.1597	20.4771	21.1597	20.4771	21.1597	21.1597	20.4771	21.1597	20.4771	21.1597	(231)
Lighting	23.0453	18.4878	16.6462	12.1957	9.4203	7.6965	8.5935	11.1702	14.5090	19.0366	21.5018	23.6858	(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 1 840.0108 (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 3056.5970 (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) 208.1383 (230a)
central heating pump 41.0000 (230c)
Total electricity for the above, kWh/year 249.1383 (231)

Electricity for lighting (calculated in Appendix L)	185.9887	(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	4331.7348	(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	840.0108	0.2100	176.4023	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3056.5970	0.2100	641.8854	(264)
Space and water heating			818.2876	(265)
Pumps, fans and electric keep-hot	249.1383	0.1387	34.5586	(267)
Energy for lighting	185.9887	0.1443	26.8439	(268)
Total CO2, kg/year			879.6901	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.3800	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	840.0108	1.1300	949.2122	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3056.5970	1.1300	3453.9546	(278)
Space and water heating			4403.1668	(279)
Pumps, fans and electric keep-hot	249.1383	1.5128	376.8965	(281)
Energy for lighting	185.9887	1.5338	285.2756	(282)
Total Primary energy kWh/year			5065.3389	(286)
Dwelling Primary energy Rate (DPER)			71.3100	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	71.0300	(1b) x	3.1500	(2b) =	223.7445	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.0300					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		223.7445	(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)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1341	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3841	(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) =	0.2977	(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	0.3795	0.3721	0.3646	0.3274	0.3200	0.2828	0.2828	0.2753	0.2977	0.3200	0.3349	0.3498	(22b)
Effective ac	0.5720	0.5692	0.5665	0.5536	0.5512	0.5400	0.5400	0.5379	0.5443	0.5512	0.5561	0.5612	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.0900	1.0000	2.0900			(26)
TER Opening Type (Uw = 1.20)			10.3800	1.1450	11.8855			(27)
External Wall 1	31.9700	10.3800	21.5900	0.1800	3.8862			(29a)
Corridor Wall	37.9800	2.0900	35.8900	0.1800	6.4602			(29a)
Total net area of external elements Aum(A, m2)			69.9500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.3219			(33)
Party Wall 1			46.5600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 179.4453 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	9.0800	0.0700	0.6356
E7 Party floor between dwellings (in blocks of flats)	24.1200	0.0700	1.6884
E16 Corner (normal)	6.3000	0.0900	0.5670
E18 Party wall between dwellings	12.6000	0.0600	0.7560
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	11.2200	0.0200	0.2244
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	29.5600	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0900	-0.5670
E2 Other lintels (including other steel lintels)	6.0000	0.0500	0.3000
E3 Sill	4.9900	0.0500	0.2495
E4 Jamb	16.6200	0.0500	0.8310

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 4.6849 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 29.0068 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	42.2353	42.0289	41.8265	40.8758	40.6979	39.8700	39.8700	39.7166	40.1889	40.6979	41.0578	41.4339	(38)
Heat transfer coeff	71.2421	71.0356	70.8333	69.8826	69.7047	68.8768	68.8768	68.7234	69.1957	69.7047	70.0646	70.4407	(39)

Average = Sum(39)m / 12 = 69.8818

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0030	1.0001	0.9972	0.9838	0.9813	0.9697	0.9697	0.9675	0.9742	0.9813	0.9864	0.9917	(40)
HLP (average)												0.9838	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2709 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	62.2947	61.3585	59.9943	57.3842	55.4580	53.3099	52.0890	53.4428	54.9269	57.2333	59.8994	62.0560	(42a)
Hot water usage for baths	26.9120	26.5123	25.9495	24.9117	24.1346	23.2730	22.8076	23.3665	23.9750	24.8970	25.9561	26.8210	(42b)
Hot water usage for other uses	37.8860	36.5083	35.1306	33.7530	32.3753	30.9976	30.9976	32.3753	33.7530	35.1306	36.5083	37.8860	(42c)

Average daily hot water use (litres/day) 116.8270 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.0926	124.3791	121.0744	116.0488	111.9679	107.5805	105.8941	109.1846	112.6548	117.2609	122.3639	126.7629	(44)
Energy conte	201.2836	177.1141	186.0868	158.8651	150.7303	132.2828	128.0698	135.1933	138.9147	159.1219	174.3298	198.4801	(45)
Energy content (annual)										Total = Sum(45)m =		1940.4723	
Distribution loss (46)m = 0.15 x (45)m	30.1925	26.5671	27.9130	23.8298	22.6095	19.8424	19.2105	20.2790	20.8372	23.8683	26.1495	29.7720	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	247.8785	219.1999	232.6817	203.9569	197.3252	177.3746	174.6647	181.7882	184.0065	205.7168	219.4216	245.0750	(62)
WWHRS	-28.4785	-25.1866	-26.3740	-21.8387	-20.3529	-17.4161	-16.3248	-17.3598	-18.0194	-21.2429	-24.0656	-27.9511	(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	219.4000	194.0132	206.3077	182.1182	176.9723	159.9585	158.3398	164.4284	165.9871	184.4739	195.3560	217.1239	(64)
										Total per year (kWh/year) = Sum(64)m =		2224.4792	(64)
12Total per year (kWh/year)												2224	(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	104.2027	92.5590	99.1498	88.8961	87.3938	80.0575	79.8591	82.2277	82.2626	90.1840	94.0381	103.2706	(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	113.5434	113.5434	113.5434	113.5434	113.5434	113.5434	113.5434	113.5434	113.5434	113.5434	113.5434	113.5434	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	107.0601	118.5308	107.0601	110.6287	107.0601	110.6287	107.0601	107.0601	110.6287	107.0601	110.6287	107.0601	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	199.6890	201.7611	196.5394	185.4229	171.3904	158.2017	149.3909	147.3188	152.5405	163.6570	177.6895	190.8782	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3543	34.3543	34.3543	34.3543	34.3543	34.3543	34.3543	34.3543	34.3543	34.3543	34.3543	34.3543	(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)	-90.8348	-90.8348	-90.8348	-90.8348	-90.8348	-90.8348	-90.8348	-90.8348	-90.8348	-90.8348	-90.8348	-90.8348	(71)
Water heating gains (Table 5)	140.0574	137.7366	133.2658	123.4668	117.4647	111.1910	107.3375	110.5211	114.2536	121.2150	130.6085	138.8045	(72)
Total internal gains	506.8695	518.0916	496.9283	479.5815	455.9782	437.0845	420.8516	421.9630	434.4859	451.9951	478.9898	496.8058	(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	10.3800	10.6334	0.6300	0.7000	0.7700	33.7319	(74)

Solar gains	33.7319	64.4634	109.5391	175.9479	237.0179	253.7347	236.8938	187.9450	131.7015	76.7353	41.6127	28.1206	(83)
Total gains	540.6014	582.5550	606.4674	655.5294	692.9961	690.8192	657.7453	609.9079	566.1874	528.7304	520.6025	524.9264	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	49.6975	49.8420	49.9844	50.6643	50.7936	51.4042	51.4042	51.5189	51.1673	50.7936	50.5328	50.2629	
alpha	4.3132	4.3228	4.3323	4.3776	4.3862	4.4269	4.4269	4.4346	4.4112	4.3862	4.3689	4.3509	
util living area	0.9816	0.9727	0.9555	0.9011	0.7862	0.6035	0.4526	0.5044	0.7398	0.9170	0.9688	0.9836	(86)
MIT	19.6739	19.8382	20.0982	20.4848	20.7908	20.9515	20.9891	20.9828	20.8814	20.5145	20.0515	19.6542	(87)
Th 2	20.0808	20.0833	20.0856	20.0968	20.0989	20.1087	20.1087	20.1105	20.1049	20.0989	20.0947	20.0903	(88)
util rest of house	0.9775	0.9667	0.9453	0.8783	0.7400	0.5311	0.3646	0.4130	0.6725	0.8931	0.9608	0.9800	(89)
MIT 2	18.5426	18.7517	19.0799	19.5606	19.9104	20.0760	20.1039	20.1023	20.0145	19.6060	19.0312	18.5243	(90)
Living area fraction									fLA = Living area / (4) =			0.2992	(91)
MIT	18.8810	19.0767	19.3846	19.8371	20.1738	20.3380	20.3687	20.3657	20.2739	19.8778	19.3364	18.8623	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8810	19.0767	19.3846	19.8371	20.1738	20.3380	20.3687	20.3657	20.2739	19.8778	19.3364	18.8623	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9704	0.9582	0.9356	0.8707	0.7441	0.5504	0.3907	0.4398	0.6862	0.8861	0.9523	0.9734	(94)
Useful gains	524.6042	558.1879	567.4155	570.7646	515.6705	380.2151	256.9993	268.2490	388.5026	468.5086	495.7684	510.9697	(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	1038.7847	1007.0542	912.6554	764.3122	590.6614	395.2114	259.5788	272.5382	427.2048	646.7052	857.3408	1032.8234	(97)
Space heating kWh	382.5503	301.6382	256.8585	139.3542	55.7932	0.0000	0.0000	0.0000	0.0000	132.5783	260.3321	388.2591	(98a)
Space heating requirement - total per year (kWh/year)												1917.3640	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	382.5503	301.6382	256.8585	139.3542	55.7932	0.0000	0.0000	0.0000	0.0000	132.5783	260.3321	388.2591	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1917.3640	
Space heating per m2											(98c) / (4) =	26.9937	(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	382.5503	301.6382	256.8585	139.3542	55.7932	0.0000	0.0000	0.0000	0.0000	132.5783	260.3321	388.2591	(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)	414.4640	326.8019	278.2866	150.9797	60.4476	0.0000	0.0000	0.0000	0.0000	143.6385	282.0500	420.6491	(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	219.4000	194.0132	206.3077	182.1182	176.9723	159.9585	158.3398	164.4284	165.9871	184.4739	195.3560	217.1239	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.2938	85.0456	84.5524	83.4671	81.7869	79.8000	79.8000	79.8000	79.8000	83.3317	84.7045	85.3477	(217)
Fuel for water heating, kWh/month	257.2284	228.1286	243.9999	218.1916	216.3823	200.4493	198.4209	206.0506	208.0039	221.3731	230.6323	254.3992	(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	22.2450	17.8457	16.0681	11.7722	9.0932	7.4292	8.2951	10.7823	14.0051	18.3755	20.7551	22.8632	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-13.4552	-20.3653	-31.3986	-37.9485	-43.2862	-41.2785	-40.7808	-37.3161	-31.6414	-24.4181	-15.2810	-11.4762	(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	-3.8784	-8.4142	-17.2142	-26.5945	-35.9045	-36.3494	-35.9184	-30.0651	-21.5907	-12.2651	-5.2508	-3.0480	(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	2077.3174	(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	2683.2602	(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)	179.5296	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-585.1393	(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	4440.9679	(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	2077.3174	0.2100	436.2367	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2683.2602	0.2100	563.4846	(264)
Space and water heating			999.7213	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	179.5296	0.1443	25.9117	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-348.6460	0.1331	-46.4147	
PV Unit electricity exported	-236.4933	0.1251	-29.5810	
Total			-75.9957	(269)
Total CO2, kg/year			961.5665	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.5400	(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	2077.3174	1.1300	2347.3687	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2683.2602	1.1300	3032.0840	(278)
Space and water heating			5379.4527	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	179.5296	1.5338	275.3685	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-348.6460	1.4919	-520.1578	
PV Unit electricity exported	-236.4933	0.4591	-108.5732	
Total			-628.7310	(283)
Total Primary energy kWh/year			5156.1910	(286)
Target Primary Energy Rate (TPER)			72.5900	(287)

Full SAP Calculation Printout

Property Reference	B1_03_2B__Copy	**Issued on Date**	29/08/2024
Assessment Reference	B1_03_2B_MF_Copy_Copy	**Prop Type Ref**	
Property			

SAP Rating	84 B	**DER**	14.41	**TER**	14.55
Environmental	89 B	**% DER < TER**			0.96
CO_2 Emissions (t/year)	0.81	**DFEE**	39.54	**TFEE**	36.24
Compliance Check	See BREL	**% DFEE < TFEE**			-9.09
% DPER < TPER	-5.55	**DPER**	82.37	**TPER**	78.04

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

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		61.9000 (1b)	x	3.1500 (2b)	=	194.9850	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.9000						
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	194.9850	(5)

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2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(21)

	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) =	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)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Window (Uw = 0.90)			16.2500	0.8687	14.1168			(27)
Door			2.0700	1.0000	2.0700			(26)
External Wall 1	52.6100	16.2500	36.3600	0.1800	6.5448	0.0000	0.0000	(29a)
Corridor Wall	16.0700	2.0700	14.0000	0.2000	2.8000	60.0000	840.0000	(29a)
Wall to Unheated	14.8100		14.8100	0.2000	2.9620	150.0000	2221.5000	(29a)
Total net area of external elements Aum(A, m2)			83.4900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.4936			(33)
Party Wall 1			21.1100	0.0000	0.0000	20.0000	422.2000	(32)
Party Floor 1			61.9000			80.0000	4952.0000	(32d)
Party Ceiling 1			61.9000			100.0000	6190.0000	(32b)
Internal Wall 1			50.0000			9.0000	450.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15075.7000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		243.5493 (35)
List of Thermal Bridges		

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	21.2000	0.0580	1.2296
E7 Party floor between dwellings (in blocks of flats)	10.2000	0.1100	1.1220
E16 Corner (normal)	9.4500	0.1800	1.7010
E18 Party wall between dwellings	3.1500	0.0250	0.0788
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	12.2000	0.1000	1.2200
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.4000	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	3.1500	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	9.4000	0.1100	1.0340
E25 Staggered party wall between dwellings	3.1500	0.2000	0.6300
E2 Other lintels (including other steel lintels)	9.3200	0.0170	0.1584
E3 Sill	8.3200	0.0300	0.2496
E4 Jamb	23.1400	0.1200	2.7768

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.2002 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 38.6938 (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	16.8624	16.6573	16.4522	15.4267	15.2216	14.1961	14.1961	13.9910	14.6063	15.2216	15.6318	16.0420	(38)
Heat transfer coeff	55.5562	55.3511	55.1460	54.1205	53.9154	52.8899	52.8899	52.6848	53.3001	53.9154	54.3256	54.7358	(39)

Average = Sum(39)m / 12 = 54.0692

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8975	0.8942	0.8909	0.8743	0.8710	0.8544	0.8544	0.8511	0.8611	0.8710	0.8776	0.8843	(40)
HLP (average)												0.8735	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.0348 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	58.3367	57.4600	56.1825	53.7383	51.9344	49.9228	48.7794	50.0473	51.4371	53.5969	56.0937	58.1132	(42a)
Hot water usage for baths	25.2099	24.8355	24.3083	23.3362	22.6082	21.8011	21.3651	21.8887	22.4587	23.3224	24.3145	25.1247	(42b)
Hot water usage for other uses	35.4685	34.1788	32.8890	31.5992	30.3095	29.0197	29.0197	30.3095	31.5992	32.8890	34.1788	35.4685	(42c)

Average daily hot water use (litres/day) 109.4022 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	119.0152	116.4743	113.3798	108.6736	104.8521	100.7436	99.1643	102.2454	105.4950	109.8083	114.5870	118.7064	(44)
Energy conte	188.4909	165.8579	174.2605	148.7688	141.1511	123.8760	119.9306	126.6012	130.0859	149.0088	163.2502	185.8656	(45)
Energy content (annual)										Total = Sum(45)m =		1817.1475	
Distribution loss (46)m = 0.15 x (45)m	28.2736	24.8787	26.1391	22.3153	21.1727	18.5814	17.9896	18.9902	19.5129	22.3513	24.4875	27.8798	(46)

Water storage 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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	235.0219	207.8859	220.7915	193.7988	187.6821	168.9060	166.4616	173.1322	175.1159	195.5398	208.2802	232.3966	(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	235.0219	207.8859	220.7915	193.7988	187.6821	168.9060	166.4616	173.1322	175.1159	195.5398	208.2802	232.3966	(64)
									Total per year (kWh/year) = Sum(64)m =			2365.0125	(64)

12Total per year (kWh/year) 2365 (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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat gains from water heating, kWh/month	99.8980	88.7701	95.1664	85.4896	84.1576	77.2128	77.1017	79.3197	79.2776	86.7702	90.3047	99.0251	(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	101.7407	101.7407	101.7407	101.7407	101.7407	101.7407	101.7407	101.7407	101.7407	101.7407	101.7407	101.7407	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	89.6353	99.2391	89.6353	92.6232	89.6353	92.6232	89.6353	89.6353	92.6232	89.6353	92.6232	89.6353	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	177.7121	179.5562	174.9091	165.0161	152.5279	140.7907	132.9496	131.1055	135.7526	145.6456	158.1338	169.8710	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.1741	33.1741	33.1741	33.1741	33.1741	33.1741	33.1741	33.1741	33.1741	33.1741	33.1741	33.1741	(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)	-81.3925	-81.3925	-81.3925	-81.3925	-81.3925	-81.3925	-81.3925	-81.3925	-81.3925	-81.3925	-81.3925	-81.3925	(71)
Water heating gains (Table 5)	134.2716	132.0984	127.9119	118.7356	113.1150	107.2400	103.6313	106.6125	110.1077	116.6267	125.4232	133.0983	(72)
Total internal gains	458.1412	467.4159	448.9785	432.8970	411.8004	394.1761	379.7385	380.8756	392.0057	408.4298	432.7024	449.1268	(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	10.6500	19.6403	0.3800	0.7000	0.7700	38.5578	(76)
South	5.6000	46.7521	0.3800	0.7000	0.7700	48.2618	(78)

Solar gains	86.8196	154.4676	224.9013	294.9584	340.6042	341.3983	327.8803	294.1495	249.6462	174.7532	105.2837	73.4107	(83)
Total gains	544.9608	621.8835	673.8798	727.8555	752.4046	735.5744	707.6188	675.0250	641.6519	583.1830	537.9861	522.5374	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.3776	75.6569	75.9383	77.3772	77.6716	79.1776	79.1776	79.4858	78.5682	77.6716	77.0851	76.5074	
alpha	6.0252	6.0438	6.0626	6.1585	6.1781	6.2785	6.2785	6.2991	6.2379	6.1781	6.1390	6.1005	
util living area	0.9829	0.9627	0.9205	0.8110	0.6473	0.4583	0.3287	0.3587	0.5654	0.8432	0.9606	0.9860	(86)
MIT	20.2726	20.4571	20.6670	20.8797	20.9731	20.9974	20.9997	20.9995	20.9907	20.8714	20.5562	20.2481	(87)
Th 2	20.1696	20.1724	20.1753	20.1894	20.1922	20.2064	20.2064	20.2092	20.2007	20.1922	20.1866	20.1809	(88)
util rest of house	0.9782	0.9533	0.9019	0.7752	0.5971	0.4023	0.2695	0.2972	0.5031	0.8041	0.9491	0.9822	(89)
MIT 2	19.3400	19.5710	19.8264	20.0776	20.1717	20.2050	20.2063	20.2091	20.1951	20.0768	19.7079	19.3182	(90)
Living area fraction									fLA = Living area / (4) =			0.4701	(91)
MIT	19.7784	19.9876	20.2216	20.4547	20.5485	20.5775	20.5793	20.5807	20.5692	20.4504	20.1067	19.7553	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.6284	19.8376	20.0716	20.3047	20.3985	20.4275	20.4293	20.4307	20.4192	20.3004	19.9567	19.6053	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9744	0.9488	0.8993	0.7806	0.6102	0.4180	0.2861	0.3144	0.5204	0.8098	0.9452	0.9788	(94)
Useful gains	531.0299	590.0393	605.9875	568.1684	459.1264	307.4538	202.4756	212.2560	333.9129	472.2327	508.5225	511.4408	(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	851.5873	826.8121	748.4178	617.2285	468.9811	308.2157	202.5317	212.3559	336.8116	522.9990	698.4471	843.2236	(97)
Space heating kWh	238.4947	159.1113	105.9682	35.3233	7.3319	0.0000	0.0000	0.0000	0.0000	37.7701	136.7457	246.8464	(98a)
Space heating requirement - total per year (kWh/year)												967.5916	
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	238.4947	159.1113	105.9682	35.3233	7.3319	0.0000	0.0000	0.0000	0.0000	37.7701	136.7457	246.8464	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												967.5916	
Space heating per m2											(98c) / (4) =	15.6315	(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	238.4947	159.1113	105.9682	35.3233	7.3319	0.0000	0.0000	0.0000	0.0000	37.7701	136.7457	246.8464	(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)	268.5751	179.1794	119.3335	39.7785	8.2566	0.0000	0.0000	0.0000	0.0000	42.5339	153.9929	277.9802	(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	235.0219	207.8859	220.7915	193.7988	187.6821	168.9060	166.4616	173.1322	175.1159	195.5398	208.2802	232.3966	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.0927	83.4676	82.5120	81.0667	80.1052	79.8000	79.8000	79.8000	79.8000	81.1312	83.1396	84.1953	(217)
Fuel for water heating, kWh/month	279.4796	249.0617	267.5871	239.0610	234.2944	211.6617	208.5985	216.9576	219.4435	241.0169	250.5185	276.0209	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	20.8608	18.8420	20.8608	20.1878	20.8608	20.1878	20.8608	20.8608	20.1878	20.8608	20.1878	20.8608	(231)
Lighting	18.2545	14.6444	13.1857	9.6604	7.4620	6.0965	6.8071	8.8481	11.4928	15.0791	17.0318	18.7618	(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	1089.6302	(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	2893.7012	(219)
Space cooling fuel	0.0000	(221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.6710)		
mechanical ventilation fans (SFP = 0.6710)	159.6186	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	245.6186	(231)
Electricity for lighting (calculated in Appendix L)	147.3242	(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	4376.2742	(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	1089.6302	0.2100	228.8223	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2893.7012	0.2100	607.6773	(264)
Space and water heating			836.4996	(265)
Pumps, fans and electric keep-hot	245.6186	0.1387	34.0703	(267)
Energy for lighting	147.3242	0.1443	21.2634	(268)
Total CO2, kg/year			891.8333	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			14.4100	(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	1089.6302	1.1300	1231.2821	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2893.7012	1.1300	3269.8824	(278)
Space and water heating			4501.1644	(279)
Pumps, fans and electric keep-hot	245.6186	1.5128	371.5719	(281)
Energy for lighting	147.3242	1.5338	225.9707	(282)
Total Primary energy kWh/year			5098.7070	(286)
Dwelling Primary energy Rate (DPER)			82.3700	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	61.9000 (1b)	x	3.1500 (2b)	=	194.9850	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 61.9000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	194.9850	(5)

2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1026	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3526	(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) =	0.2997	(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	0.3821	0.3746	0.3671	0.3297	0.3222	0.2847	0.2847	0.2772	0.2997	0.3222	0.3371	0.3521	(22b)
Effective ac	0.5730	0.5702	0.5674	0.5543	0.5519	0.5405	0.5405	0.5384	0.5449	0.5519	0.5568	0.5620	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.0700	1.0000	2.0700			(26)
TER Opening Type (Uw = 1.20)			13.4000	1.1450	15.3435			(27)
External Wall 1	52.6100	13.4000	39.2100	0.1800	7.0578			(29a)
Corridor Wall	16.0700	2.0700	14.0000	0.1800	2.5200			(29a)
Wall to Unheated	14.8100		14.8100	0.1800	2.6658			(29a)
Total net area of external elements Aum(A, m2)			83.4900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.6571			(33)
Party Wall 1			21.1100	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 223.5493 (35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E7	Party floor between dwellings (in blocks of flats)	21.2000	0.0700	1.4840
E7	Party floor between dwellings (in blocks of flats)	10.2000	0.0700	0.7140
E16	Corner (normal)	9.4500	0.0900	0.8505
E18	Party wall between dwellings	3.1500	0.0600	0.1890
E23	Balcony within or between dwellings, balcony support penetrates wall insulation	12.2000	0.0200	0.2440
P3	Party wall - Intermediate floor between dwellings (in blocks of flats)	13.4000	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)	9.4000	0.0700	0.6580
E25	Staggered party wall between dwellings	3.1500	0.0600	0.1890
E2	Other lintels (including other steel lintels)	9.3200	0.0500	0.4660
E3	Sill	8.3200	0.0500	0.4160
E4	Jamb	23.1400	0.0500	1.1570

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0840 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 35.7411 (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	36.8697	36.6873	36.5085	35.6688	35.5117	34.7803	34.7803	34.6448	35.0620	35.5117	35.8295	36.1618	(38)
Heat transfer coeff	72.6108	72.4284	72.2497	71.4099	71.2528	70.5214	70.5214	70.3859	70.8031	71.2528	71.5706	71.9029	(39)

Average = Sum(39)m / 12 = 71.4091

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1730	1.1701	1.1672	1.1536	1.1511	1.1393	1.1393	1.1371	1.1438	1.1511	1.1562	1.1616	(40)
HLP (average)												1.1536	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.0348 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	58.3367	57.4600	56.1825	53.7383	51.9344	49.9228	48.7794	50.0473	51.4371	53.5969	56.0937	58.1132	(42a)
Hot water usage for baths	25.2099	24.8355	24.3083	23.3362	22.6082	21.8011	21.3651	21.8887	22.4587	23.3224	24.3145	25.1247	(42b)
Hot water usage for other uses	35.4685	34.1788	32.8890	31.5992	30.3095	29.0197	29.0197	30.3095	31.5992	32.8890	34.1788	35.4685	(42c)

Average daily hot water use (litres/day) 109.4022 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	119.0152	116.4743	113.3798	108.6736	104.8521	100.7436	99.1643	102.2454	105.4950	109.8083	114.5870	118.7064	(44)
Energy conte	188.4909	165.8579	174.2605	148.7688	141.1511	123.8760	119.9306	126.6012	130.0859	149.0088	163.2502	185.8656	(45)
Energy content (annual)										Total = Sum(45)m =		1817.1475	
Distribution loss (46)m = 0.15 x (45)m	28.2736	24.8787	26.1391	22.3153	21.1727	18.5814	17.9896	18.9902	19.5129	22.3513	24.4875	27.8798	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.7527 (55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	235.0858	207.9436	220.8554	193.8606	187.7460	168.9679	166.5255	173.1961	175.1777	195.6037	208.3420	232.4605	(62)
WWHRS	-26.6691	-23.5864	-24.6983	-20.4512	-19.0598	-16.3096	-15.2876	-16.2568	-16.8745	-19.8932	-22.5366	-26.1752	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	208.4167	184.3572	196.1571	173.4094	168.6863	152.6583	151.2379	156.9392	158.3032	175.7105	185.8054	206.2852	(64)
									Total per year (kWh/year) = Sum(64)m =			2117.9667	(64)
12Total per year (kWh/year)												2118	(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	99.9492	88.8163	95.2176	85.5391	84.2087	77.2623	77.1528	79.3708	79.3270	86.8214	90.3542	99.0762	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	101.7407	101.7407	101.7407	101.7407	101.7407	101.7407	101.7407	101.7407	101.7407	101.7407	101.7407	101.7407	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	89.7225	99.3356	89.7225	92.7132	89.7225	92.7132	89.7225	89.7225	92.7132	89.7225	92.7132	89.7225	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	177.7121	179.5562	174.9091	165.0161	152.5279	140.7907	132.9496	131.1055	135.7526	145.6456	158.1338	169.8710	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.1741	33.1741	33.1741	33.1741	33.1741	33.1741	33.1741	33.1741	33.1741	33.1741	33.1741	33.1741	(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)	-81.3925	-81.3925	-81.3925	-81.3925	-81.3925	-81.3925	-81.3925	-81.3925	-81.3925	-81.3925	-81.3925	-81.3925	(71)
Water heating gains (Table 5)													

	134.3403	132.1671	127.9806	118.8043	113.1837	107.3087	103.7000	106.6812	110.1764	116.6954	125.4919	133.1670	(72)
Total internal gains													
	458.2970	467.5811	449.1344	433.0558	411.9563	394.3349	379.8943	381.0314	392.1644	408.5857	432.8611	449.2826	(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	
East	8.7800	19.6403	0.6300	0.7000	0.7700	52.7004	(76)
South	4.6200	46.7521	0.6300	0.7000	0.7700	66.0107	(78)

Solar gains	118.7111	211.2017	307.4908	403.2570	465.6498	466.7309	448.2521	402.1460	341.3163	238.9339	143.9564	100.3776	(83)
Total gains	577.0081	678.7828	756.6252	836.3128	877.6061	861.0658	828.1465	783.1773	733.4808	647.5196	576.8175	549.6602	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	52.9371	53.0704	53.2017	53.8273	53.9460	54.5055	54.5055	54.6104	54.2887	53.9460	53.7065	53.4583	
alpha	4.5291	4.5380	4.5468	4.5885	4.5964	4.6337	4.6337	4.6407	4.6192	4.5964	4.5804	4.5639	
util living area													
	0.9816	0.9623	0.9243	0.8342	0.6909	0.5113	0.3722	0.4094	0.6282	0.8719	0.9637	0.9848	(86)
MIT	19.7843	20.0345	20.3440	20.6857	20.8936	20.9791	20.9961	20.9940	20.9474	20.6666	20.1714	19.7430	(87)
Th 2	19.9416	19.9440	19.9463	19.9573	19.9593	19.9689	19.9689	19.9707	19.9652	19.9593	19.9552	19.9508	(88)
util rest of house													
	0.9765	0.9525	0.9054	0.7967	0.6312	0.4342	0.2863	0.3198	0.5477	0.8332	0.9525	0.9807	(89)
MIT 2	18.5602	18.8739	19.2540	19.6584	19.8755	19.9573	19.9676	19.9685	19.9322	19.6505	19.0575	18.5149	(90)
Living area fraction										fLA = Living area / (4) =		0.4701	(91)
MIT	19.1356	19.4195	19.7664	20.1414	20.3541	20.4377	20.4511	20.4506	20.4095	20.1282	19.5812	19.0923	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1356	19.4195	19.7664	20.1414	20.3541	20.4377	20.4511	20.4506	20.4095	20.1282	19.5812	19.0923	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9716	0.9467	0.9017	0.8038	0.6547	0.4698	0.3267	0.3619	0.5834	0.8402	0.9477	0.9762	(94)
Useful gains	560.6379	642.5722	682.2123	672.2640	574.5884	404.5345	270.5428	283.4338	427.8914	544.0375	546.6258	536.5883	(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													
	1077.2281	1051.6236	958.4961	802.7457	616.6301	411.6795	271.5863	285.1061	446.7312	678.9104	893.2870	1070.7967	(97)
Space heating kWh													
	384.3431	274.8826	205.5551	93.9468	31.2790	0.0000	0.0000	0.0000	0.0000	100.3454	249.5960	397.4511	(98a)
Space heating requirement - total per year (kWh/year)												1737.3991	
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													
	384.3431	274.8826	205.5551	93.9468	31.2790	0.0000	0.0000	0.0000	0.0000	100.3454	249.5960	397.4511	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1737.3991	
Space heating per m2											(98c) / (4) =	28.0678	(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													
	384.3431	274.8826	205.5551	93.9468	31.2790	0.0000	0.0000	0.0000	0.0000	100.3454	249.5960	397.4511	(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)													
	416.4064	297.8143	222.7033	101.7842	33.8884	0.0000	0.0000	0.0000	0.0000	108.7166	270.4183	430.6079	(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													
	208.4167	184.3572	196.1571	173.4094	168.6863	152.6583	151.2379	156.9392	158.3032	175.7105	185.8054	206.2852	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.4130	84.9537	84.1649	82.7470	81.0855	79.8000	79.8000	79.8000	79.8000	82.8524	84.7224	85.5050	(217)
Fuel for water heating, kWh/month													
	244.0106	217.0090	233.0629	209.5660	208.0351	191.3011	189.5211	196.6657	198.3750	212.0767	219.3109	241.2551	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	18.6426	14.9558	13.4660	9.8658	7.6206	6.2261	6.9518	9.0362	11.7371	15.3997	17.3939	19.1607	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-11.7636	-17.8275	-27.5246	-33.3202	-38.0620	-36.3233	-35.8883	-32.8114	-27.7816	-21.3978	-13.3682	-10.0311	(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	-3.3420	-7.2527	-14.8397	-22.9266	-30.9498	-31.3265	-30.9523	-25.9088	-18.6081	-10.5702	-4.5246	-2.6262	(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	1882.3392	(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	2560.1892	(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)	150.4561	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-509.9271	(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	4169.0574	(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	1882.3392	0.2100	395.2912	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2560.1892	0.2100	537.6397	(264)
Space and water heating			932.9310	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	150.4561	0.1443	21.7155	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-306.0994	0.1331	-40.7405	
PV Unit electricity exported	-203.8277	0.1251	-25.4956	
Total			-66.2361	(269)
Total CO2, kg/year			900.3396	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.5500	(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	1882.3392	1.1300	2127.0433	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2560.1892	1.1300	2893.0138	(278)
Space and water heating			5020.0571	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	150.4561	1.5338	230.7746	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-306.0994	1.4918	-456.6432	
PV Unit electricity exported	-203.8277	0.4591	-93.5786	
Total			-550.2218	(283)
Total Primary energy kWh/year			4830.7107	(286)
Target Primary Energy Rate (TPER)			78.0400	(287)

Full SAP Calculation Printout

Property Reference	B2_04_2B__Copy	**Issued on Date**	29/08/2024
Assessment Reference	B2_04 (terrace above)	**Prop Type Ref**	
Property			

SAP Rating	83 B	**DER**	16.02	**TER**	16.63
Environmental	88 B	**% DER < TER**			3.67
CO_2 Emissions (t/year)	0.92	**DFEE**	43.69	**TFEE**	45.87
Compliance Check	See BREL	**% DFEE < TFEE**			4.77
% DPER < TPER	-2.33	**DPER**	91.33	**TPER**	89.25

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	62.4700	(1b)	x 3.1500	(2b) =	196.7805	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.4700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	196.7805	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		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) =		80.1000 (23c)

Effective ac	0.2764	0.2729	0.2695	0.2521	0.2487	0.2313	0.2313	0.2278	0.2382	0.2487	0.2556	0.2625	(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	
Windows (Uw = 0.90)			15.5700	0.8687	13.5261			(27)
External Wall 1	57.4600	15.5700	41.8900	0.1800	7.5402	0.0000	0.0000	(29a)
Corridor wall	10.4300		10.4300	0.2000	2.0860	0.0000	0.0000	(29a)
External Roof	33.1000		33.1000	0.1500	4.9650	9.0000	297.9000	(30)
Total net area of external elements Aum(A, m2)			100.9900					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.1173			(33)
Party Wall 1			44.5100	0.0000	0.0000	20.0000	890.2000	(32)
Party Floor 1			62.4700			80.0000	4997.6000	(32d)
Internal Wall 1			50.0000			9.0000	450.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	6635.7000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		106.2222 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	18.2400	0.0580	1.0579

E15 Flat roof with parapet	18.2400	0.3000	5.4720	
E7 Party floor between dwellings (in blocks of flats)	6.6200	0.1100	0.7282	
E16 Corner (normal)	7.5000	0.1800	1.3500	
E18 Party wall between dwellings	2.5000	0.0250	0.0625	
E25 Staggered party wall between dwellings	10.0000	0.2400	2.4000	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	24.1900	0.0000	0.0000	
E2 Other lintels (including other steel lintels)	8.4200	0.0170	0.1431	
E3 Sill	8.4200	0.0300	0.2526	
E4 Jamb	21.6000	0.1200	2.5920	
E24 Eaves (insulation at ceiling level - inverted)	14.4900	0.1500	2.1735	
P4 Party wall - Roof (insulation at ceiling level)	3.4500	0.0300	0.1035	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.5500	0.1000	0.5550	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 16.8904 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 45.0076 (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	17.9491	17.7239	17.4986	16.3724	16.1471	15.0209	15.0209	14.7956	15.4714	16.1471	16.5976	17.0481	(38)
Heat transfer coeff	62.9568	62.7315	62.5063	61.3800	61.1548	60.0285	60.0285	59.8032	60.4790	61.1548	61.6053	62.0558	(39)
Average = Sum(39)m / 12 =												61.3237	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0078	1.0042	1.0006	0.9826	0.9789	0.9609	0.9609	0.9573	0.9681	0.9789	0.9862	0.9934	(40)
HLP (average)												0.9817	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.0505 (42)
Hot water usage for mixer showers

58.6004	57.7198	56.4365	53.9812	52.1692	50.1485	48.9999	50.2735	51.6696	53.8392	56.3472	58.3759	(42a)

Hot water usage for baths

25.3233	24.9472	24.4176	23.4411	22.7099	21.8991	21.4612	21.9871	22.5597	23.4273	24.4239	25.2377	(42b)

Hot water usage for other uses

35.6296	34.3340	33.0383	31.7427	30.4471	29.1515	29.1515	30.4471	31.7427	33.0383	34.3340	35.6296	(42c)

Average daily hot water use (litres/day) 109.8969 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	119.5533	117.0010	113.8924	109.1650	105.3262	101.1991	99.6126	102.7077	105.9720	110.3048	115.1051	119.2432	(44)
Energy conte	189.3432	166.6078	175.0484	149.4414	141.7893	124.4361	120.4728	127.1736	130.6741	149.6826	163.9883	186.7060	(45)
Energy content (annual)										Total = Sum(45)m =		1825.3637	
Distribution loss (46)m = 0.15 x (45)m	28.4015	24.9912	26.2573	22.4162	21.2684	18.6654	18.0709	19.0760	19.6011	22.4524	24.5982	28.0059	(46)
Water storage 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	235.8742	208.6358	221.5794	194.4714	188.3203	169.4661	167.0038	173.7046	175.7041	196.2136	209.0183	233.2370	(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	235.8742	208.6358	221.5794	194.4714	188.3203	169.4661	167.0038	173.7046	175.7041	196.2136	209.0183	233.2370	(64)
										Total per year (kWh/year) = Sum(64)m =		2373.2287	(64)
12Total per year (kWh/year)												2373	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	100.1814	89.0195	95.4284	85.7133	84.3697	77.3990	77.2820	79.5100	79.4731	86.9943	90.5501	99.3045	(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	102.5270	102.5270	102.5270	102.5270	102.5270	102.5270	102.5270	102.5270	102.5270	102.5270	102.5270	102.5270	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	90.3508	100.0313	90.3508	93.3625	90.3508	93.3625	90.3508	90.3508	93.3625	90.3508	93.3625	90.3508	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	179.1306	180.9894	176.3052	166.3332	153.7454	141.9145	134.0108	132.1520	136.8362	146.8082	159.3960	171.2269	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.2527	33.2527	33.2527	33.2527	33.2527	33.2527	33.2527	33.2527	33.2527	33.2527	33.2527	33.2527	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-82.0216	-82.0216	-82.0216	-82.0216	-82.0216	-82.0216	-82.0216	-82.0216	-82.0216	-82.0216	-82.0216	-82.0216	(71)
Water heating gains (Table 5)	134.6524	132.4695	128.2640	119.0462	113.4002	107.4986	103.8737	106.8683	110.3794	116.9278	125.7640	133.4739	(72)
Total internal gains	460.8919	470.2482	451.6781	435.5000	414.2545	396.5338	381.9934	383.1292	394.3361	410.8448	435.2807	451.8096	(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	
East	3.0700	19.6403	0.3800	0.7000	0.7700	11.1148	(76)
South	7.1900	46.7521	0.3800	0.7000	0.7700	61.9647	(78)
Southwest	3.7800	36.7938	0.3800	0.7000	0.7700	25.6379	(79)

West			1.5300		19.6403		0.3800		0.7000		0.7700		5.5393 (80)
Solar gains	104.2566	177.7319	242.6754	298.3889	331.0729	327.0138	315.9898	292.0461	262.1376	196.3812	124.9232	89.1794	(83)
Total gains	565.1486	647.9801	694.3535	733.8889	745.3274	723.5476	697.9832	675.1753	656.4737	607.2260	560.2039	540.9890	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	29.2780	29.3832	29.4890	30.0301	30.1407	30.7063	30.7063	30.8219	30.4775	30.1407	29.9203	29.7031	
alpha	2.9519	2.9589	2.9659	3.0020	3.0094	3.0471	3.0471	3.0548	3.0318	3.0094	2.9947	2.9802	
util living area	0.9190	0.8835	0.8373	0.7546	0.6420	0.4918	0.3660	0.3915	0.5658	0.7677	0.8811	0.9265	(86)
MIT	19.2426	19.5530	19.9239	20.3703	20.6989	20.9047	20.9709	20.9637	20.8463	20.4332	19.7927	19.2027	(87)
Th 2	20.0768	20.0798	20.0828	20.0979	20.1009	20.1160	20.1160	20.1191	20.1100	20.1009	20.0949	20.0889	(88)
util rest of house	0.9086	0.8692	0.8174	0.7250	0.5991	0.4337	0.2968	0.3219	0.5083	0.7338	0.8643	0.9169	(89)
MIT 2	18.0431	18.4288	18.8869	19.4340	19.8131	20.0414	20.0993	20.0972	19.9820	19.5209	18.7436	18.0015	(90)
Living area fraction										fLA = Living area / (4) =		0.4865	(91)
MIT	18.6266	18.9757	19.3913	19.8895	20.2440	20.4614	20.5233	20.5187	20.4025	19.9647	19.2540	18.5859	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.4766	18.8257	19.2413	19.7395	20.0940	20.3114	20.3733	20.3687	20.2525	19.8147	19.1040	18.4359	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8861	0.8462	0.7966	0.7122	0.5988	0.4469	0.3173	0.3420	0.5179	0.7219	0.8425	0.8952	(94)
Useful gains	500.7695	548.2928	553.1280	522.6977	446.2772	323.3685	221.4945	230.9374	340.0169	438.3521	471.9691	484.3141	(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	892.5142	873.5773	796.4135	665.3288	513.3318	342.8447	226.5061	237.3433	372.0952	563.5227	739.5087	883.4169	(97)
Space heating kWh	291.4581	218.5912	181.0044	102.6944	49.8887	0.0000	0.0000	0.0000	0.0000	93.1270	192.6285	296.9325	(98a)
Space heating requirement - total per year (kWh/year)												1426.3246	
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	291.4581	218.5912	181.0044	102.6944	49.8887	0.0000	0.0000	0.0000	0.0000	93.1270	192.6285	296.9325	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1426.3246	
Space heating per m2										(98c) / (4) =		22.8322	(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	291.4581	218.5912	181.0044	102.6944	49.8887	0.0000	0.0000	0.0000	0.0000	93.1270	192.6285	296.9325	(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)	328.2185	246.1613	203.8337	115.6468	56.1809	0.0000	0.0000	0.0000	0.0000	104.8727	216.9240	334.3835	(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	235.8742	208.6358	221.5794	194.4714	188.3203	169.4661	167.0038	173.7046	175.7041	196.2136	209.0183	233.2370	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.5354	84.1645	83.6100	82.6964	81.5306	79.8000	79.8000	79.8000	79.8000	82.4909	83.8771	84.6024	(217)
Fuel for water heating, kWh/month	279.0241	247.8906	265.0156	235.1630	230.9812	212.3636	209.2780	217.6749	220.1806	237.8608	249.1960	275.6862	(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	22.8513	20.6398	22.8513	22.1141	22.8513	22.1141	22.8513	22.8513	22.1141	22.8513	22.1141	22.8513	(231)
Lighting	18.4746	14.8210	13.3447	9.7769	7.5519	6.1700	6.8891	8.9548	11.6314	15.2610	17.2372	18.9881	(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												1606.2214	(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												2880.3144	(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)	183.0551	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	269.0551	(231)
Electricity for lighting (calculated in Appendix L)	149.1007	(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	4904.6916	(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	1606.2214	0.2100	337.3065	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2880.3144	0.2100	604.8660	(264)
Space and water heating			942.1725	(265)
Pumps, fans and electric keep-hot	269.0551	0.1387	37.3213	(267)
Energy for lighting	149.1007	0.1443	21.5198	(268)
Total CO2, kg/year			1001.0136	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			16.0200	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1606.2214	1.1300	1815.0302	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2880.3144	1.1300	3254.7553	(278)
Space and water heating			5069.7855	(279)
Pumps, fans and electric keep-hot	269.0551	1.5128	407.0265	(281)
Energy for lighting	149.1007	1.5338	228.6956	(282)
Total Primary energy kWh/year			5705.5076	(286)
Dwelling Primary energy Rate (DPER)			91.3300	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	62.4700	(1b) x	3.1500	(2b) =	196.7805	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.4700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		196.7805	(5)

2. Ventilation rate

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

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1016	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3516	(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) =	0.3253	(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	0.4147	0.4066	0.3984	0.3578	0.3497	0.3090	0.3090	0.3009	0.3253	0.3497	0.3659	0.3822	(22b)
Effective ac	0.5860	0.5827	0.5794	0.5640	0.5611	0.5477	0.5477	0.5453	0.5529	0.5611	0.5669	0.5730	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opening Type (Uw = 1.20)			15.5700	1.1450	17.8282			(27)
External Wall 1	57.4600	15.5700	41.8900	0.1800	7.5402			(29a)
Corridor wall	10.4300		10.4300	0.1800	1.8774			(29a)
External Roof	33.1000		33.1000	0.1100	3.6410			(30)
Total net area of external elements Aum(A, m2)			100.9900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.8868			(33)
Party Wall 1			44.5100	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 106.2222 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element				
E7 Party floor between dwellings (in blocks of flats)	18.2400	0.0700	1.2768	
E15 Flat roof with parapet	18.2400	0.5600	10.2144	
E7 Party floor between dwellings (in blocks of flats)	6.6200	0.0700	0.4634	
E16 Corner (normal)	7.5000	0.0900	0.6750	
E18 Party wall between dwellings	2.5000	0.0600	0.1500	
E25 Staggered party wall between dwellings	10.0000	0.0600	0.6000	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	24.1900	0.0000	0.0000	
E2 Other lintels (including other steel lintels)	8.4200	0.0500	0.4210	
E3 Sill	8.4200	0.0500	0.4210	
E4 Jamb	21.6000	0.0500	1.0800	
E24 Eaves (insulation at ceiling level - inverted)	14.4900	0.2400	3.4776	
P4 Party wall - Roof (insulation at ceiling level)	3.4500	0.1200	0.4140	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.5500	0.0200	0.1110	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 19.3042 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 50.1910 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	38.0529	37.8361	37.6235	36.6252	36.4384	35.5689	35.5689	35.4079	35.9039	36.4384	36.8163	37.2113	(38)
Heat transfer coeff	88.2440	88.0271	87.8146	86.8163	86.6295	85.7600	85.7600	85.5990	86.0949	86.6295	87.0073	87.4024	(39)
Average = Sum(39)m / 12 =												86.8154	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4126	1.4091	1.4057	1.3897	1.3867	1.3728	1.3728	1.3702	1.3782	1.3867	1.3928	1.3991	(40)
HLP (average)												1.3897	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.0505 (42)

Hot water usage for mixer showers

58.6004	57.7198	56.4365	53.9812	52.1692	50.1485	48.9999	50.2735	51.6696	53.8392	56.3472	58.3759	(42a)

Hot water usage for baths

25.3233	24.9472	24.4176	23.4411	22.7099	21.8991	21.4612	21.9871	22.5597	23.4273	24.4239	25.2377	(42b)

Hot water usage for other uses

35.6296	34.3340	33.0383	31.7427	30.4471	29.1515	29.1515	30.4471	31.7427	33.0383	34.3340	35.6296	(42c)

Average daily hot water use (litres/day) 109.8969 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	119.5533	117.0010	113.8924	109.1650	105.3262	101.1991	99.6126	102.7077	105.9720	110.3048	115.1051	119.2432	(44)
Energy conte	189.3432	166.6078	175.0484	149.4414	141.7893	124.4361	120.4728	127.1736	130.6741	149.6826	163.9883	186.7060	(45)
Energy content (annual)										Total = Sum(45)m =		1825.3637	
Distribution loss (46)m = 0.15 x (45)m	28.4015	24.9912	26.2573	22.4162	21.2684	18.6654	18.0709	19.0760	19.6011	22.4524	24.5982	28.0059	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	235.9381	208.6935	221.6433	194.5333	188.3842	169.5280	167.0677	173.7685	175.7659	196.2775	209.0802	233.3009	(62)
WWHRS	-26.7897	-23.6930	-24.8099	-20.5436	-19.1459	-16.3833	-15.3567	-16.3303	-16.9508	-19.9831	-22.6384	-26.2936	(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	209.1485	185.0005	196.8334	173.9897	169.2383	153.1447	151.7110	157.4382	158.8151	176.2944	186.4417	207.0073	(64)
										Total per year (kWh/year) = Sum(64)m =		2125.0628	(64)
12Total per year (kWh/year)												2125	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	100.2325	89.0657	95.4795	85.7627	84.4209	77.4485	77.3331	79.5611	79.5226	87.0454	90.5996	99.3557	(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	102.5270	102.5270	102.5270	102.5270	102.5270	102.5270	102.5270	102.5270	102.5270	102.5270	102.5270	102.5270	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	90.3508	100.0313	90.3508	93.3625	90.3508	93.3625	90.3508	90.3508	93.3625	90.3508	93.3625	90.3508	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	179.1306	180.9894	176.3052	166.3332	153.7454	141.9145	134.0108	132.1520	136.8362	146.8082	159.3960	171.2269	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.2527	33.2527	33.2527	33.2527	33.2527	33.2527	33.2527	33.2527	33.2527	33.2527	33.2527	33.2527	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-82.0216	-82.0216	-82.0216	-82.0216	-82.0216	-82.0216	-82.0216	-82.0216	-82.0216	-82.0216	-82.0216	-82.0216	(71)

Water heating gains (Table 5)

	134.7212	132.5382	128.3327	119.1149	113.4689	107.5673	103.9424	106.9370	110.4481	116.9965	125.8328	133.5426 (72)
Total internal gains												
	460.9607	470.3169	451.7469	435.5688	414.3232	396.6025	382.0621	383.1979	394.4048	410.9136	435.3494	451.8783 (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	
East	3.0700	19.6403	0.6300	0.7000	0.7700	18.4271	(76)
South	7.1900	46.7521	0.6300	0.7000	0.7700	102.7310	(78)
Southwest	3.7800	36.7938	0.6300	0.7000	0.7700	42.5049	(79)
West	1.5300	19.6403	0.6300	0.7000	0.7700	9.1835	(80)

Solar gains	172.8465	294.6607	402.3302	494.6973	548.8840	542.1545	523.8777	484.1816	434.5965	325.5793	207.1096	147.8500 (83)
Total gains	633.8072	764.9777	854.0771	930.2661	963.2072	938.7570	905.9399	867.3796	829.0014	736.4929	642.4590	599.7284 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	20.8881	20.9396	20.9902	21.2316	21.2774	21.4931	21.4931	21.5336	21.4095	21.2774	21.1850	21.0892	
alpha	2.3925	2.3960	2.3993	2.4154	2.4185	2.4329	2.4329	2.4356	2.4273	2.4185	2.4123	2.4059	
util living area	0.9197	0.8802	0.8300	0.7488	0.6421	0.5065	0.3862	0.4152	0.5838	0.7748	0.8848	0.9280	(86)
MIT	18.4232	18.8457	19.3636	19.9691	20.4541	20.7850	20.9194	20.9014	20.6780	20.0369	19.1344	18.3513	(87)
Th 2	19.7537	19.7564	19.7590	19.7712	19.7735	19.7842	19.7842	19.7862	19.7801	19.7735	19.7689	19.7640	(88)
util rest of house	0.9075	0.8630	0.8055	0.7123	0.5882	0.4298	0.2899	0.3184	0.5096	0.7339	0.8652	0.9170	(89)
MIT 2	16.8268	17.3498	17.9868	18.7201	19.2766	19.6296	19.7448	19.7347	19.5302	18.8223	17.7281	16.7432	(90)
Living area fraction									fLA = Living area / (4) =			0.4865	(91)
MIT	17.6034	18.0775	18.6566	19.3277	19.8494	20.1917	20.3163	20.3023	20.0886	19.4132	18.4122	17.5255	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.6034	18.0775	18.6566	19.3277	19.8494	20.1917	20.3163	20.3023	20.0886	19.4132	18.4122	17.5255	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8799	0.8340	0.7797	0.6975	0.5918	0.4567	0.3333	0.3610	0.5295	0.7201	0.8382	0.8903	(94)
Useful gains	557.6646	638.0275	665.9641	648.8888	570.0474	428.7095	301.9762	313.1426	438.9959	530.3429	538.4808	533.9520	(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	1173.9444	1159.9806	1067.5259	905.2952	705.9776	479.5436	318.7056	334.0318	515.5871	763.4811	984.2484	1164.6812	(97)
Space heating kWh	458.5121	350.7525	298.7620	184.6126	101.1321	0.0000	0.0000	0.0000	0.0000	173.4548	320.9526	469.2625	(98a)
Space heating requirement - total per year (kWh/year)												2357.4412	
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	458.5121	350.7525	298.7620	184.6126	101.1321	0.0000	0.0000	0.0000	0.0000	173.4548	320.9526	469.2625	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2357.4412	
Space heating per m2											(98c) / (4) =	37.7372	(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	458.5121	350.7525	298.7620	184.6126	101.1321	0.0000	0.0000	0.0000	0.0000	173.4548	320.9526	469.2625	(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)	496.7629	380.0135	323.6858	200.0137	109.5689	0.0000	0.0000	0.0000	0.0000	187.9250	347.7276	508.4100	(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	209.1485	185.0005	196.8334	173.9897	169.2383	153.1447	151.7110	157.4382	158.8151	176.2944	186.4417	207.0073	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.7698	85.4713	84.9929	84.1929	82.9445	79.8000	79.8000	79.8000	79.8000	84.0234	85.2664	85.8367	(217)
Fuel for water heating, kWh/month	243.8486	216.4474	231.5880	206.6559	204.0381	191.9106	190.1140	197.2909	199.0165	209.8159	218.6579	241.1642	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	18.7731	15.0605	13.5603	9.9349	7.6740	6.2697	7.0005	9.0995	11.8193	15.5075	17.5157	19.2949	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-11.8690	-17.9857	-27.7662	-33.6094	-38.3890	-36.6337	-36.1945	-33.0927	-28.0221	-21.5857	-13.4873	-10.1211	(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	-3.3757	-7.3255	-14.9882	-23.1554	-31.2582	-31.6390	-31.2615	-26.1683	-18.7949	-10.6766	-4.5703	-2.6528	(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	2554.1074	(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	2550.5482	(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)	151.5098	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-514.6227	(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	4827.5426	(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	2554.1074	0.2100	536.3626	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2550.5482	0.2100	535.6151	(264)
Space and water heating			1071.9777	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	151.5098	0.1443	21.8675	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-308.7563	0.1331	-41.0948	
PV Unit electricity exported	-205.8664	0.1251	-25.7507	
Total			-66.8455	(269)
Total CO2, kg/year			1038.9290	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.6300	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2554.1074	1.1300	2886.1414	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2550.5482	1.1300	2882.1194	(278)
Space and water heating			5768.2608	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	151.5098	1.5338	232.3908	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-308.7563	1.4918	-460.6092	
PV Unit electricity exported	-205.8664	0.4591	-94.5149	
Total			-555.1241	(283)
Total Primary energy kWh/year			5575.6283	(286)
Target Primary Energy Rate (TPER)			89.2500	(287)

Full SAP Calculation Printout

Property Reference	B2_05_2B__Copy	**Issued on Date**	29/08/2024
Assessment Reference	B2_05_2B_TF_Copy_Copy	**Prop Type Ref**	
Property			

SAP Rating	83 B	**DER**	14.90	**TER**	16.23
Environmental	88 B	**% DER < TER**			8.19
CO_2 Emissions (t/year)	1.03	**DFEE**	45.05	**TFEE**	48.72
Compliance Check	See BREL	**% DFEE < TFEE**			7.53
% DPER < TPER	2.16	**DPER**	85.07	**TPER**	86.94

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	76.0600	(1b)	x 3.0200	(2b) =	229.7012	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	76.0600					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		229.7012	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		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) =		80.1000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2477	0.2448	0.2419	0.2274	0.2245	0.2099	0.2099	0.2070	0.2157	0.2245	0.2303	0.2361	(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	
Window (Uw = 0.90)			17.2600	0.8687	14.9942			(27)
Door			1.6800	1.0000	1.6800			(26)
External Wall 1	54.7800	17.2600	37.5200	0.1800	6.7536	14.0000	525.2800	(29a)
Corridor Wall	32.1000	1.6800	30.4200	0.2000	6.0840	0.0000	0.0000	(29a)
External Roof 1	76.0600		76.0600	0.1100	8.3666	9.0000	684.5400	(30)
Total net area of external elements Aum(A, m2)			162.9400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		37.8784			(33)
Party Wall 1			38.9900	0.0000	0.0000	20.0000	779.8000	(32)
Party Floor 1			76.0600			80.0000	6084.8000	(32d)
Internal Wall 1			50.0000			9.0000	450.0000	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		8524.4200	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							112.0749	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E7 Party floor between dwellings (in blocks of flats)	5.8600	0.0580	0.3399	
E7 Party floor between dwellings (in blocks of flats)	10.6300	0.1100	1.1693	
E16 Corner (normal)	6.0400	0.1800	1.0872	
E18 Party wall between dwellings	6.0400	0.0250	0.1510	
E24 Eaves (insulation at ceiling level - inverted)	12.2800	0.0800	0.9824	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.9100	0.0000	0.0000	
E17 Corner (inverted - internal area greater than external area)	6.0400	0.0000	0.0000	
E25 Staggered party wall between dwellings	6.0400	0.2000	1.2080	
P4 Party wall - Roof (insulation at ceiling level)	12.9100	0.0300	0.3873	
E14 Flat roof	10.6300	0.1600	1.7008	
E15 Flat roof with parapet	18.1400	0.3000	5.4420	
E2 Other lintels (including other steel lintels)	9.1100	0.0170	0.1549	
E3 Sill	8.3000	0.0300	0.2490	
E4 Jamb	20.7800	0.1200	2.4936	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.5500	0.1000	0.5550	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.9204 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 53.7988 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	18.7774	18.5571	18.3368	17.2353	17.0150	15.9136	15.9136	15.6933	16.3542	17.0150	17.4556	17.8962	(38)
Heat transfer coeff	72.5762	72.3559	72.1356	71.0341	70.8138	69.7123	69.7123	69.4920	70.1529	70.8138	71.2544	71.6950	(39)
Average = Sum(39)m / 12 =												70.9790	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9542	0.9513	0.9484	0.9339	0.9310	0.9165	0.9165	0.9136	0.9223	0.9310	0.9368	0.9426	(40)
HLP (average)												0.9332	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3839 (42)

Hot water usage for mixer showers

64.1891	63.2245	61.8188	59.1293	57.1445	54.9311	53.6730	55.0681	56.5973	58.9738	61.7210	63.9432	(42a)

Hot water usage for baths

27.7266	27.3149	26.7350	25.6658	24.8652	23.9775	23.4980	24.0738	24.7008	25.6507	26.7419	27.6329	(42b)

Hot water usage for other uses

39.0431	37.6233	36.2036	34.7838	33.3641	31.9443	31.9443	33.3641	34.7838	36.2036	37.6233	39.0431	(42c)

Average daily hot water use (litres/day) 120.3809 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	130.9588	128.1626	124.7573	119.5789	115.3738	110.8529	109.1153	112.5059	116.0819	120.8280	126.0862	130.6191	(44)
Energy conte	207.4067	182.5019	191.7474	163.6976	155.3153	136.3066	131.9656	139.3058	143.1405	163.9625	179.6329	204.5180	(45)
Energy content (annual)										Total = Sum(45)m =		1999.5009	

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

31.1110	27.3753	28.7621	24.5546	23.2973	20.4460	19.7948	20.8959	21.4711	24.5944	26.9449	30.6777	(46)

Water storage loss:
Store volume 150.0000 (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)
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)
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

250.2549	221.2035	234.5956	205.1636	198.1635	177.7726	174.8138	182.1540	184.6065	206.8107	221.0989	247.3662	(62)
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)
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)
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)
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

250.2549	221.2035	234.5956	205.1636	198.1635	177.7726	174.8138	182.1540	184.6065	206.8107	221.0989	247.3662	(64)
									Total per year (kWh/year) = Sum(64)m =		2504.0039	(64)
12Total per year (kWh/year)											2504	(64)

Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

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

Heat gains from water heating, kWh/month

103.2413	91.6432	98.0346	87.6022	85.9209	78.4948	78.1571	80.5978	80.7670	88.7961	92.9008	102.2808	(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	119.1928	119.1928	119.1928	119.1928	119.1928	119.1928	119.1928	119.1928	119.1928	119.1928	119.1928	119.1928	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	106.4087	117.8097	106.4087	109.9557	106.4087	109.9557	106.4087	106.4087	109.9557	106.4087	109.9557	106.4087	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	211.0096	213.1993	207.6815	195.9348	181.1067	167.1704	157.8601	155.6705	161.1883	172.9350	187.7630	201.6993	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.9193	34.9193	34.9193	34.9193	34.9193	34.9193	34.9193	34.9193	34.9193	34.9193	34.9193	34.9193	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-95.3542	-95.3542	-95.3542	-95.3542	-95.3542	-95.3542	-95.3542	-95.3542	-95.3542	-95.3542	-95.3542	-95.3542	(71)
Water heating gains (Table 5)	138.7652	136.3737	131.7669	121.6698	115.4851	109.0205	105.0499	108.3303	112.1764	119.3496	129.0288	137.4742	(72)
Total internal gains	517.9414	529.1405	507.6149	489.3181	464.7584	444.9044	428.0765	429.1674	442.0782	460.4511	488.5054	507.3401	(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			17.2600		19.6403		0.3800		0.7000		0.7700		62.4889 (80)
Solar gains	62.4889	122.2416	201.3145	293.6051	359.8241	368.3440	350.6785	301.2277	234.1370	145.0499	77.9163	51.3878	(83)
Total gains	580.4303	651.3821	708.9294	782.9232	824.5825	813.2484	778.7551	730.3950	676.2153	605.5010	566.4217	558.7279	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	32.6263	32.7257	32.8256	33.3346	33.4383	33.9667	33.9667	34.0743	33.7533	33.4383	33.2316	33.0273	
alpha	3.1751	3.1817	3.1884	3.2223	3.2292	3.2644	3.2644	3.2716	3.2502	3.2292	3.2154	3.2018	
util living area	0.9473	0.9240	0.8840	0.7975	0.6719	0.5108	0.3823	0.4207	0.6254	0.8322	0.9216	0.9523	(86)
MIT	19.2330	19.4961	19.8791	20.3681	20.7187	20.9169	20.9755	20.9664	20.8349	20.3745	19.7425	19.1986	(87)
Th 2	20.1217	20.1241	20.1266	20.1388	20.1412	20.1535	20.1535	20.1559	20.1486	20.1412	20.1363	20.1314	(88)
util rest of house	0.9398	0.9136	0.8681	0.7705	0.6300	0.4530	0.3129	0.3493	0.5679	0.8036	0.9092	0.9455	(89)
MIT 2	18.0579	18.3883	18.8656	19.4662	19.8711	20.0883	20.1394	20.1356	20.0090	19.4886	18.7106	18.0211	(90)
Living area fraction										fLA = Living area / (4) =		0.4449	(91)
MIT	18.5807	18.8812	19.3165	19.8675	20.2482	20.4570	20.5114	20.5052	20.3765	19.8827	19.1697	18.5450	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.4307	18.7312	19.1665	19.7175	20.0982	20.3070	20.3614	20.3552	20.2265	19.7327	19.0197	18.3950	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9215	0.8932	0.8475	0.7560	0.6278	0.4638	0.3303	0.3666	0.5734	0.7881	0.8894	0.9281	(94)
Useful gains	534.8586	581.8373	600.8394	591.8695	517.6582	377.1718	257.1899	267.7421	387.7644	477.1653	503.7806	518.5500	(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	1025.5532	1000.7662	913.7065	768.4098	594.7099	397.8453	262.2172	274.8569	429.7888	646.7222	849.3312	1017.7083	(97)
Space heating kWh	365.0768	281.5202	232.7731	127.1090	57.3265	0.0000	0.0000	0.0000	0.0000	126.1503	248.7965	371.3738	(98a)
Space heating requirement - total per year (kWh/year)												1810.1261	
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	365.0768	281.5202	232.7731	127.1090	57.3265	0.0000	0.0000	0.0000	0.0000	126.1503	248.7965	371.3738	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1810.1261	
Space heating per m2										(98c) / (4) =		23.7987	(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	365.0768	281.5202	232.7731	127.1090	57.3265	0.0000	0.0000	0.0000	0.0000	126.1503	248.7965	371.3738	(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)	411.1225	317.0273	262.1319	143.1407	64.5569	0.0000	0.0000	0.0000	0.0000	142.0611	280.1762	418.2137	(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	250.2549	221.2035	234.5956	205.1636	198.1635	177.7726	174.8138	182.1540	184.6065	206.8107	221.0989	247.3662	(64)
Efficiency of water heater												79.8000	(216)
(217)m	84.9055	84.6016	84.0423	83.0188	81.6570	79.8000	79.8000	79.8000	79.8000	82.9866	84.3251	84.9688	(217)
Fuel for water heating, kWh/month	294.7452	261.4648	279.1399	247.1292	242.6781	222.7727	219.0649	228.2632	231.3365	249.2096	262.1982	291.1258	(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	25.4522	22.9891	25.4522	24.6312	25.4522	24.6312	25.4522	25.4522	24.6312	25.4522	24.6312	25.4522	(231)
Lighting	23.4587	18.8194	16.9448	12.4145	9.5893	7.8345	8.7477	11.3706	14.7692	19.3780	21.8875	24.1106	(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												2038.4303	(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												3029.1281	(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)	213.6795	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	299.6795	(231)
Electricity for lighting (calculated in Appendix L)	189.3248	(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	5556.5628	(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	2038.4303	0.2100	428.0704	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3029.1281	0.2100	636.1169	(264)
Space and water heating			1064.1873	(265)
Pumps, fans and electric keep-hot	299.6795	0.1387	41.5692	(267)
Energy for lighting	189.3248	0.1443	27.3254	(268)
Total CO2, kg/year			1133.0819	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			14.9000	(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	2038.4303	1.1300	2303.4263	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3029.1281	1.1300	3422.9148	(278)
Space and water heating			5726.3411	(279)
Pumps, fans and electric keep-hot	299.6795	1.5128	453.3552	(281)
Energy for lighting	189.3248	1.5338	290.3927	(282)
Total Primary energy kWh/year			6470.0890	(286)
Dwelling Primary energy Rate (DPER)			85.0700	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	76.0600	(1b) x	3.0200	(2b) =	229.7012	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	76.0600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		229.7012	(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)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1306	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3806	(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) =	0.2950	(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	0.3761	0.3687	0.3613	0.3245	0.3171	0.2802	0.2802	0.2728	0.2950	0.3171	0.3318	0.3466	(22b)
Effective ac	0.5707	0.5680	0.5653	0.5526	0.5503	0.5393	0.5393	0.5372	0.5435	0.5503	0.5551	0.5601	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.6800	1.0000	1.6800			(26)
TER Opening Type (Uw = 1.20)			17.2600	1.1450	19.7634			(27)
External Wall 1	54.7800	17.2600	37.5200	0.1800	6.7536			(29a)
Corridor Wall	32.1000	1.6800	30.4200	0.1800	5.4756			(29a)
External Roof 1	76.0600		76.0600	0.1100	8.3666			(30)
Total net area of external elements Aum(A, m2)			162.9400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		42.0392			(33)
Party Wall 1			38.9900	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 112.0749 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	5.8600	0.0700	0.4102
E7 Party floor between dwellings (in blocks of flats)	10.6300	0.0700	0.7441
E16 Corner (normal)	6.0400	0.0900	0.5436
E18 Party wall between dwellings	6.0400	0.0600	0.3624
E24 Eaves (insulation at ceiling level - inverted)	12.2800	0.2400	2.9472
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.9100	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	6.0400	-0.0900	-0.5436
E25 Staggered party wall between dwellings	6.0400	0.0600	0.3624
P4 Party wall - Roof (insulation at ceiling level)	12.9100	0.1200	1.5492
E14 Flat roof	10.6300	0.0800	0.8504
E15 Flat roof with parapet	18.1400	0.5600	10.1584
E2 Other lintels (including other steel lintels)	9.1100	0.0500	0.4555
E3 Sill	8.3000	0.0500	0.4150
E4 Jamb	20.7800	0.0500	1.0390
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.5500	0.0200	0.1110

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 19.4048 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 61.4440 (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	43.2614	43.0532	42.8492	41.8908	41.7115	40.8768	40.8768	40.7222	41.1983	41.7115	42.0742	42.4535	(38)
Heat transfer coeff	104.7053	104.4972	104.2931	103.3348	103.1554	102.3207	102.3207	102.1662	102.6423	103.1554	103.5182	103.8974	(39)

Average = Sum(39)m / 12 = 103.3339

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3766	1.3739	1.3712	1.3586	1.3562	1.3453	1.3453	1.3432	1.3495	1.3562	1.3610	1.3660	(40)
HLP (average)												1.3586	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3839 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
64.1891	63.2245	61.8188	59.1293	57.1445	54.9311	53.6730	55.0681	56.5973	58.9738	61.7210	63.9432	(42a)

Hot water usage for baths

27.7266	27.3149	26.7350	25.6658	24.8652	23.9775	23.4980	24.0738	24.7008	25.6507	26.7419	27.6329	(42b)

Hot water usage for other uses

39.0431	37.6233	36.2036	34.7838	33.3641	31.9443	31.9443	33.3641	34.7838	36.2036	37.6233	39.0431	(42c)

Average daily hot water use (litres/day) 120.3809 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	130.9588	128.1626	124.7573	119.5789	115.3738	110.8529	109.1153	112.5059	116.0819	120.8280	126.0862	130.6191	(44)
Energy conte	207.4067	182.5019	191.7474	163.6976	155.3153	136.3066	131.9656	139.3058	143.1405	163.9625	179.6329	204.5180	(45)
Energy content (annual)										Total = Sum(45)m =		1999.5009	
Distribution loss (46)m = 0.15 x (45)m	31.1110	27.3753	28.7621	24.5546	23.2973	20.4460	19.7948	20.8959	21.4711	24.5944	26.9449	30.6777	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.7527 (55)
Total storage loss

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

If cylinder contains dedicated solar storage

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

254.0016	224.5876	238.3423	208.7894	201.9102	181.3985	178.5605	185.9008	188.2324	210.5574	224.7248	251.1129	(62)
WWHRS -29.3446	-25.9526	-27.1760	-22.5028	-20.9718	-17.9458	-16.8213	-17.8877	-18.5674	-21.8889	-24.7974	-28.8012	(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												
224.6571	198.6350	211.1663	186.2866	180.9384	163.4527	161.7392	168.0130	169.6650	188.6685	199.9273	222.3117	(64)
									Total per year (kWh/year) = Sum(64)m =		2275.4608	(64)
12Total per year (kWh/year)											2275	(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

106.2387	94.3505	101.0319	90.5029	88.9183	81.3954	81.1545	83.5951	83.6677	91.7934	95.8014	105.2782	(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	119.1928	119.1928	119.1928	119.1928	119.1928	119.1928	119.1928	119.1928	119.1928	119.1928	119.1928	119.1928	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	106.4087	117.8097	106.4087	109.9557	106.4087	109.9557	106.4087	106.4087	109.9557	106.4087	109.9557	106.4087	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	211.0096	213.1993	207.6815	195.9348	181.1067	167.1704	157.8601	155.6705	161.1883	172.9350	187.7630	201.6993	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.9193	34.9193	34.9193	34.9193	34.9193	34.9193	34.9193	34.9193	34.9193	34.9193	34.9193	34.9193	(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)	-95.3542	-95.3542	-95.3542	-95.3542	-95.3542	-95.3542	-95.3542	-95.3542	-95.3542	-95.3542	-95.3542	-95.3542	(71)
Water heating gains (Table 5)	142.7939	140.4025	135.7956	125.6985	119.5138	113.0492	109.0786	112.3590	116.2051	123.3783	133.0575	141.5029	(72)
Total internal gains	521.9701	533.1692	511.6436	493.3468	468.7871	448.9331	432.1053	433.1961	446.1069	464.4798	492.5341	511.3688	(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	17.2600	19.6403	0.6300	0.7000	0.7700	103.6000	(80)

Solar gains	103.6000	202.6637	333.7582	486.7664	596.5505	610.6756	581.3881	499.4038	388.1746	240.4775	129.1771	85.1956	(83)
Total gains	625.5701	735.8329	845.4018	980.1132	1065.3376	1059.6087	1013.4933	932.5998	834.2815	704.9573	621.7111	596.5644	(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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	22.6148	22.6599	22.7042	22.9148	22.9546	23.1419	23.1419	23.1769	23.0694	22.9546	22.8742	22.7907	
alpha	2.5077	2.5107	2.5136	2.5277	2.5303	2.5428	2.5428	2.5451	2.5380	2.5303	2.5249	2.5194	
util living area	0.9499	0.9254	0.8826	0.7974	0.6783	0.5331	0.4110	0.4560	0.6565	0.8467	0.9280	0.9549	(86)
MIT	18.3114	18.6656	19.2127	19.9022	20.4452	20.7886	20.9208	20.8949	20.6230	19.8847	18.9830	18.2528	(87)
Th 2	19.7813	19.7834	19.7855	19.7952	19.7970	19.8055	19.8055	19.8071	19.8023	19.7970	19.7934	19.7895	(88)
util rest of house	0.9415	0.9133	0.8633	0.7642	0.6253	0.4550	0.3110	0.3536	0.5824	0.8134	0.9142	0.9474	(89)
MIT 2	16.6971	17.1415	17.8225	18.6630	19.2886	19.6532	19.7668	19.7518	19.5027	18.6685	17.5546	16.6279	(90)
Living area fraction									fLA = Living area / (4) =			0.4449	(91)
MIT	17.4154	17.8196	18.4411	19.2143	19.8032	20.1583	20.2802	20.2604	20.0012	19.2096	18.1901	17.3508	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.4154	17.8196	18.4411	19.2143	19.8032	20.1583	20.2802	20.2604	20.0012	19.2096	18.1901	17.3508	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9191	0.8875	0.8369	0.7459	0.6256	0.4793	0.3521	0.3942	0.5958	0.7938	0.8899	0.9262	(94)
Useful gains	574.9410	653.0542	707.5027	731.0440	666.4761	507.8727	356.8879	367.6719	497.0811	559.5991	553.2512	552.5191	(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	1373.2476	1350.0595	1245.3695	1065.8259	835.8859	568.7337	376.5656	394.4004	605.7079	888.1257	1148.0271	1366.3380	(97)
Space heating kWh	593.9401	468.3876	400.1729	241.0430	126.0409	0.0000	0.0000	0.0000	0.0000	244.4238	428.2386	605.4813	(98a)
Space heating requirement - total per year (kWh/year)												3107.7282	
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	593.9401	468.3876	400.1729	241.0430	126.0409	0.0000	0.0000	0.0000	0.0000	244.4238	428.2386	605.4813	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3107.7282	
Space heating per m2											(98c) / (4) =	40.8589	(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	593.9401	468.3876	400.1729	241.0430	126.0409	0.0000	0.0000	0.0000	0.0000	244.4238	428.2386	605.4813	(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)	643.4887	507.4622	433.5568	261.1516	136.5557	0.0000	0.0000	0.0000	0.0000	264.8145	463.9638	655.9927	(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	224.6571	198.6350	211.1663	186.2866	180.9384	163.4527	161.7392	168.0130	169.6650	188.6685	199.9273	222.3117	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.1340	85.9145	85.4704	84.6387	83.2649	79.8000	79.8000	79.8000	79.8000	84.6415	85.7230	86.1894	(217)
Fuel for water heating, kWh/month	260.8228	231.2008	247.0637	220.0962	217.3045	204.8280	202.6807	210.5426	212.6128	222.9032	233.2250	257.9339	(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	22.1096	17.7372	15.9704	11.7006	9.0379	7.3840	8.2446	10.7167	13.9199	18.2637	20.6288	22.7241	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-14.3666	-21.7239	-33.4633	-40.4076	-46.0586	-43.9074	-43.3706	-39.6944	-33.6787	-26.0224	-16.3064	-12.2553	(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	-4.1946	-9.0937	-18.5920	-28.7060	-38.7400	-39.2177	-38.7601	-32.4584	-23.3230	-13.2585	-5.6795	-3.2975	(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	3366.9861	(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	2721.2141	(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)	178.4374	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-626.5760	(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	5726.0615	(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	3366.9861	0.2100	707.0671	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2721.2141	0.2100	571.4550	(264)
Space and water heating			1278.5220	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	178.4374	0.1443	25.7540	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-371.2551	0.1331	-49.4320	
PV Unit electricity exported	-255.3209	0.1251	-31.9393	
Total			-81.3713	(269)
Total CO2, kg/year			1234.8340	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.2300	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3366.9861	1.1300	3804.6943	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2721.2141	1.1300	3074.9719	(278)
Space and water heating			6879.6662	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	178.4374	1.5338	273.6932	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-371.2551	1.4920	-553.9168	
PV Unit electricity exported	-255.3209	0.4591	-117.2292	
Total			-671.1460	(283)
Total Primary energy kWh/year			6612.3142	(286)
Target Primary Energy Rate (TPER)			86.9400	(287)

Full SAP Calculation Printout

Property Reference	Gate House__Copy	**Issued on Date**	29/08/2024
Assessment Reference	Gate House_LEAN_LATEST	**Prop Type Ref**	
Property			

SAP Rating	83 B	**DER**	15.09	**TER**	13.33
Environmental	86 B	**% DER < TER**			-13.20
CO_2 Emissions (t/year)	1.36	**DFEE**	44.94	**TFEE**	50.49
Compliance Check	See BREL	**% DFEE < TFEE**			10.99
% DPER < TPER	-22.21	**DPER**	85.43	**TPER**	69.90

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	48.4200 (1b)	x	2.5000 (2b)	=	121.0500	(1b) - (3b)
First floor	48.4200 (1c)	x	2.8200 (2c)	=	136.5444	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	96.8400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	257.5944	(5)

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2. Ventilation rate

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				m3 per hour	
Number of open chimneys			0 * 80 =	0.0000	(6a)
Number of open flues			0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire			0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler			0 * 20 =	0.0000	(6d)
Number of flues attached to other heater			0 * 35 =	0.0000	(6e)
Number of blocked chimneys			0 * 20 =	0.0000	(6f)
Number of intermittent extract fans			0 * 10 =	0.0000	(7a)
Number of passive vents			0 * 10 =	0.0000	(7b)
Number of flueless gas fires			0 * 40 =	0.0000	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =			0.0000 / (5) =	0.0000	(8)
Pressure test				Yes	
Pressure Test Method				Blower Door	
Measured/design AP50				4.0000	(17)
Infiltration rate				0.2000	(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) =	0.1850	(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	0.2359	0.2313	0.2266	0.2035	0.1989	0.1758	0.1758	0.1711	0.1850	0.1989	0.2081	0.2174	(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	0.3354	0.3307	0.3261	0.3030	0.2984	0.2752	0.2752	0.2706	0.2845	0.2984	0.3076	0.3169	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Window (Uw = 0.90)			23.4900	0.8687	20.4064			(27)
Door			1.9200	1.0000	1.9200			(26)
Heatloss Floor 1			48.4200	0.1000	4.8420	0.0000	0.0000	(28a)
External Wall 1	167.8500	25.4100	142.4400	0.1800	25.6392	0.0000	0.0000	(29a)
External Roof 1	48.4200		48.4200	0.0900	4.3578	0.0000	0.0000	(30)
Total net area of external elements Aum(A, m2)			264.6900					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	57.1654			(33)
Internal Wall 1			60.0000			9.0000	540.0000	(32c)
Internal Floor 1			48.4200			18.0000	871.5600	(32d)
Internal Ceiling 1			48.4200			9.0000	435.7800	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 1847.3400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	19.0762 (35)
List of Thermal Bridges	

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	15.1100	0.0170	0.2569	
E3 Sill	14.2000	0.0300	0.4260	
E4 Jamb	35.0200	0.1200	4.2024	
E5 Ground floor (normal)	31.5500	0.1000	3.1550	
E6 Intermediate floor within a dwelling	31.5500	0.0000	0.0000	
E16 Corner (normal)	31.8000	0.1270	4.0386	
E17 Corner (inverted - internal area greater than external area)	10.6000	0.0000	0.0000	
E15 Flat roof with parapet	31.0000	0.3000	9.3000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			21.3789	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	78.5442	(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	28.5089	28.1158	27.7226	25.7569	25.3637	23.3979	23.3979	23.0048	24.1843	25.3637	26.1500	26.9363	(38)
Heat transfer coeff	107.0532	106.6600	106.2669	104.3011	103.9080	101.9422	101.9422	101.5490	102.7285	103.9080	104.6943	105.4806	(39)
Average = Sum(39)m / 12 =												104.2028	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1055	1.1014	1.0973	1.0770	1.0730	1.0527	1.0527	1.0486	1.0608	1.0730	1.0811	1.0892	(40)
HLP (average)												1.0760	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7083	(42)
Hot water usage for mixer showers	69.6288	68.5824	67.0576	64.1402	61.9872	59.5863	58.2215	59.7348	61.3936	63.9715	66.9516	69.3620	(42a)
Hot water usage for baths	30.0659	29.6194	28.9906	27.8312	26.9631	26.0004	25.4805	26.1049	26.7847	27.8148	28.9980	29.9642	(42b)
Hot water usage for other uses	42.3655	40.8250	39.2844	37.7438	36.2033	34.6627	34.6627	36.2033	37.7438	39.2844	40.8250	42.3655	(42c)
Average daily hot water use (litres/day)												130.5854	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	142.0602	139.0267	135.3326	129.7152	125.1536	120.2494	118.3647	122.0429	125.9222	131.0707	136.7746	141.6918	(44)
Energy conte	224.9887	197.9722	208.0012	177.5737	168.4808	147.8607	143.1519	151.1146	155.2746	177.8617	194.8605	221.8551	(45)
Energy content (annual)										Total = Sum(45)m =		2168.9955	
Distribution loss (46)m = 0.15 x (45)m	33.7483	29.6958	31.2002	26.6361	25.2721	22.1791	21.4728	22.6672	23.2912	26.6793	29.2291	33.2783	(46)
Water storage 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	271.5197	240.0002	254.5322	222.6037	215.0118	192.8907	189.6829	197.6456	200.3046	224.3927	239.8905	268.3861	(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	271.5197	240.0002	254.5322	222.6037	215.0118	192.8907	189.6829	197.6456	200.3046	224.3927	239.8905	268.3861	(64)
										Total per year (kWh/year) = Sum(64)m =		2716.8605	(64)
12Total per year (kWh/year)												2717	(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	112.0335	99.4482	106.3852	95.0672	93.2447	85.1877	84.8228	87.4704	87.6528	96.3638	100.8151	110.9916	(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	135.4142	135.4142	135.4142	135.4142	135.4142	135.4142	135.4142	135.4142	135.4142	135.4142	135.4142	135.4142	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	126.6590	140.2296	126.6590	130.8810	126.6590	130.8810	126.6590	126.6590	130.8810	126.6590	130.8810	126.6590	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	251.1156	253.7214	247.1549	233.1756	215.5292	198.9440	187.8641	185.2583	191.8249	205.8042	223.4506	240.0357	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.5414	36.5414	36.5414	36.5414	36.5414	36.5414	36.5414	36.5414	36.5414	36.5414	36.5414	36.5414	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-108.3314	-108.3314	-108.3314	-108.3314	-108.3314	-108.3314	-108.3314	-108.3314	-108.3314	-108.3314	-108.3314	-108.3314	(71)
Water heating gains (Table 5)	150.5827	147.9883	142.9908	132.0378	125.3288	118.3162	114.0091	117.5678	121.7400	129.5212	140.0210	149.1823	(72)
Total internal gains	594.9816	608.5636	583.4290	562.7186	534.1412	511.7655	492.1565	493.1094	508.0701	528.6087	560.9768	582.5013	(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	4.7400	10.6334	0.3800	0.7000	0.7700	9.2911	(74)
East	11.6000	19.6403	0.3800	0.7000	0.7700	41.9972	(76)
South	1.6600	46.7521	0.3800	0.7000	0.7700	14.3062	(78)
West	5.4900	19.6403	0.3800	0.7000	0.7700	19.8763	(80)

Solar gains	85.4707	162.2231	259.3483	372.9079	456.7145	468.4320	445.5259	382.1258	299.2837	190.0284	105.5683	70.9890	(83)
Total gains	680.4522	770.7867	842.7773	935.6265	990.8558	980.1975	937.6824	875.2352	807.3538	718.6371	666.5451	653.4903	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	4.7934	4.8111	4.8289	4.9199	4.9385	5.0337	5.0337	5.0532	4.9952	4.9385	4.9014	4.8649	
alpha	1.3196	1.3207	1.3219	1.3280	1.3292	1.3356	1.3356	1.3369	1.3330	1.3292	1.3268	1.3243	
util living area	0.8063	0.7734	0.7293	0.6536	0.5635	0.4550	0.3649	0.3940	0.5340	0.6824	0.7703	0.8132	(86)
MIT	16.2726	16.7091	17.4434	18.4610	19.4024	20.1779	20.5764	20.5115	19.9016	18.6888	17.3363	16.2051	(87)
Th 2	19.9964	19.9997	20.0030	20.0196	20.0230	20.0397	20.0397	20.0430	20.0330	20.0230	20.0163	20.0096	(88)
util rest of house	0.7942	0.7595	0.7121	0.6307	0.5316	0.4097	0.3040	0.3336	0.4905	0.6565	0.7543	0.8017	(89)
MIT 2	14.7603	15.2753	16.1431	17.3409	18.4281	19.3055	19.7248	19.6676	19.0155	17.6295	16.0353	14.6858	(90)
Living area fraction										fLA = Living area / (4) =		0.4671	(91)
MIT	15.4666	15.9450	16.7504	17.8641	18.8832	19.7130	20.1225	20.0617	19.4294	18.1243	16.6430	15.3954	(92)
Temperature adjustment												-0.1500	
adjusted MIT	15.3166	15.7950	16.6004	17.7141	18.7332	19.5630	19.9725	19.9117	19.2794	17.9743	16.4930	15.2454	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.7159	0.6813	0.6368	0.5654	0.4833	0.3849	0.2994	0.3246	0.4518	0.5889	0.6770	0.7238	(94)
Useful gains	487.1652	525.1403	536.7121	529.0262	478.8420	377.2786	280.7349	284.0890	364.7689	423.2085	451.2411	472.9848	(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	1179.3663	1162.0583	1073.3421	919.3154	730.8033	505.9380	343.8030	356.6125	532.0705	766.2443	983.3894	1165.0748	(97)
Space heating kWh	514.9976	428.0089	399.2527	281.0083	187.4592	0.0000	0.0000	0.0000	0.0000	255.2186	383.1468	514.9149	(98a)
Space heating requirement - total per year (kWh/year)												2964.0069	
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	514.9976	428.0089	399.2527	281.0083	187.4592	0.0000	0.0000	0.0000	0.0000	255.2186	383.1468	514.9149	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2964.0069	
Space heating per m2											(98c) / (4) =	30.6073	(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	514.9976	428.0089	399.2527	281.0083	187.4592	0.0000	0.0000	0.0000	0.0000	255.2186	383.1468	514.9149	(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)	579.9523	481.9920	449.6089	316.4508	211.1026	0.0000	0.0000	0.0000	0.0000	287.4083	431.4716	579.8592	(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	271.5197	240.0002	254.5322	222.6037	215.0118	192.8907	189.6829	197.6456	200.3046	224.3927	239.8905	268.3861	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.4722	85.3419	85.0649	84.5834	83.7537	79.8000	79.8000	79.8000	79.8000	84.3492	85.1044	85.4962	(217)
Fuel for water heating, kWh/month	317.6701	281.2219	299.2210	263.1765	256.7191	241.7176	237.6978	247.6762	251.0083	266.0283	281.8780	313.9159	(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	25.2138	22.7737	25.2138	24.4004	25.2138	24.4004	25.2138	25.2138	24.4004	25.2138	24.4004	25.2138	(231)
Lighting	29.9196	24.0026	21.6117	15.8337	12.2304	9.9923	11.1570	14.5022	18.8370	24.7151	27.9157	30.7512	(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												3337.8457	(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												3257.9308	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.6710)

mechanical ventilation fans (SFP = 0.6710) 210.8719 (230a)

central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	296.8719	(231)
Electricity for lighting (calculated in Appendix L)	241.4686	(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	7134.1170	(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	3337.8457	0.2100	700.9476	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3257.9308	0.2100	684.1655	(264)
Space and water heating			1385.1131	(265)
Pumps, fans and electric keep-hot	296.8719	0.1387	41.1798	(267)
Energy for lighting	241.4686	0.1443	34.8514	(268)
Total CO2, kg/year			1461.1442	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			15.0900	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3337.8457	1.1300	3771.7656	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3257.9308	1.1300	3681.4618	(278)
Space and water heating			7453.2274	(279)
Pumps, fans and electric keep-hot	296.8719	1.5128	449.1079	(281)
Energy for lighting	241.4686	1.5338	370.3726	(282)
Total Primary energy kWh/year			8272.7078	(286)
Dwelling Primary energy Rate (DPER)			85.4300	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	48.4200	(1b)	x 2.5000	(2b) =	121.0500	(1b) - (3b)
First floor	48.4200	(1c)	x 2.8200	(2c) =	136.5444	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	96.8400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		257.5944	(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)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1165	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3665	(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) =	0.3390	(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	0.4322	0.4237	0.4152	0.3729	0.3644	0.3220	0.3220	0.3136	0.3390	0.3644	0.3813	0.3983	(22b)
Effective ac	0.5934	0.5898	0.5862	0.5695	0.5664	0.5519	0.5519	0.5492	0.5575	0.5664	0.5727	0.5793	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.9200	1.0000	1.9200			(26)
TER Opening Type (Uw = 1.20)			22.3000	1.1450	25.5344			(27)
Heatloss Floor 1			48.4200	0.1300	6.2946			(28a)
External Wall 1	167.8500	24.2200	143.6300	0.1800	25.8534			(29a)
External Roof 1	48.4200		48.4200	0.1100	5.3262			(30)
Total net area of external elements Aum(A, m2)			264.6900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		64.9286			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 19.0762 (35)

List of Thermal Bridges

		Length	Psi-value	Total
K1	Element			
E2	Other lintels (including other steel lintels)	15.1100	0.0500	0.7555
E3	Sill	14.2000	0.0500	0.7100
E4	Jamb	35.0200	0.0500	1.7510
E5	Ground floor (normal)	31.5500	0.1600	5.0480
E6	Intermediate floor within a dwelling	31.5500	0.0000	0.0000
E16	Corner (normal)	31.8000	0.0900	2.8620
E17	Corner (inverted - internal area greater than external area)	10.6000	-0.0900	-0.9540
E15	Flat roof with parapet	31.0000	0.5600	17.3600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 27.5325 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 92.4611 (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	50.4424	50.1341	49.8319	48.4125	48.1470	46.9107	46.9107	46.6818	47.3869	48.1470	48.6842	49.2458	(38)
Heat transfer coeff	142.9034	142.5951	142.2930	140.8736	140.6080	139.3718	139.3718	139.1429	139.8480	140.6080	141.1452	141.7069	(39)

Average = Sum(39)m / 12 = 140.8723

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4757	1.4725	1.4694	1.4547	1.4520	1.4392	1.4392	1.4368	1.4441	1.4520	1.4575	1.4633	(40)
HLP (average)												1.4547	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.7083 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	69.6288	68.5824	67.0576	64.1402	61.9872	59.5863	58.2215	59.7348	61.3936	63.9715	66.9516	69.3620	(42a)
Hot water usage for baths	30.0659	29.6194	28.9906	27.8312	26.9631	26.0004	25.4805	26.1049	26.7847	27.8148	28.9980	29.9642	(42b)
Hot water usage for other uses	42.3655	40.8250	39.2844	37.7438	36.2033	34.6627	34.6627	36.2033	37.7438	39.2844	40.8250	42.3655	(42c)

Average daily hot water use (litres/day) 130.5854 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	142.0602	139.0267	135.3326	129.7152	125.1536	120.2494	118.3647	122.0429	125.9222	131.0707	136.7746	141.6918	(44)
Energy conte	224.9887	197.9722	208.0012	177.5737	168.4808	147.8607	143.1519	151.1146	155.2746	177.8617	194.8605	221.8551	(45)

Energy content (annual) Total = Sum(45)m = 2168.9955

Distribution loss (46)m = 0.15 x (45)m	33.7483	29.6958	31.2002	26.6361	25.2721	22.1791	21.4728	22.6672	23.2912	26.6793	29.2291	33.2783	(46)

Water storage loss:

Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	271.5836	240.0579	254.5961	222.6655	215.0757	192.9525	189.7468	197.7095	200.3665	224.4566	239.9523	268.4500	(62)
WWHRS	-31.8314	-28.1519	-29.4791	-24.4098	-22.7491	-19.4666	-18.2468	-19.4036	-20.1409	-23.7438	-26.8989	-31.2419	(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	239.7522	211.9060	225.1170	198.2557	192.3266	173.4859	171.5000	178.3059	180.2256	200.7127	213.0534	237.2081	(64)

Total per year (kWh/year) = Sum(64)m = 2421.8491 (64)

12Total per year (kWh/year) 2422 (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

	112.0846	99.4943	106.4363	95.1167	93.2958	85.2371	84.8739	87.5215	87.7023	96.4149	100.8646	111.0427	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	135.4142	135.4142	135.4142	135.4142	135.4142	135.4142	135.4142	135.4142	135.4142	135.4142	135.4142	135.4142	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	126.6590	140.2296	126.6590	130.8810	126.6590	130.8810	126.6590	126.6590	130.8810	126.6590	130.8810	126.6590	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	251.1156	253.7214	247.1549	233.1756	215.5292	198.9440	187.8641	185.2583	191.8249	205.8042	223.4506	240.0357	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.5414	36.5414	36.5414	36.5414	36.5414	36.5414	36.5414	36.5414	36.5414	36.5414	36.5414	36.5414	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-108.3314	-108.3314	-108.3314	-108.3314	-108.3314	-108.3314	-108.3314	-108.3314	-108.3314	-108.3314	-108.3314	-108.3314	(71)
Water heating gains (Table 5)	150.6514	148.0571	143.0596	132.1066	125.3975	118.3849	114.0779	117.6365	121.8087	129.5900	140.0897	149.2510	(72)
Total internal gains	595.0503	608.6323	583.4977	562.7873	534.2100	511.8342	492.2252	493.1781	508.1388	528.6774	561.0455	582.5700	(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	4.5000	10.6334	0.6300	0.7000	0.7700	14.6237	(74)
East	11.0100	19.6403	0.6300	0.7000	0.7700	66.0855	(76)
South	1.5800	46.7521	0.6300	0.7000	0.7700	22.5751	(78)
West	5.2100	19.6403	0.6300	0.7000	0.7700	31.2721	(80)

Solar gains	134.5564	255.3709	408.2317	586.9430	718.8265	737.2600	701.2117	601.4415	471.0785	299.1323	166.1929	111.7602	(83)
Total gains	729.6067	864.0033	991.7294	1149.7304	1253.0364	1249.0942	1193.4370	1094.6196	979.2173	827.8097	727.2384	694.3301	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	3.5909	3.5987	3.6063	3.6426	3.6495	3.6819	3.6819	3.6879	3.6693	3.6495	3.6356	3.6212	
alpha	1.2394	1.2399	1.2404	1.2428	1.2433	1.2455	1.2455	1.2459	1.2446	1.2433	1.2424	1.2414	
util living area	0.8281	0.7909	0.7404	0.6598	0.5660	0.4611	0.3733	0.4071	0.5504	0.7033	0.7944	0.8362	(86)
MIT	15.7501	16.2412	17.0701	18.1771	19.2112	20.0477	20.4947	20.4131	19.7204	18.3692	16.8765	15.6571	(87)
Th 2	19.7058	19.7082	19.7106	19.7216	19.7237	19.7334	19.7334	19.7352	19.7297	19.7237	19.7195	19.7151	(88)
util rest of house	0.8142	0.7744	0.7193	0.6308	0.5251	0.4015	0.2918	0.3258	0.4938	0.6712	0.7754	0.8231	(89)
MIT 2	14.0335	14.6080	15.5782	16.8638	18.0392	18.9610	19.4141	19.3467	18.6361	17.1187	15.3747	13.9286	(90)
Living area fraction										fLA = Living area / (4) =		0.4671	(91)
MIT	14.8353	15.3708	16.2750	17.4772	18.5866	19.4685	19.9188	19.8448	19.1425	17.7027	16.0761	14.7359	(92)
Temperature adjustment												0.0000	
adjusted MIT	14.8353	15.3708	16.2750	17.4772	18.5866	19.4685	19.9188	19.8448	19.1425	17.7027	16.0761	14.7359	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.7383	0.6973	0.6450	0.5679	0.4825	0.3877	0.3048	0.3336	0.4633	0.6057	0.6998	0.7479	(94)
Useful gains	538.6916	602.4443	639.6224	652.8999	604.6450	484.2285	363.7903	365.1457	453.6484	501.3649	508.9196	519.2736	(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	1505.5273	1493.0812	1390.9172	1208.2981	968.3095	678.5349	462.5461	479.3147	705.1823	998.7019	1266.9392	1493.0122	(97)
Space heating kWh	719.3258	598.5080	558.9633	399.8868	270.5664	0.0000	0.0000	0.0000	0.0000	370.0187	545.7741	724.4615	(98a)
Space heating requirement - total per year (kWh/year)												4187.5045	
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	719.3258	598.5080	558.9633	399.8868	270.5664	0.0000	0.0000	0.0000	0.0000	370.0187	545.7741	724.4615	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4187.5045	
Space heating per m2											(98c) / (4) =	43.2415	(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	719.3258	598.5080	558.9633	399.8868	270.5664	0.0000	0.0000	0.0000	0.0000	370.0187	545.7741	724.4615	(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)	779.3345	648.4377	605.5941	433.2468	293.1380	0.0000	0.0000	0.0000	0.0000	400.8870	591.3046	784.8987	(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	239.7522	211.9060	225.1170	198.2557	192.3266	173.4859	171.5000	178.3059	180.2256	200.7127	213.0534	237.2081	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.3651	86.2563	86.0148	85.6001	84.8251	79.8000	79.8000	79.8000	79.8000	85.4123	86.0744	86.3965	(217)
Fuel for water heating, kWh/month	277.6032	245.6702	261.7190	231.6068	226.7330	217.4009	214.9123	223.4410	225.8466	234.9927	247.5223	274.5575	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	26.3172	21.1127	19.0096	13.9273	10.7578	8.7892	9.8136	12.7561	16.5690	21.7394	24.5546	27.0487	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-44.4142	-62.1696	-88.7317	-99.0284	-106.1445	-98.8118	-97.5406	-92.3579	-83.1693	-70.6854	-48.6490	-38.4470	(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	-26.4822	-55.5416	-110.0998	-164.9589	-217.7536	-218.6942	-216.1672	-183.2381	-134.5553	-79.3525	-35.3286	-20.9585	(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	4536.8413	(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	2882.0054	(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)	212.3952	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2393.2798	(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	5323.9621	(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	4536.8413	0.2100	952.7367	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2882.0054	0.2100	605.2211	(264)
Space and water heating			1557.9578	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	212.3952	0.1443	30.6552	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-930.1493	0.1347	-125.3360	
PV Unit electricity exported	-1463.1305	0.1260	-184.3010	
Total			-309.6370	(269)
Total CO2, kg/year			1290.9053	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.3300	(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	4536.8413	1.1300	5126.6307	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2882.0054	1.1300	3256.6661	(278)
Space and water heating			8383.2968	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	212.3952	1.5338	325.7788	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-930.1493	1.4980	-1393.3783	
PV Unit electricity exported	-1463.1305	0.4624	-676.5154	
Total			-2069.8937	(283)
Total Primary energy kWh/year			6769.2827	(286)
Target Primary Energy Rate (TPER)			69.9000	(287)

Full SAP Calculation Printout

Property Reference	Maisonette__Copy	**Issued on Date**	29/08/2024
Assessment Reference	Maisonette__latest	**Prop Type Ref**	
Property			

SAP Rating	84 B	**DER**	14.24	**TER**	12.77
Environmental	89 B	**% DER < TER**			-11.51
CO_2 Emissions (t/year)	0.8	**DFEE**	33.11	**TFEE**	37.09
Compliance Check	See BREL	**% DFEE < TFEE**			10.71
% DPER < TPER	-21.58	**DPER**	81.33	**TPER**	66.89

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	61.7000	(1b)	x 2.5000	(2b) =	154.2500	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	154.2500	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2000	(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) =	0.1700	(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	0.2167	0.2125	0.2083	0.1870	0.1827	0.1615	0.1615	0.1573	0.1700	0.1827	0.1913	0.1998	(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	0.3162	0.3120	0.3077	0.2865	0.2823	0.2610	0.2610	0.2568	0.2695	0.2823	0.2907	0.2993	(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	
Window (Uw = 0.90)			10.3600	0.8687	9.0000			(27)
door			1.9200	1.0000	1.9200			(26)
Heatloss Floor 1			61.7000	0.1000	6.1700	0.0000	0.0000	(28a)
External Wall 1	56.3200	12.2800	44.0400	0.1800	7.9272	0.0000	0.0000	(29a)
Total net area of external elements Aum(A, m2)			118.0200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	25.0172			(33)
Party Wall 1			26.6500	0.0000	0.0000	70.0000	1865.5000	(32)
Party Floor 1			61.7000			80.0000	4936.0000	(32d)
Party Ceiling 1			61.7000			30.0000	1851.0000	(32b)
Internal Wall 1			50.0000			9.0000	450.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	9102.5000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		147.5284 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E18 Party wall between dwellings	15.0000	0.0250	0.3750	
P1 Party wall - Ground floor	10.6600	0.0500	0.5330	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.6600	0.0000	0.0000	
E1 Steel lintel with perforated steel base plate	6.9100	0.0200	0.1382	
E7 Party floor between dwellings (in blocks of flats)	22.5300	0.0580	1.3067	
E3 Sill	5.9800	0.0300	0.1794	
E4 Jamb	18.9600	0.1200	2.2752	
E5 Ground floor (normal)	22.5300	0.1000	2.2530	
E16 Corner (normal)	5.0000	0.1270	0.6350	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.6955 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 32.7127 (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	16.0979	15.8816	15.6652	14.5836	14.3672	13.2856	13.2856	13.0692	13.7182	14.3672	14.7999	15.2326	(38)
Heat transfer coeff	48.8107	48.5943	48.3780	47.2963	47.0800	45.9983	45.9983	45.7820	46.4310	47.0800	47.5126	47.9453	(39)

Average = Sum(39)m / 12 = 47.2422

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7911	0.7876	0.7841	0.7666	0.7630	0.7455	0.7455	0.7420	0.7525	0.7630	0.7701	0.7771	(40)
HLP (average)												0.7657	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.0293 (42)

Hot water usage for mixer showers

58.2438	57.3685	56.0930	53.6526	51.8517	49.8433	48.7017	49.9675	51.3551	53.5115	56.0043	58.0206	(42a)

Hot water usage for baths

25.1700	24.7961	24.2697	23.2992	22.5724	21.7665	21.3312	21.8539	22.4231	23.2854	24.2760	25.0849	(42b)

Hot water usage for other uses

35.4117	34.1240	32.8363	31.5486	30.2609	28.9732	28.9732	30.2609	31.5486	32.8363	34.1240	35.4117	(42c)

Average daily hot water use (litres/day) 109.2278 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	118.8255	116.2887	113.1991	108.5004	104.6850	100.5831	99.0062	102.0824	105.3268	109.6333	114.4043	118.5172	(44)
Energy conte	188.1905	165.5935	173.9828	148.5316	140.9261	123.6786	119.7394	126.3994	129.8785	148.7713	162.9899	185.5693	(45)
Energy content (annual)										Total = Sum(45)m =		1814.2510	
Distribution loss (46)m = 0.15 x (45)m	28.2286	24.8390	26.0974	22.2797	21.1389	18.5518	17.9609	18.9599	19.4818	22.3157	24.4485	27.8354	(46)

Water storage 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

234.7215	207.6215	220.5138	193.5616	187.4571	168.7086	166.2704	172.9304	174.9085	195.3023	208.0199	232.1003	(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

234.7215	207.6215	220.5138	193.5616	187.4571	168.7086	166.2704	172.9304	174.9085	195.3023	208.0199	232.1003	(64)

Total per year (kWh/year) = Sum(64)m = 2362.1160 (64)

12Total per year (kWh/year) 2362 (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

99.7981	88.6822	95.0741	85.4108	84.0827	77.1471	77.0382	79.2526	79.2086	86.6913	90.2182	98.9266	(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	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	92.3959	102.2954	92.3959	95.4757	92.3959	95.4757	92.3959	92.3959	95.4757	92.3959	95.4757	92.3959	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	177.2131	179.0520	174.4180	164.5527	152.0996	140.3954	132.5763	130.7374	135.3714	145.2367	157.6898	169.3940	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	(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)	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	(71)
Water heating gains (Table 5)	134.1373	131.9676	127.7877	118.6261	113.0144	107.1488	103.5459	106.5223	110.0120	116.5205	125.3030	132.9659	(72)
Total internal gains	460.1853	469.7541	451.0407	435.0936	413.9490	396.4590	381.9572	383.0946	394.2982	410.5921	434.9076	451.1948	(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	1.7600	10.6334	0.3800	0.7000	0.7700	3.4498	(74)
East	6.3000	19.6403	0.3800	0.7000	0.7700	22.8088	(76)
West	2.3000	19.6403	0.3800	0.7000	0.7700	8.3270	(80)

Solar gains 34.5857	67.5011	111.5101	164.2869	203.5270	209.4818	198.9574	169.3118	130.1310	80.1207	43.0786	28.4806	(83)

Total gains	494.7710	537.2553	562.5508	599.3805	617.4760	605.9409	580.9146	552.4065	524.4292	490.7129	477.9862	479.6753	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	51.8016	52.0323	52.2649	53.4602	53.7059	54.9688	54.9688	55.2286	54.4566	53.7059	53.2168	52.7366	
alpha	4.4534	4.4688	4.4843	4.5640	4.5804	4.6646	4.6646	4.6819	4.6304	4.5804	4.5478	4.5158	
util living area													
	0.9545	0.9330	0.8951	0.8008	0.6590	0.4771	0.3467	0.3786	0.5850	0.8199	0.9238	0.9587	(86)
MIT	20.0243	20.1993	20.4357	20.7354	20.9113	20.9847	20.9972	20.9959	20.9609	20.7495	20.3734	20.0124	(87)
Th 2	20.2611	20.2641	20.2671	20.2824	20.2855	20.3008	20.3008	20.3039	20.2947	20.2855	20.2794	20.2732	(88)
util rest of house													
	0.9472	0.9228	0.8793	0.7736	0.6188	0.4278	0.2924	0.3224	0.5326	0.7894	0.9107	0.9521	(89)
MIT 2	19.1277	19.3473	19.6402	20.0079	20.2040	20.2896	20.2993	20.3016	20.2639	20.0329	19.5781	19.1222	(90)
Living area fraction										fLA = Living area / (4) =		0.4768	(91)
MIT	19.5553	19.7536	20.0195	20.3548	20.5413	20.6211	20.6321	20.6326	20.5963	20.3746	19.9573	19.5467	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.4053	19.6036	19.8695	20.2048	20.3913	20.4711	20.4821	20.4826	20.4463	20.2246	19.8073	19.3967	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9372	0.9121	0.8697	0.7705	0.6249	0.4399	0.3065	0.3370	0.5441	0.7866	0.9009	0.9425	(94)
Useful gains	463.6991	490.0558	489.2739	461.8238	385.8755	266.5705	178.0654	186.1354	285.3542	386.0078	430.6026	452.1132	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	737.2973	714.5098	646.7888	534.6743	409.1840	270.0584	178.5702	186.9112	294.6630	453.1247	603.7572	728.6107	(97)
Space heating kWh													
	203.5571	150.8331	117.1911	52.4524	17.3416	0.0000	0.0000	0.0000	0.0000	49.9350	124.6713	205.7141	(98a)
Space heating requirement - total per year (kWh/year)												921.6956	
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													
	203.5571	150.8331	117.1911	52.4524	17.3416	0.0000	0.0000	0.0000	0.0000	49.9350	124.6713	205.7141	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												921.6956	
Space heating per m2											(98c) / (4) =	14.9383	(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													
	203.5571	150.8331	117.1911	52.4524	17.3416	0.0000	0.0000	0.0000	0.0000	49.9350	124.6713	205.7141	(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)													
	229.2309	169.8571	131.9720	59.0680	19.5288	0.0000	0.0000	0.0000	0.0000	56.2331	140.3956	231.6600	(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													
	234.7215	207.6215	220.5138	193.5616	187.4571	168.7086	166.2704	172.9304	174.9085	195.3023	208.0199	232.1003	(64)
Efficiency of water heater												79.8000	(216)
(217)m	83.7419	83.3549	82.7090	81.5625	80.4908	79.8000	79.8000	79.8000	79.8000	81.4815	82.9505	83.7902	(217)
Fuel for water heating, kWh/month													
	280.2915	249.0814	266.6141	237.3170	232.8927	211.4143	208.3589	216.7047	219.1836	239.6890	250.7761	277.0017	(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	19.4910	17.6048	19.4910	18.8623	19.4910	18.8623	19.4910	19.4910	18.8623	19.4910	18.8623	19.4910	(231)
Lighting	18.8056	15.0866	13.5838	9.9521	7.6873	6.2806	7.0126	9.1152	11.8398	15.5344	17.5461	19.3283	(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												1037.9455	(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												2889.3251	(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)												143.4911	(230a)
central heating pump												41.0000	(230c)

main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	229.4911	(231)
Electricity for lighting (calculated in Appendix L)	151.7723	(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	4308.5340	(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	1037.9455	0.2100	217.9686	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2889.3251	0.2100	606.7583	(264)
Space and water heating			824.7268	(265)
Pumps, fans and electric keep-hot	229.4911	0.1387	31.8332	(267)
Energy for lighting	151.7723	0.1443	21.9054	(268)
Total CO2, kg/year			878.4655	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			14.2400	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1037.9455	1.1300	1172.8784	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2889.3251	1.1300	3264.9374	(278)
Space and water heating			4437.8158	(279)
Pumps, fans and electric keep-hot	229.4911	1.5128	347.1741	(281)
Energy for lighting	151.7723	1.5338	232.7934	(282)
Total Primary energy kWh/year			5017.7833	(286)
Dwelling Primary energy Rate (DPER)			81.3300	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	61.7000	(1b)	x 2.5000	(2b) =	154.2500	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		154.2500	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1297 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3797 (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) =	0.3227 (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	0.4115	0.4034	0.3953	0.3550	0.3469	0.3066	0.3066	0.2985	0.3227	0.3469	0.3630	0.3792	(22b)
Effective ac	0.5846	0.5814	0.5781	0.5630	0.5602	0.5470	0.5470	0.5446	0.5521	0.5602	0.5659	0.5719	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.9200	1.0000	1.9200			(26)
TER Opening Type (Uw = 1.20)			10.3600	1.1450	11.8626			(27)
Heatloss Floor 1			61.7000	0.1300	8.0210			(28a)
External Wall 1	56.3200	12.2800	44.0400	0.1800	7.9272			(29a)
Total net area of external elements Aum(A, m2)			118.0200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.7308			(33)
Party Wall 1			26.6500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 157.5284 (35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E18	Party wall between dwellings	15.0000	0.0600	0.9000
P1	Party wall - Ground floor	10.6600	0.0800	0.8528
P3	Party wall - Intermediate floor between dwellings (in blocks of flats)	10.6600	0.0000	0.0000
E1	Steel lintel with perforated steel base plate	6.9100	0.0500	0.3455
E7	Party floor between dwellings (in blocks of flats)	22.5300	0.0700	1.5771
E3	Sill	5.9800	0.0500	0.2990
E4	Jamb	18.9600	0.0500	0.9480
E5	Ground floor (normal)	22.5300	0.1600	3.6048
E16	Corner (normal)	5.0000	0.0900	0.4500

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.9772 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 38.7080 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.7600	29.5927	29.4287	28.6584	28.5143	27.8434	27.8434	27.7191	28.1018	28.5143	28.8059	29.1107	(38)
Heat transfer coeff	68.4680	68.3007	68.1367	67.3664	67.2223	66.5514	66.5514	66.4271	66.8098	67.2223	67.5138	67.8187	(39)
Average = Sum(39)m / 12 =												67.3657	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1097	1.1070	1.1043	1.0918	1.0895	1.0786	1.0786	1.0766	1.0828	1.0895	1.0942	1.0992	(40)
HLP (average)												1.0918	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.0293 (42)

Hot water usage for mixer showers

58.2438	57.3685	56.0930	53.6526	51.8517	49.8433	48.7017	49.9675	51.3551	53.5115	56.0043	58.0206	(42a)

Hot water usage for baths

25.1700	24.7961	24.2697	23.2992	22.5724	21.7665	21.3312	21.8539	22.4231	23.2854	24.2760	25.0849	(42b)

Hot water usage for other uses

35.4117	34.1240	32.8363	31.5486	30.2609	28.9732	28.9732	30.2609	31.5486	32.8363	34.1240	35.4117	(42c)

Average daily hot water use (litres/day) 109.2278 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	118.8255	116.2887	113.1991	108.5004	104.6850	100.5831	99.0062	102.0824	105.3268	109.6333	114.4043	118.5172	(44)
Energy conte	188.1905	165.5935	173.9828	148.5316	140.9261	123.6786	119.7394	126.3994	129.8785	148.7713	162.9899	185.5693	(45)
Energy content (annual)										Total = Sum(45)m =		1814.2510	
Distribution loss (46)m = 0.15 x (45)m	28.2286	24.8390	26.0974	22.2797	21.1389	18.5518	17.9609	18.9599	19.4818	22.3157	24.4485	27.8354	(46)

Water storage loss:

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

If cylinder contains dedicated solar storage

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
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)
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)

Primary loss, Combi loss

Total heat required for water heating calculated for each month

234.7854	207.6792	220.5777	193.6235	187.5211	168.7704	166.3343	172.9943	174.9704	195.3662	208.0818	232.1642	(62)
-26.6266	-23.5488	-24.6589	-20.4186	-19.0294	-16.2836	-15.2633	-16.2309	-16.8476	-19.8615	-22.5006	-26.1335	(63a)
-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)
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)
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)

WWHRS, PV diverter, Solar input, FGHRS

Output from w/h

208.1588	184.1304	195.9187	173.2049	168.4917	152.4869	151.0711	156.7633	158.1228	175.5047	185.5811	206.0307	(64)

Total per year (kWh/year) = Sum(64)m = 2115.4650 (64)

12Total per year (kWh/year) 2115 (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

99.8493	88.7284	95.1252	85.4602	84.1339	77.1966	77.0893	79.3037	79.2581	86.7424	90.2676	98.9777	(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	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	92.3959	102.2954	92.3959	95.4757	92.3959	95.4757	92.3959	92.3959	95.4757	92.3959	95.4757	92.3959	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	177.2131	179.0520	174.4180	164.5527	152.0996	140.3954	132.5763	130.7374	135.3714	145.2367	157.6898	169.3940	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	(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)	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	(71)
Water heating gains (Table 5)	134.2060	132.0363	127.8564	118.6948	113.0832	107.2175	103.6146	106.5910	110.0807	116.5892	125.3717	133.0346	(72)
Total internal gains	460.2540	469.8228	451.1094	435.1623	414.0177	396.5277	382.0259	383.1633	394.3669	410.6608	434.9763	451.2635	(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	1.7600	10.6334	0.6300	0.7000	0.7700	5.7195	(74)
East	6.3000	19.6403	0.6300	0.7000	0.7700	37.8146	(76)
West	2.3000	19.6403	0.6300	0.7000	0.7700	13.8053	(80)

Solar gains	57.3394	111.9098	184.8721	272.3703	337.4264	347.2988	329.8505	280.7012	215.7435	132.8318	71.4197	47.2178	(83)
Total gains	517.5934	581.7326	635.9815	707.5326	751.4441	743.8266	711.8763	663.8646	610.1104	543.4926	506.3960	498.4813	(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	39.4324	39.5290	39.6242	40.0773	40.1632	40.5681	40.5681	40.6440	40.4112	40.1632	39.9897	39.8100	
alpha	3.6288	3.6353	3.6416	3.6718	3.6775	3.7045	3.7045	3.7096	3.6941	3.6775	3.6660	3.6540	
util living area	0.9684	0.9509	0.9177	0.8378	0.7088	0.5392	0.4022	0.4459	0.6660	0.8726	0.9492	0.9720	(86)
MIT	19.4066	19.6432	19.9954	20.4457	20.7692	20.9378	20.9837	20.9762	20.8634	20.4391	19.8596	19.3708	(87)
Th 2	19.9929	19.9951	19.9973	20.0075	20.0094	20.0183	20.0183	20.0200	20.0149	20.0094	20.0056	20.0015	(88)
util rest of house	0.9621	0.9415	0.9018	0.8074	0.6579	0.4671	0.3164	0.3568	0.5950	0.8414	0.9378	0.9664	(89)
MIT 2	18.1576	18.4553	18.8937	19.4413	19.8040	19.9761	20.0110	20.0085	19.9117	19.4487	18.7384	18.1183	(90)
Living area fraction									fLA = Living area / (4) =			0.4768	(91)
MIT	18.7531	19.0217	19.4190	19.9202	20.2642	20.4347	20.4748	20.4699	20.3655	19.9209	19.2730	18.7155	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7531	19.0217	19.4190	19.9202	20.2642	20.4347	20.4748	20.4699	20.3655	19.9209	19.2730	18.7155	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9522	0.9301	0.8909	0.8044	0.6717	0.4985	0.3568	0.3985	0.6215	0.8383	0.9274	0.9571	(94)
Useful gains	492.8607	541.0952	566.6047	569.1621	504.7499	370.7789	254.0196	264.5463	379.2029	455.5983	469.6200	477.1082	(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	989.5787	964.5217	880.2584	742.3914	575.7046	388.3046	257.8748	270.3523	418.5967	626.5751	821.8458	984.4227	(97)
Space heating kWh	369.5582	284.5426	233.3584	124.7251	52.7903	0.0000	0.0000	0.0000	0.0000	127.2068	253.6026	377.4420	(98a)
Space heating requirement - total per year (kWh/year)												1823.2259	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	369.5582	284.5426	233.3584	124.7251	52.7903	0.0000	0.0000	0.0000	0.0000	127.2068	253.6026	377.4420	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1823.2259	
Space heating per m2										(98c) / (4) =		29.5499	(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	369.5582	284.5426	233.3584	124.7251	52.7903	0.0000	0.0000	0.0000	0.0000	127.2068	253.6026	377.4420	(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)	400.3881	308.2802	252.8259	135.1302	57.1942	0.0000	0.0000	0.0000	0.0000	137.8188	274.7590	408.9296	(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	208.1588	184.1304	195.9187	173.2049	168.4917	152.4869	151.0711	156.7633	158.1228	175.5047	185.5811	206.0307	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.3324	85.0323	84.4530	83.3359	81.7773	79.8000	79.8000	79.8000	79.8000	83.3499	84.7606	85.3990	(217)
Fuel for water heating, kWh/month	243.9388	216.5418	231.9856	207.8395	206.0372	191.0863	189.3121	196.4453	198.1488	210.5638	218.9475	241.2565	(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	19.1980	15.4014	13.8672	10.1597	7.8477	6.4116	7.1589	9.3054	12.0868	15.8586	17.9122	19.7316	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-29.1594	-41.2621	-59.5420	-67.2392	-72.7825	-68.0683	-67.2584	-63.3754	-56.5389	-47.3457	-32.1235	-25.1946	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-16.0111	-33.7357	-67.1402	-100.9560	-133.5837	-134.2254	-132.6153	-112.2161	-82.1807	-48.2485	-21.3814	-12.6546	(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	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1975.3260	(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	2552.1032	(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)	154.9392	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1524.8385	(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	3243.5299	(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	1975.3260	0.2100	414.8185	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2552.1032	0.2100	535.9417	(264)
Space and water heating			950.7601	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	154.9392	0.1443	22.3625	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-629.8899	0.1345	-84.7134	
PV Unit electricity exported	-894.9486	0.1259	-112.6452	
Total			-197.3586	(269)
Total CO2, kg/year			787.6933	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.7700	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1975.3260	1.1300	2232.1184	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2552.1032	1.1300	2883.8766	(278)
Space and water heating			5115.9950	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	154.9392	1.5338	237.6509	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-629.8899	1.4970	-942.9727	
PV Unit electricity exported	-894.9486	0.4620	-413.4848	
Total			-1356.4575	(283)
Total Primary energy kWh/year			4127.2892	(286)
Target Primary Energy Rate (TPER)			66.8900	(287)

Full SAP Calculation Printout

Property Reference	Be Lean_Copy	**Issued on Date**	29/08/2024
Assessment Reference	Be Lean_Copy	**Prop Type Ref**	
Property			

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

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1. Overall dwelling characteristics

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

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2. Ventilation rate

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			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)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.0753	(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)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Window (Uw = 1.70)			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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	138.2931	135.5814	132.8698	119.8695	117.4357	106.1058	106.1058	104.0077	110.4699	117.4357	122.3592	127.5066	(38)

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:													
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)
										Total per year (kWh/year) = Sum(64)m =		3093.1155	(64)
12Total per year (kWh/year)												3093	(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													
	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, ni1,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)

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)

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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												79.8000	(216)
(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)

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)	
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)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1004 (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	
TER Opaque door			3.8800	1.0000	3.8800			(26)
TER Opening Type (Uw = 1.20)			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	

Total fabric heat loss (33) + (36) + (36a) = 107.6622 (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	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)
Heat transfer coeff	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)
Average = Sum(39)m / 12 =												183.1346	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	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)
HLP (average)												0.9289	
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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	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 conte	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)
Energy content (annual)										Total = Sum(45)m =		2007.5275	
Distribution loss (46)m = 0.15 x (45)m	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:													
Store volume												180.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5520	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8381	(55)
Total storage 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	(56)
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	(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	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)
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	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)
										Total per year (kWh/year) = Sum(64)m =		2587.3202	(64)
12Total per year (kWh/year)												2587	(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	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 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	0.7000	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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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, ni1,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													
	0.9992	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) =		0.0992	(91)
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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	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												79.8000	(216)
(217)m	87.1602	86.9796	86.6334	85.8196	83.9581	79.8000	79.8000	79.8000	79.8000	85.7383	86.8217	87.1987	(217)
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)

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)

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

5 YEAR WARRANTY*

A+ EPC SCORE RATING

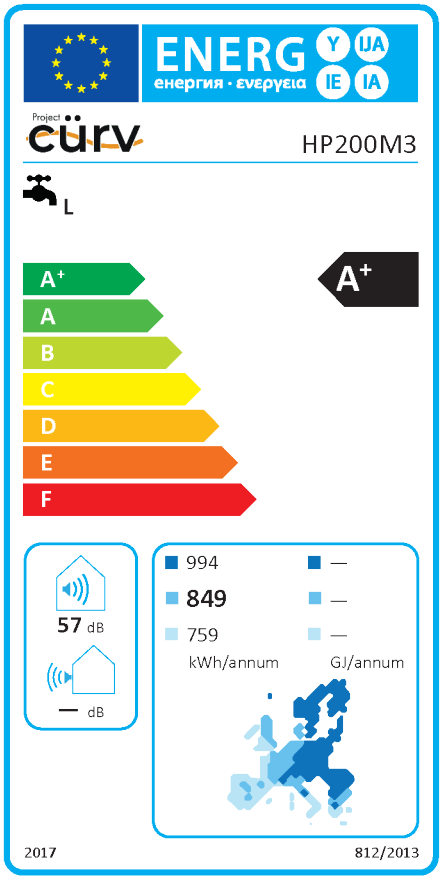
REDUCES ENERGY BILLS

FAST HEAT UP TIME

RANGE OF MODES

LEGIONELLA PROTECTION

* 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

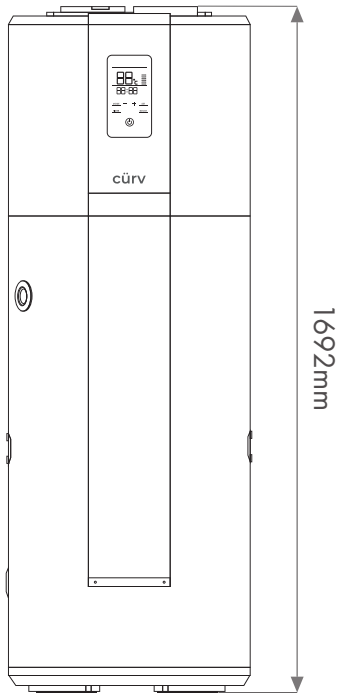
Performances

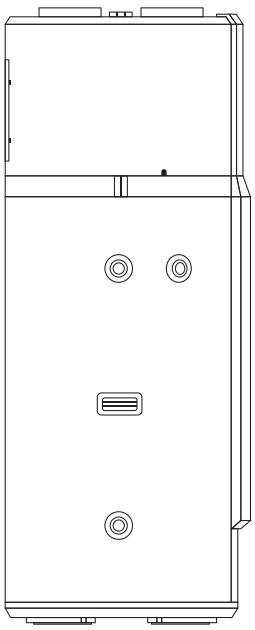
Type Of Extraction	Ambient / Exterior
COP @ 7°C / EN16147	3.04
COP @ 14°C / EN16147	3.39
Tapping Cycle	L
Power Input By Electric Backup	1500W
Rated Power Input By Heat Pump	495W
Maximum Power Input By Heat Pump	865W
Maximum Power Input	2365W
Standby Power Input / Pes	27W
Max Volume Of Usable Hot Water 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

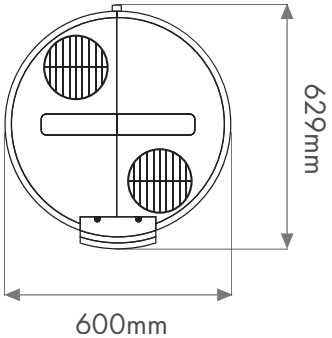
Dimension And Connections

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®







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Appendix D

DER Worksheets Be Green

Full SAP Calculation Printout

Property Reference	B1_00_2B__Copy_Copy_Copy	**Issued on Date**	29/08/2024
Assessment Reference	B1_00_2B_GF_Copy_Copy	**Prop Type Ref**	
Property			

SAP Rating	79 C	**DER**	4.42	**TER**	15.50
Environmental	97 A	**% DER < TER**			71.48
CO_2 Emissions (t/year)	0.22	**DFEE**	39.44	**TFEE**	40.47
Compliance Check	See BREL	**% DFEE < TFEE**			2.56
% DPER < TPER	41.72	**DPER**	48.48	**TPER**	83.18

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	62.5700	(1b)	x 3.1500	(2b) =	197.0955	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.5700					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		197.0955	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(21)

	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) =		80.1000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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 m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Window (Uw = 0.90)			17.2800	0.8687	15.0116			(27)
Door			1.9500	1.0000	1.9500			(26)
Heatloss Floor 1			62.5700	0.1000	6.2570	0.0000	0.0000	(28a)
External Wall 1	50.1200	17.2800	32.8400	0.1800	5.9112	0.0000	0.0000	(29a)
Corrido Wall	5.0000	1.9500	3.0500	0.2000	0.6100	0.0000	0.0000	(29a)
Total net area of external elements Aum(A, m2)			117.6900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.7398			(33)
Party Wall 1			44.8200	0.0000	0.0000	20.0000	896.4000	(32)
Party Ceiling 1			62.5700			100.0000	6257.0000	(32b)
Internal Wall 1			50.0000			9.0000	450.0000	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		7603.4000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							121.5183	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E5 Ground floor (normal)	15.9100	0.1000	1.5910	
E7 Party floor between dwellings (in blocks of flats)	10.3600	0.0580	0.6009	
E5 Ground floor (normal)	1.5900	0.2600	0.4134	
E7 Party floor between dwellings (in blocks of flats)	1.5900	0.1100	0.1749	
E16 Corner (normal)	3.1500	0.1270	0.4001	
E18 Party wall between dwellings	3.1500	0.0250	0.0788	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.5500	0.1000	0.5550	
P1 Party wall - Ground floor	14.2300	0.0500	0.7115	
E2 Other lintels (including other steel lintels)	9.1900	0.0170	0.1562	
E3 Sill	8.2500	0.0300	0.2475	
E4 Jamb	25.0600	0.1200	3.0072	
E25 Staggered party wall between dwellings	9.4500	0.2000	1.8900	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.8264 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 39.5662 (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	17.0449	16.8376	16.6303	15.5937	15.3864	14.3498	14.3498	14.1425	14.7644	15.3864	15.8010	16.2157	(38)
Heat transfer coeff	56.6111	56.4038	56.1965	55.1599	54.9526	53.9160	53.9160	53.7087	54.3306	54.9526	55.3672	55.7819	(39)
Average = Sum(39)m / 12 =												55.1081	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9048	0.9015	0.8981	0.8816	0.8783	0.8617	0.8617	0.8584	0.8683	0.8783	0.8849	0.8915	(40)
HLP (average)												0.8807	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.0533 (42)
Hot water usage for mixer showers

58.6465	57.7651	56.4808	54.0236	52.2102	50.1879	49.0385	50.3130	51.7102	53.8815	56.3915	58.4218	(42a)

Hot water usage for baths

25.3431	24.9667	24.4367	23.4595	22.7277	21.9163	21.4780	22.0043	22.5774	23.4456	24.4430	25.2575	(42b)

Hot water usage for other uses

35.6577	34.3611	33.0644	31.7678	30.4711	29.1745	29.1745	30.4711	31.7678	33.0644	34.3611	35.6577	(42c)

Average daily hot water use (litres/day) 109.9833 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	119.6473	117.0930	113.9820	109.2508	105.4090	101.2787	99.6909	102.7885	106.0553	110.3915	115.1956	119.3370	(44)
Energy conte	189.4921	166.7388	175.1861	149.5589	141.9008	124.5340	120.5676	127.2736	130.7768	149.8003	164.1173	186.8528	(45)
Energy content (annual)										Total = Sum(45)m =		1826.7991	
Distribution loss (46)m = 0.15 x (45)m	28.4238	25.0108	26.2779	22.4338	21.2851	18.6801	18.0851	19.0910	19.6165	22.4700	24.6176	28.0279	(46)
Water storage 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	209.0779	184.4292	194.7719	168.5129	161.4866	143.4880	140.1534	146.8594	149.7308	169.3861	183.0713	206.4386	(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	209.0779	184.4292	194.7719	168.5129	161.4866	143.4880	140.1534	146.8594	149.7308	169.3861	183.0713	206.4386	(64)
									Total per year (kWh/year) = Sum(64)m =			2057.4061	(64)
12Total per year (kWh/year)												2057	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	63.0061	55.4407	58.2494	49.7283	47.1820	41.4075	40.0887	42.3185	43.4833	49.8086	54.5690	62.1286	(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	102.6644	102.6644	102.6644	102.6644	102.6644	102.6644	102.6644	102.6644	102.6644	102.6644	102.6644	102.6644	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	90.4760	100.1699	90.4760	93.4919	90.4760	93.4919	90.4760	90.4760	93.4919	90.4760	93.4919	90.4760	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	179.3789	181.2403	176.5496	166.5638	153.9585	142.1113	134.1966	132.3352	137.0258	147.0117	159.6170	171.4642	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.2664	33.2664	33.2664	33.2664	33.2664	33.2664	33.2664	33.2664	33.2664	33.2664	33.2664	33.2664	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-82.1315	-82.1315	-82.1315	-82.1315	-82.1315	-82.1315	-82.1315	-82.1315	-82.1315	-82.1315	-82.1315	-82.1315	(71)
Water heating gains (Table 5)	84.6857	82.5010	78.2922	69.0671	63.4167	57.5105	53.8827	56.8797	60.3935	66.9470	75.7903	83.5061	(72)
Total internal gains	408.3399	417.7105	399.1172	382.9222	361.6505	346.9130	332.3546	333.4902	344.7106	358.2341	382.6985	399.2457	(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	6.7600	46.7521	0.3800	0.7000	0.7700	58.2589	(78)
West	10.5200	19.6403	0.3800	0.7000	0.7700	38.0871	(80)

Solar gains	96.3460	169.9195	244.2409	316.3187	362.4571	362.2627	348.3355	314.3105	269.6691	191.3201	116.5468	81.6620 (83)
Total gains	504.6859	587.6300	643.3580	699.2409	724.1077	709.1756	680.6901	647.8007	614.3797	549.5542	499.2453	480.9078 (84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	37.3081	37.4453	37.5834	38.2897	38.4341	39.1731	39.1731	39.3243	38.8741	38.4341	38.1463	37.8628	
alpha	3.4872	3.4964	3.5056	3.5526	3.5623	3.6115	3.6115	3.6216	3.5916	3.5623	3.5431	3.5242	
util living area	0.9444	0.9103	0.8597	0.7618	0.6304	0.4674	0.3434	0.3741	0.5652	0.7958	0.9118	0.9512	(86)
MIT	19.5373	19.8342	20.1814	20.5763	20.8281	20.9569	20.9890	20.9851	20.9127	20.5777	20.0125	19.4966	(87)
Th 2	20.1635	20.1663	20.1691	20.1832	20.1860	20.2002	20.2002	20.2030	20.1945	20.1860	20.1804	20.1747	(88)
util rest of house	0.9365	0.8982	0.8414	0.7329	0.5888	0.4143	0.2830	0.3120	0.5103	0.7640	0.8980	0.9442	(89)
MIT 2	18.4601	18.8305	19.2588	19.7396	20.0245	20.1673	20.1941	20.1943	20.1231	19.7541	19.0684	18.4172	(90)
Living area fraction									fLA = Living area / (4) =			0.4680	(91)
MIT	18.9642	19.3002	19.6905	20.1312	20.4006	20.5368	20.5661	20.5643	20.4926	20.1395	19.5102	18.9223	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9642	19.3002	19.6905	20.1312	20.4006	20.5368	20.5661	20.5643	20.4926	20.1395	19.5102	18.9223	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9226	0.8837	0.8296	0.7309	0.6001	0.4370	0.3108	0.3404	0.5311	0.7620	0.8848	0.9310	(94)
Useful gains	465.6117	519.2835	533.7376	511.0748	434.5339	309.9000	211.5856	220.5261	326.3214	418.7755	441.7537	447.7300	(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	830.1574	812.2270	741.2622	619.5098	478.1178	320.0872	213.8361	223.6609	347.3144	524.2210	687.1197	821.2379	(97)
Space heating kWh	271.2220	196.8580	154.3983	78.0732	32.4264	0.0000	0.0000	0.0000	0.0000	78.4515	176.6635	277.8898	(98a)
Space heating requirement - total per year (kWh/year)												1265.9826	
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	271.2220	196.8580	154.3983	78.0732	32.4264	0.0000	0.0000	0.0000	0.0000	78.4515	176.6635	277.8898	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1265.9826	
Space heating per m2											(98c) / (4) =	20.2331	(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	271.2220	196.8580	154.3983	78.0732	32.4264	0.0000	0.0000	0.0000	0.0000	78.4515	176.6635	277.8898	(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)	271.2220	196.8580	154.3983	78.0732	32.4264	0.0000	0.0000	0.0000	0.0000	78.4515	176.6635	277.8898	(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	209.0779	184.4292	194.7719	168.5129	161.4866	143.4880	140.1534	146.8594	149.7308	169.3861	183.0713	206.4386	(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	82.0283	72.3578	76.4156	66.1133	63.3567	56.2952	54.9869	57.6179	58.7445	66.4559	71.8250	80.9928	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	15.5720	14.0651	15.5720	15.0697	15.5720	15.0697	15.5720	15.5720	15.0697	15.5720	15.0697	15.5720	(231)
Lighting	18.5132	14.8519	13.3725	9.7973	7.5677	6.1829	6.9035	8.9734	11.6556	15.2928	17.2732	19.0277	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-11.3734	-19.7648	-35.2250	-46.6750	-54.8778	-51.5764	-50.5376	-44.6149	-34.8144	-24.5721	-13.4437	-9.3226	(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	-1.7805	-4.9110	-13.3433	-26.7650	-42.2588	-46.3436	-45.0813	-34.8145	-21.4896	-8.8186	-2.7131	-1.3017	(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	1265.9826 (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	807.1900 (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)	183.3481	(230a)
Total electricity for the above, kWh/year	183.3481	(231)
Electricity for lighting (calculated in Appendix L)	149.4118	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-646.4189	(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	1759.5136	(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	1265.9826	0.1559	197.4158	(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)	807.1900	0.1413	114.0212	(264)
Space and water heating			311.4369	(265)
Pumps, fans and electric keep-hot	183.3481	0.1387	25.4326	(267)
Energy for lighting	149.4118	0.1443	21.5647	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-396.7979	0.1317	-52.2585	
PV Unit electricity exported	-249.6210	0.1192	-29.7570	
Total			-82.0155	(269)
Total CO2, kg/year			276.4188	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.4200	(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	1265.9826	1.5773	1996.8269	(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)	807.1900	1.5223	1228.8131	(278)
Space and water heating			3225.6401	(279)
Pumps, fans and electric keep-hot	183.3481	1.5128	277.3690	(281)
Energy for lighting	149.4118	1.5338	229.1727	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-396.7979	1.4866	-589.8763	
PV Unit electricity exported	-249.6210	0.4372	-109.1322	
Total			-699.0085	(283)
Total Primary energy kWh/year			3033.1733	(286)
Dwelling Primary energy Rate (DPER)			48.4800	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	62.5700 (1b)	x	3.1500 (2b)	=	197.0955	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 62.5700						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	197.0955	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1015	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3515	(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) = 0.2988 (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	0.3809	0.3734	0.3660	0.3286	0.3212	0.2838	0.2838	0.2763	0.2988	0.3212	0.3361	0.3510	(22b)
Effective ac	0.5725	0.5697	0.5670	0.5540	0.5516	0.5403	0.5403	0.5382	0.5446	0.5516	0.5565	0.5616	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.9500	1.0000	1.9500			(26)
TER Opening Type (Uw = 1.20)			13.6900	1.1450	15.6756			(27)
Heatloss Floor 1			62.5700	0.1300	8.1341			(28a)
External Wall 1	50.1200	13.6900	36.4300	0.1800	6.5574			(29a)
Corrido Wall	5.0000	1.9500	3.0500	0.1800	0.5490			(29a)
Total net area of external elements Aum(A, m2)			117.6900					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.8661			(33)
Party Wall 1			44.8200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 101.5183 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	15.9100	0.1600	2.5456
E7 Party floor between dwellings (in blocks of flats)	10.3600	0.0700	0.7252
E5 Ground floor (normal)	1.5900	0.1600	0.2544
E7 Party floor between dwellings (in blocks of flats)	1.5900	0.0700	0.1113
E16 Corner (normal)	3.1500	0.0900	0.2835
E18 Party wall between dwellings	3.1500	0.0600	0.1890
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.5500	0.0200	0.1110
P1 Party wall - Ground floor	14.2300	0.0800	1.1384
E2 Other lintels (including other steel lintels)	9.1900	0.0500	0.4595
E3 Sill	8.2500	0.0500	0.4125
E4 Jamb	25.0600	0.0500	1.2530
E25 Staggered party wall between dwellings	9.4500	0.0600	0.5670

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.0504 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 40.9165 (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	37.2393	37.0560	36.8764	36.0329	35.8751	35.1403	35.1403	35.0043	35.4233	35.8751	36.1943	36.5281	(38)
Heat transfer coeff	78.1557	77.9725	77.7929	76.9494	76.7915	76.0568	76.0568	75.9207	76.3398	76.7915	77.1108	77.4446	(39)

Average = Sum(39)m / 12 = 76.9486

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2491	1.2462	1.2433	1.2298	1.2273	1.2155	1.2155	1.2134	1.2201	1.2273	1.2324	1.2377	(40)
HLP (average)												1.2298	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.0533 (42)
Hot water usage for mixer showers

58.6465	57.7651	56.4808	54.0236	52.2102	50.1879	49.0385	50.3130	51.7102	53.8815	56.3915	58.4218	(42a)

Hot water usage for baths

25.3431	24.9667	24.4367	23.4595	22.7277	21.9163	21.4780	22.0043	22.5774	23.4456	24.4430	25.2575	(42b)

Hot water usage for other uses

35.6577	34.3611	33.0644	31.7678	30.4711	29.1745	29.1745	30.4711	31.7678	33.0644	34.3611	35.6577	(42c)

Average daily hot water use (litres/day) 109.9833 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	119.6473	117.0930	113.9820	109.2508	105.4090	101.2787	99.6909	102.7885	106.0553	110.3915	115.1956	119.3370	(44)
Energy conte	189.4921	166.7388	175.1861	149.5589	141.9008	124.5340	120.5676	127.2736	130.7768	149.8003	164.1173	186.8528	(45)
Energy content (annual)										Total = Sum(45)m =		1826.7991	
Distribution loss (46)m = 0.15 x (45)m	28.4238	25.0108	26.2779	22.4338	21.2851	18.6801	18.0851	19.0910	19.6165	22.4700	24.6176	28.0279	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	236.0870	208.8245	221.7810	194.6508	188.4957	169.6258	167.1625	173.8685	175.8687	196.3952	209.2091	233.4477	(62)
WWHRS	-26.8107	-23.7116	-24.8294	-20.5598	-19.1610	-16.3962	-15.3688	-16.3432	-16.9641	-19.9988	-22.6562	-26.3142	(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	209.2763	185.1129	196.9516	174.0910	169.3348	153.2296	151.7937	157.5253	158.9046	176.3964	186.5529	207.1335	(64)
									Total per year (kWh/year) = Sum(64)m =			2126.3025	(64)
12Total per year (kWh/year)												2126	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	100.2821	89.1092	95.5253	85.8018	84.4579	77.4810	77.3646	79.5944	79.5568	87.0845	90.6425	99.4045	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	102.6644	102.6644	102.6644	102.6644	102.6644	102.6644	102.6644	102.6644	102.6644	102.6644	102.6644	102.6644	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	90.5242	100.2233	90.5242	93.5417	90.5242	93.5417	90.5242	90.5242	93.5417	90.5242	93.5417	90.5242	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	179.3789	181.2403	176.5496	166.5638	153.9585	142.1113	134.1966	132.3352	137.0258	147.0117	159.6170	171.4642	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.2664	33.2664	33.2664	33.2664	33.2664	33.2664	33.2664	33.2664	33.2664	33.2664	33.2664	33.2664	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-82.1315	-82.1315	-82.1315	-82.1315	-82.1315	-82.1315	-82.1315	-82.1315	-82.1315	-82.1315	-82.1315	-82.1315	(71)
Water heating gains (Table 5)													
	134.7877	132.6030	128.3942	119.1692	113.5187	107.6125	103.9847	106.9817	110.4955	117.0491	125.8923	133.6082	(72)
Total internal gains													
	461.4901	470.8659	452.2674	436.0740	414.8008	397.0648	382.5049	383.6405	394.8624	411.3843	435.8503	452.3959	(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	5.3600	46.7521	0.6300	0.7000	0.7700	76.5839	(78)
West	8.3300	19.6403	0.6300	0.7000	0.7700	49.9993	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	126.5832	223.2340	320.8468	415.4960	476.0751	475.8102	457.5216	412.8479	354.2377	251.3412	153.1213	107.2925	(83)
Total gains	588.0734	694.0998	773.1142	851.5700	890.8759	872.8751	840.0264	796.4883	749.1001	662.7255	588.9716	559.6885	(84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
tau	22.5760	22.6291	22.6813	22.9299	22.9771	23.1990	23.1990	23.2406	23.1130	22.9771	22.8819	22.7833	
alpha	2.5051	2.5086	2.5121	2.5287	2.5318	2.5466	2.5466	2.5494	2.5409	2.5318	2.5255	2.5189	
util living area													
	0.9206	0.8844	0.8342	0.7478	0.6340	0.4939	0.3745	0.4067	0.5835	0.7801	0.8870	0.9282	(86)
MIT	18.6143	18.9945	19.4884	20.0750	20.5302	20.8241	20.9365	20.9199	20.7172	20.1139	19.2744	18.5497	(87)
Th 2	19.8809	19.8832	19.8855	19.8962	19.8982	19.9076	19.9076	19.9093	19.9040	19.8982	19.8942	19.8899	(88)
util rest of house													
	0.9094	0.8690	0.8121	0.7143	0.5849	0.4252	0.2896	0.3206	0.5161	0.7430	0.8693	0.9181	(89)
MIT 2	17.1439	17.6161	18.2252	18.9368	19.4602	19.7756	19.8740	19.8643	19.6755	19.0037	17.9815	17.0688	(90)
Living area fraction									fLA = Living area / (4) =			0.4680	(91)
MIT	17.8320	18.2612	18.8163	19.4694	19.9609	20.2663	20.3712	20.3583	20.1630	19.5232	18.5865	17.7618	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.8320	18.2612	18.8163	19.4694	19.9609	20.2663	20.3712	20.3583	20.1630	19.5232	18.5865	17.7618	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8830	0.8413	0.7872	0.6999	0.5878	0.4486	0.3265	0.3571	0.5330	0.7287	0.8433	0.8926	(94)
Useful gains	519.2643	583.9660	608.5820	596.0559	523.7007	391.5748	274.3097	284.4162	399.2417	482.9421	496.6508	499.5716	(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													
	1057.6020	1041.8027	958.1213	813.3083	634.3666	430.9594	286.8264	300.5169	462.8455	685.2261	885.7331	1050.2901	(97)
Space heating kWh													
	400.5233	307.6663	260.0573	156.4217	82.3354	0.0000	0.0000	0.0000	0.0000	150.4993	280.1392	409.7345	(98a)
Space heating requirement - total per year (kWh/year)												2047.3770	
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													
	400.5233	307.6663	260.0573	156.4217	82.3354	0.0000	0.0000	0.0000	0.0000	150.4993	280.1392	409.7345	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2047.3770	
Space heating per m2										(98c) / (4) =		32.7214	(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													
	400.5233	307.6663	260.0573	156.4217	82.3354	0.0000	0.0000	0.0000	0.0000	150.4993	280.1392	409.7345	(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)													
	433.9364	333.3329	281.7522	169.4710	89.2041	0.0000	0.0000	0.0000	0.0000	163.0545	303.5094	443.9161	(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													
	209.2763	185.1129	196.9516	174.0910	169.3348	153.2296	151.7937	157.5253	158.9046	176.3964	186.5529	207.1335	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.4910	85.1908	84.6840	83.8206	82.5367	79.8000	79.8000	79.8000	79.8000	83.7058	84.9693	85.5598	(217)

Fuel for water heating, kWh/month

	244.7933	217.2923	232.5723	207.6948	205.1629	192.0171	190.2176	197.4002	199.1285	210.7337	219.5532	242.0920 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	18.8091	15.0894	13.5863	9.9539	7.6887	6.2817	7.0139	9.1169	11.8420	15.5373	17.5494	19.3319 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-11.8876	-18.0136	-27.8088	-33.6604	-38.4466	-36.6884	-36.2485	-33.1423	-28.0646	-21.6189	-13.5083	-10.1370 (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	-3.3816	-7.3382	-15.0140	-23.1952	-31.3121	-31.6936	-31.3155	-26.2135	-18.8273	-10.6951	-4.5782	-2.6573 (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	2218.1766 (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	2558.6580 (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)	151.8006 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-515.4465 (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	4499.1887 (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	2218.1766	0.2100	465.8171	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2558.6580	0.2100	537.3182	(264)
Space and water heating			1003.1353	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	151.8006	0.1443	21.9095	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-309.2250	0.1331	-41.1572	
PV Unit electricity exported	-206.2215	0.1251	-25.7951	
Total			-66.9524	(269)
Total CO2, kg/year			970.0217	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.5000	(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	2218.1766	1.1300	2506.5396	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2558.6580	1.1300	2891.2835	(278)
Space and water heating			5397.8231	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	151.8006	1.5338	232.8368	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-309.2250	1.4918	-461.3088	
PV Unit electricity exported	-206.2215	0.4591	-94.6779	
Total			-555.9867	(283)
Total Primary energy kWh/year			5204.7741	(286)
Target Primary Energy Rate (TPER)			83.1800	(287)

Full SAP Calculation Printout

Property Reference	B1_02_2B__Copy_Copy_Copy	**Issued on Date**	29/08/2024
Assessment Reference	B1_02_2B_MF_Copy_Copy	**Prop Type Ref**	
Property			

SAP Rating	83 B	**DER**	3.40	**TER**	13.54
Environmental	97 A	**% DER < TER**			74.89
CO_2 Emissions (t/year)	0.18	**DFEE**	34.19	**TFEE**	33.78
Compliance Check	See BREL	**% DFEE < TFEE**			-1.21
% DPER < TPER	48.09	**DPER**	37.68	**TPER**	72.59

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	71.0300 (1b)	x	3.1500 (2b)	=	223.7445	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.0300					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	223.7445	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		0 * 10 =	0.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			3.0000	(17)
Infiltration rate			0.1500	(18)
Number of sides sheltered			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) =	80.1000	(23c)

Effective ac	0.2477	0.2448	0.2419	0.2274	0.2245	0.2099	0.2099	0.2070	0.2157	0.2245	0.2303	0.2361	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Window (Uw = 0.90)			10.3800	0.8687	9.0174			(27)
Door			2.0900	1.0000	2.0900			(26)
External Wall 1	31.9700	10.3800	21.5900	0.1800	3.8862	0.0000	0.0000	(29a)
Corridor Wall	37.9800	2.0900	35.8900	0.2000	7.1780	0.0000	0.0000	(29a)
Total net area of external elements Aum(A, m2)			69.9500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		22.1716			(33)
Party Wall 1			46.5600	0.0000	0.0000	20.0000	931.2000	(32)
Party Floor 1			71.0300			80.0000	5682.4000	(32d)
Party Ceiling 1			71.0300			100.0000	7103.0000	(32b)
Internal Wall 1			50.0000			9.0000	450.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 14166.6000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	199.4453	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E7 Party floor between dwellings (in blocks of flats)	9.0800	0.0580	0.5266	
E7 Party floor between dwellings (in blocks of flats)	24.1200	0.1100	2.6532	
E16 Corner (normal)	6.3000	0.1270	0.8001	
E18 Party wall between dwellings	12.6000	0.0250	0.3150	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	11.2200	0.1000	1.1220	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	29.5600	0.0000	0.0000	
E17 Corner (inverted - internal area greater than external area)	6.3000	0.0000	0.0000	
E2 Other lintels (including other steel lintels)	6.0000	0.0170	0.1020	
E3 Sill	4.9900	0.0300	0.1497	
E4 Jamb	16.6200	0.1200	1.9944	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				7.6630 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	29.8346 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	18.2905	18.0759	17.8613	16.7884	16.5738	15.5009	15.5009	15.2863	15.9300	16.5738	17.0030	17.4321	(38)
Heat transfer coeff	48.1251	47.9105	47.6959	46.6230	46.4084	45.3355	45.3355	45.1209	45.7647	46.4084	46.8376	47.2668	(39)
Average = Sum(39)m / 12 =												46.5694	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6775	0.6745	0.6715	0.6564	0.6534	0.6383	0.6383	0.6352	0.6443	0.6534	0.6594	0.6654	(40)
HLP (average)												0.6556	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2709	(42)
Hot water usage for mixer showers	62.2947	61.3585	59.9943	57.3842	55.4580	53.3099	52.0890	53.4428	54.9269	57.2333	59.8994	62.0560	(42a)
Hot water usage for baths	26.9120	26.5123	25.9495	24.9117	24.1346	23.2730	22.8076	23.3665	23.9750	24.8970	25.9561	26.8210	(42b)
Hot water usage for other uses	37.8860	36.5083	35.1306	33.7530	32.3753	30.9976	30.9976	32.3753	33.7530	35.1306	36.5083	37.8860	(42c)
Average daily hot water use (litres/day)												116.8270	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.0926	124.3791	121.0744	116.0488	111.9679	107.5805	105.8941	109.1846	112.6548	117.2609	122.3639	126.7629	(44)
Energy conte	201.2836	177.1141	186.0868	158.8651	150.7303	132.2828	128.0698	135.1933	138.9147	159.1219	174.3298	198.4801	(45)
Energy content (annual)											Total = Sum(45)m =	1940.4723	
Distribution loss (46)m = 0.15 x (45)m	30.1925	26.5671	27.9130	23.8298	22.6095	19.8424	19.2105	20.2790	20.8372	23.8683	26.1495	29.7720	(46)
Water storage 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	220.8694	194.8045	205.6726	177.8191	170.3161	151.2368	147.6556	154.7791	157.8687	178.7077	193.2838	218.0659	(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	220.8694	194.8045	205.6726	177.8191	170.3161	151.2368	147.6556	154.7791	157.8687	178.7077	193.2838	218.0659	(64)
										Total per year (kWh/year) = Sum(64)m =		2171.0793	(64)
12Total per year (kWh/year)												2171	(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	66.9268	58.8905	61.8739	52.8226	50.1178	43.9840	42.5832	44.9518	46.1891	52.9080	57.9646	65.9946	(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	113.5434	113.5434	113.5434	113.5434	113.5434	113.5434	113.5434	113.5434	113.5434	113.5434	113.5434	113.5434	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	107.0601	118.5308	107.0601	110.6287	107.0601	110.6287	107.0601	107.0601	110.6287	107.0601	110.6287	107.0601	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	199.6890	201.7611	196.5394	185.4229	171.3904	158.2017	149.3909	147.3188	152.5405	163.6570	177.6895	190.8782	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3543	34.3543	34.3543	34.3543	34.3543	34.3543	34.3543	34.3543	34.3543	34.3543	34.3543	34.3543	(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)	-90.8348	-90.8348	-90.8348	-90.8348	-90.8348	-90.8348	-90.8348	-90.8348	-90.8348	-90.8348	-90.8348	-90.8348	(71)
Water heating gains (Table 5)	89.9554	87.6346	83.1638	73.3648	67.3627	61.0889	57.2355	60.4190	64.1516	71.1130	80.5065	88.7025	(72)
Total internal gains	453.7674	464.9895	443.8263	426.4794	402.8761	386.9824	370.7495	371.8609	384.3839	398.8930	425.8878	443.7037	(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	10.3800	10.6334	0.3800	0.7000	0.7700	20.3462	(74)

Solar gains	20.3462	38.8827	66.0712	106.1273	142.9632	153.0463	142.8883	113.3636	79.4390	46.2848	25.0997	16.9616	(83)
Total gains	474.1137	503.8722	509.8975	532.6067	545.8393	540.0288	513.6378	485.2246	463.8229	445.1778	450.9875	460.6654	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	81.7695	82.1358	82.5053	84.4040	84.7942	86.8010	86.8010	87.2138	85.9870	84.7942	84.0173	83.2544	
alpha	6.4513	6.4757	6.5004	6.6269	6.6529	6.7867	6.7867	6.8143	6.7325	6.6529	6.6012	6.5503	
util living area	0.9861	0.9770	0.9597	0.8925	0.7491	0.5336	0.3880	0.4270	0.6636	0.9017	0.9710	0.9879	(86)
MIT	20.3272	20.4411	20.5946	20.8214	20.9543	20.9960	20.9996	20.9993	20.9839	20.8365	20.5716	20.3196	(87)
Th 2	20.3607	20.3634	20.3661	20.3795	20.3822	20.3957	20.3957	20.3984	20.3903	20.3822	20.3768	20.3715	(88)
util rest of house	0.9830	0.9721	0.9508	0.8710	0.7097	0.4847	0.3349	0.3715	0.6109	0.8777	0.9639	0.9853	(89)
MIT 2	19.5727	19.7182	19.9120	20.1954	20.3421	20.3930	20.3955	20.3980	20.3786	20.2188	19.8941	19.5717	(90)
Living area fraction										fLA = Living area / (4) =		0.2992	(91)
MIT	19.7984	19.9345	20.1162	20.3827	20.5253	20.5734	20.5762	20.5779	20.5597	20.4036	20.0968	19.7955	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7984	19.9345	20.1162	20.3827	20.5253	20.5734	20.5762	20.5779	20.5597	20.4036	20.0968	19.7955	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9797	0.9681	0.9467	0.8711	0.7192	0.4991	0.3508	0.3881	0.6259	0.8786	0.9601	0.9822	(94)
Useful gains	464.4969	487.7943	482.7331	463.9608	392.5496	269.5549	180.1687	188.3274	290.2944	391.1296	433.0127	452.4846	(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	745.8633	720.3093	649.4381	535.3581	409.5666	270.8080	180.2646	188.5111	295.6256	454.9694	608.7378	737.1480	(97)
Space heating kWh	209.3366	156.2501	124.0286	51.4060	12.6606	0.0000	0.0000	0.0000	0.0000	47.4968	126.5221	211.7896	(98a)
Space heating requirement - total per year (kWh/year)												939.4904	
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	209.3366	156.2501	124.0286	51.4060	12.6606	0.0000	0.0000	0.0000	0.0000	47.4968	126.5221	211.7896	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												939.4904	
Space heating per m2											(98c) / (4) =	13.2267	(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	209.3366	156.2501	124.0286	51.4060	12.6606	0.0000	0.0000	0.0000	0.0000	47.4968	126.5221	211.7896	(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)	209.3366	156.2501	124.0286	51.4060	12.6606	0.0000	0.0000	0.0000	0.0000	47.4968	126.5221	211.7896	(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	220.8694	194.8045	205.6726	177.8191	170.3161	151.2368	147.6556	154.7791	157.8687	178.7077	193.2838	218.0659	(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	86.6545	76.4284	80.6923	69.7644	66.8208	59.3353	57.9303	60.7251	61.9372	70.1131	75.8318	85.5546	(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	17.6775	15.9668	17.6775	17.1073	17.6775	17.1073	17.6775	17.6775	17.1073	17.6775	17.1073	17.6775	(231)
Lighting	23.0453	18.4878	16.6462	12.1957	9.4203	7.6965	8.5935	11.1702	14.5090	19.0366	21.5018	23.6858	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-11.3335	-19.7191	-35.2494	-46.7397	-55.2655	-53.1571	-52.0820	-45.8548	-35.6307	-24.5455	-13.3882	-9.2873	(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	-1.8205	-4.9567	-13.3189	-26.7003	-41.8711	-44.7629	-43.5368	-33.5746	-20.6733	-8.8452	-2.7686	-1.3370	(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 1 939.4904 (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 851.7878 (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)	208.1383	(230a)
Total electricity for the above, kWh/year	208.1383	(231)
Electricity for lighting (calculated in Appendix L)	185.9887	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-646.4189	(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	1538.9863	(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	939.4904	0.1567	147.2066	(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)	851.7878	0.1413	120.3352	(264)
Space and water heating			267.5419	(265)
Pumps, fans and electric keep-hot	208.1383	0.1387	28.8714	(267)
Energy for lighting	185.9887	0.1443	26.8439	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-402.2530	0.1315	-52.8907	
PV Unit electricity exported	-244.1659	0.1197	-29.2146	
Total			-82.1053	(269)
Total CO2, kg/year			241.1518	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.4000	(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	939.4904	1.5801	1484.4850	(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)	851.7878	1.5224	1296.7596	(278)
Space and water heating			2781.2447	(279)
Pumps, fans and electric keep-hot	208.1383	1.5128	314.8717	(281)
Energy for lighting	185.9887	1.5338	285.2756	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-402.2530	1.4858	-597.6604	
PV Unit electricity exported	-244.1659	0.4389	-107.1567	
Total			-704.8171	(283)
Total Primary energy kWh/year			2676.5749	(286)
Dwelling Primary energy Rate (DPER)			37.6800	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	71.0300 (1b)	x	3.1500 (2b)	=	223.7445	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 71.0300						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	223.7445	(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)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1341	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3841	(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) =	0.2977	(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													
	0.3795	0.3721	0.3646	0.3274	0.3200	0.2828	0.2828	0.2753	0.2977	0.3200	0.3349	0.3498	(22b)
Effective ac	0.5720	0.5692	0.5665	0.5536	0.5512	0.5400	0.5400	0.5379	0.5443	0.5512	0.5561	0.5612	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.0900	1.0000	2.0900			(26)
TER Opening Type (Uw = 1.20)			10.3800	1.1450	11.8855			(27)
External Wall 1	31.9700	10.3800	21.5900	0.1800	3.8862			(29a)
Corridor Wall	37.9800	2.0900	35.8900	0.1800	6.4602			(29a)
Total net area of external elements Aum(A, m2)			69.9500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.3219			(33)
Party Wall 1			46.5600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 179.4453 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	9.0800	0.0700	0.6356
E7 Party floor between dwellings (in blocks of flats)	24.1200	0.0700	1.6884
E16 Corner (normal)	6.3000	0.0900	0.5670
E18 Party wall between dwellings	12.6000	0.0600	0.7560
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	11.2200	0.0200	0.2244
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	29.5600	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	6.3000	-0.0900	-0.5670
E2 Other lintels (including other steel lintels)	6.0000	0.0500	0.3000
E3 Sill	4.9900	0.0500	0.2495
E4 Jamb	16.6200	0.0500	0.8310

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 4.6849 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 29.0068 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	42.2353	42.0289	41.8265	40.8758	40.6979	39.8700	39.8700	39.7166	40.1889	40.6979	41.0578	41.4339	(38)
Heat transfer coeff													
	71.2421	71.0356	70.8333	69.8826	69.7047	68.8768	68.8768	68.7234	69.1957	69.7047	70.0646	70.4407	(39)
Average = Sum(39)m / 12 =												69.8818	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0030	1.0001	0.9972	0.9838	0.9813	0.9697	0.9697	0.9675	0.9742	0.9813	0.9864	0.9917	(40)
HLP (average)												0.9838	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2709 (42)

Hot water usage for mixer showers

62.2947	61.3585	59.9943	57.3842	55.4580	53.3099	52.0890	53.4428	54.9269	57.2333	59.8994	62.0560	(42a)

Hot water usage for baths

26.9120	26.5123	25.9495	24.9117	24.1346	23.2730	22.8076	23.3665	23.9750	24.8970	25.9561	26.8210	(42b)

Hot water usage for other uses

37.8860	36.5083	35.1306	33.7530	32.3753	30.9976	30.9976	32.3753	33.7530	35.1306	36.5083	37.8860	(42c)

Average daily hot water use (litres/day) 116.8270 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	127.0926	124.3791	121.0744	116.0488	111.9679	107.5805	105.8941	109.1846	112.6548	117.2609	122.3639	126.7629	(44)
Energy conte	201.2836	177.1141	186.0868	158.8651	150.7303	132.2828	128.0698	135.1933	138.9147	159.1219	174.3298	198.4801	(45)
Energy content (annual)										Total = Sum(45)m =		1940.4723	
Distribution loss (46)m = 0.15 x (45)m													
	30.1925	26.5671	27.9130	23.8298	22.6095	19.8424	19.2105	20.2790	20.8372	23.8683	26.1495	29.7720	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	247.8785	219.1999	232.6817	203.9569	197.3252	177.3746	174.6647	181.7882	184.0065	205.7168	219.4216	245.0750	(62)
WWHRS	-28.4785	-25.1866	-26.3740	-21.8387	-20.3529	-17.4161	-16.3248	-17.3598	-18.0194	-21.2429	-24.0656	-27.9511	(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													
	219.4000	194.0132	206.3077	182.1182	176.9723	159.9585	158.3398	164.4284	165.9871	184.4739	195.3560	217.1239	(64)
										Total per year (kWh/year) = Sum(64)m =		2224.4792	(64)
12Total per year (kWh/year)												2224	(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													
	104.2027	92.5590	99.1498	88.8961	87.3938	80.0575	79.8591	82.2277	82.2626	90.1840	94.0381	103.2706	(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	113.5434	113.5434	113.5434	113.5434	113.5434	113.5434	113.5434	113.5434	113.5434	113.5434	113.5434	113.5434	(66)

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

	107.0601	118.5308	107.0601	110.6287	107.0601	110.6287	107.0601	107.0601	110.6287	107.0601	110.6287	107.0601	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	199.6890	201.7611	196.5394	185.4229	171.3904	158.2017	149.3909	147.3188	152.5405	163.6570	177.6895	190.8782	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.3543	34.3543	34.3543	34.3543	34.3543	34.3543	34.3543	34.3543	34.3543	34.3543	34.3543	34.3543	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-90.8348	-90.8348	-90.8348	-90.8348	-90.8348	-90.8348	-90.8348	-90.8348	-90.8348	-90.8348	-90.8348	-90.8348	(71)
Water heating gains (Table 5)													
	140.0574	137.7366	133.2658	123.4668	117.4647	111.1910	107.3375	110.5211	114.2536	121.2150	130.6085	138.8045	(72)
Total internal gains													
	506.8695	518.0916	496.9283	479.5815	455.9782	437.0845	420.8516	421.9630	434.4859	451.9951	478.9898	496.8058	(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	10.3800	10.6334	0.6300	0.7000	0.7700	33.7319	(74)

Solar gains	33.7319	64.4634	109.5391	175.9479	237.0179	253.7347	236.8938	187.9450	131.7015	76.7353	41.6127	28.1206	(83)
Total gains	540.6014	582.5550	606.4674	655.5294	692.9961	690.8192	657.7453	609.9079	566.1874	528.7304	520.6025	524.9264	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	49.6975	49.8420	49.9844	50.6643	50.7936	51.4042	51.4042	51.5189	51.1673	50.7936	50.5328	50.2629	
alpha	4.3132	4.3228	4.3323	4.3776	4.3862	4.4269	4.4269	4.4346	4.4112	4.3862	4.3689	4.3509	
util living area													
	0.9816	0.9727	0.9555	0.9011	0.7862	0.6035	0.4526	0.5044	0.7398	0.9170	0.9688	0.9836	(86)
MIT	19.6739	19.8382	20.0982	20.4848	20.7908	20.9515	20.9891	20.9828	20.8814	20.5145	20.0515	19.6542	(87)
Th 2	20.0808	20.0833	20.0856	20.0968	20.0989	20.1087	20.1087	20.1105	20.1049	20.0989	20.0947	20.0903	(88)
util rest of house													
	0.9775	0.9667	0.9453	0.8783	0.7400	0.5311	0.3646	0.4130	0.6725	0.8931	0.9608	0.9800	(89)
MIT 2	18.5426	18.7517	19.0799	19.5606	19.9104	20.0760	20.1039	20.1023	20.0145	19.6060	19.0312	18.5243	(90)
Living area fraction										fLA = Living area / (4) =		0.2992	(91)
MIT	18.8810	19.0767	19.3846	19.8371	20.1738	20.3380	20.3687	20.3657	20.2739	19.8778	19.3364	18.8623	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8810	19.0767	19.3846	19.8371	20.1738	20.3380	20.3687	20.3657	20.2739	19.8778	19.3364	18.8623	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9704	0.9582	0.9356	0.8707	0.7441	0.5504	0.3907	0.4398	0.6862	0.8861	0.9523	0.9734	(94)
Useful gains	524.6042	558.1879	567.4155	570.7646	515.6705	380.2151	256.9993	268.2490	388.5026	468.5086	495.7684	510.9697	(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													
	1038.7847	1007.0542	912.6554	764.3122	590.6614	395.2114	259.5788	272.5382	427.2048	646.7052	857.3408	1032.8234	(97)
Space heating kWh													
	382.5503	301.6382	256.8585	139.3542	55.7932	0.0000	0.0000	0.0000	0.0000	132.5783	260.3321	388.2591	(98a)
Space heating requirement - total per year (kWh/year)												1917.3640	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	382.5503	301.6382	256.8585	139.3542	55.7932	0.0000	0.0000	0.0000	0.0000	132.5783	260.3321	388.2591	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1917.3640	
Space heating per m2											(98c) / (4) =	26.9937	(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													
	382.5503	301.6382	256.8585	139.3542	55.7932	0.0000	0.0000	0.0000	0.0000	132.5783	260.3321	388.2591	(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)													
	414.4640	326.8019	278.2866	150.9797	60.4476	0.0000	0.0000	0.0000	0.0000	143.6385	282.0500	420.6491	(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													
	219.4000	194.0132	206.3077	182.1182	176.9723	159.9585	158.3398	164.4284	165.9871	184.4739	195.3560	217.1239	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.2938	85.0456	84.5524	83.4671	81.7869	79.8000	79.8000	79.8000	79.8000	83.3317	84.7045	85.3477	(217)
Fuel for water heating, kWh/month													
	257.2284	228.1286	243.9999	218.1916	216.3823	200.4493	198.4209	206.0506	208.0039	221.3731	230.6323	254.3992	(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	22.2450	17.8457	16.0681	11.7722	9.0932	7.4292	8.2951	10.7823	14.0051	18.3755	20.7551	22.8632	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													

(233a)m	-13.4552	-20.3653	-31.3986	-37.9485	-43.2862	-41.2785	-40.7808	-37.3161	-31.6414	-24.4181	-15.2810	-11.4762	(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	-3.8784	-8.4142	-17.2142	-26.5945	-35.9045	-36.3494	-35.9184	-30.0651	-21.5907	-12.2651	-5.2508	-3.0480	(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	2077.3174	(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	2683.2602	(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)	179.5296	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-585.1393	(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	4440.9679	(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	2077.3174	0.2100	436.2367	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2683.2602	0.2100	563.4846	(264)
Space and water heating			999.7213	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	179.5296	0.1443	25.9117	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-348.6460	0.1331	-46.4147	
PV Unit electricity exported	-236.4933	0.1251	-29.5810	
Total			-75.9957	(269)
Total CO2, kg/year			961.5665	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.5400	(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	2077.3174	1.1300	2347.3687	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2683.2602	1.1300	3032.0840	(278)
Space and water heating			5379.4527	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	179.5296	1.5338	275.3685	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-348.6460	1.4919	-520.1578	
PV Unit electricity exported	-236.4933	0.4591	-108.5732	
Total			-628.7310	(283)
Total Primary energy kWh/year			5156.1910	(286)
Target Primary Energy Rate (TPER)			72.5900	(287)

Full SAP Calculation Printout

Property Reference	B1_03_2B__Copy_Copy_Copy	**Issued on Date**	29/08/2024
Assessment Reference	B1_03_2B_MF_Copy_Copy	**Prop Type Ref**	
Property			

SAP Rating	81 B	**DER**	4.16	**TER**	14.55
Environmental	97 A	**% DER < TER**			71.41
CO_2 Emissions (t/year)	0.19	**DFEE**	39.54	**TFEE**	36.24
Compliance Check	See BREL	**% DFEE < TFEE**			-9.09
% DPER < TPER	41.32	**DPER**	45.79	**TPER**	78.04

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	61.9000	(1b)	x 3.1500	(2b) =	194.9850	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.9000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	194.9850	(5)

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2. Ventilation rate

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	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(21)

	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) =		80.1000 (23c)

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

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Window (Uw = 0.90)			16.2500	0.8687	14.1168			(27)
Door			2.0700	1.0000	2.0700			(26)
External Wall 1	52.6100	16.2500	36.3600	0.1800	6.5448	0.0000	0.0000	(29a)
Corridor Wall	16.0700	2.0700	14.0000	0.2000	2.8000	60.0000	840.0000	(29a)
Wall to Unheated	14.8100		14.8100	0.2000	2.9620	150.0000	2221.5000	(29a)
Total net area of external elements Aum(A, m2)			83.4900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.4936			(33)
Party Wall 1			21.1100	0.0000	0.0000	20.0000	422.2000	(32)
Party Floor 1			61.9000			80.0000	4952.0000	(32d)
Party Ceiling 1			61.9000			100.0000	6190.0000	(32b)
Internal Wall 1			50.0000			9.0000	450.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15075.7000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		243.5493 (35)
List of Thermal Bridges		

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	21.2000	0.0580	1.2296
E7 Party floor between dwellings (in blocks of flats)	10.2000	0.1100	1.1220
E16 Corner (normal)	9.4500	0.1800	1.7010
E18 Party wall between dwellings	3.1500	0.0250	0.0788
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	12.2000	0.1000	1.2200
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.4000	0.0000	0.0000
E17 Corner (inverted - internal area greater than external area)	3.1500	0.0000	0.0000
E7 Party floor between dwellings (in blocks of flats)	9.4000	0.1100	1.0340
E25 Staggered party wall between dwellings	3.1500	0.2000	0.6300
E2 Other lintels (including other steel lintels)	9.3200	0.0170	0.1584
E3 Sill	8.3200	0.0300	0.2496
E4 Jamb	23.1400	0.1200	2.7768

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.2002 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 38.6938 (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	16.8624	16.6573	16.4522	15.4267	15.2216	14.1961	14.1961	13.9910	14.6063	15.2216	15.6318	16.0420	(38)
Heat transfer coeff	55.5562	55.3511	55.1460	54.1205	53.9154	52.8899	52.8899	52.6848	53.3001	53.9154	54.3256	54.7358	(39)

Average = Sum(39)m / 12 = 54.0692

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8975	0.8942	0.8909	0.8743	0.8710	0.8544	0.8544	0.8511	0.8611	0.8710	0.8776	0.8843	(40)
HLP (average)												0.8735	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.0348 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	58.3367	57.4600	56.1825	53.7383	51.9344	49.9228	48.7794	50.0473	51.4371	53.5969	56.0937	58.1132	(42a)
Hot water usage for baths	25.2099	24.8355	24.3083	23.3362	22.6082	21.8011	21.3651	21.8887	22.4587	23.3224	24.3145	25.1247	(42b)
Hot water usage for other uses	35.4685	34.1788	32.8890	31.5992	30.3095	29.0197	29.0197	30.3095	31.5992	32.8890	34.1788	35.4685	(42c)

Average daily hot water use (litres/day) 109.4022 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	119.0152	116.4743	113.3798	108.6736	104.8521	100.7436	99.1643	102.2454	105.4950	109.8083	114.5870	118.7064	(44)
Energy conte	188.4909	165.8579	174.2605	148.7688	141.1511	123.8760	119.9306	126.6012	130.0859	149.0088	163.2502	185.8656	(45)
Energy content (annual)											Total = Sum(45)m =	1817.1475	
Distribution loss (46)m = 0.15 x (45)m	28.2736	24.8787	26.1391	22.3153	21.1727	18.5814	17.9896	18.9902	19.5129	22.3513	24.4875	27.8798	(46)

Water storage 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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	208.0767	183.5483	193.8463	167.7228	160.7369	142.8300	139.5164	146.1870	149.0399	168.5946	182.2042	205.4514	(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	208.0767	183.5483	193.8463	167.7228	160.7369	142.8300	139.5164	146.1870	149.0399	168.5946	182.2042	205.4514	(64)
										Total per year (kWh/year) = Sum(64)m =		2047.7545	(64)
12Total per year (kWh/year)												2048	(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	62.6732	55.1477	57.9416	49.4656	46.9328	41.1888	39.8769	42.0949	43.2536	49.5454	54.2807	61.8003	(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	101.7407	101.7407	101.7407	101.7407	101.7407	101.7407	101.7407	101.7407	101.7407	101.7407	101.7407	101.7407	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	89.6353	99.2391	89.6353	92.6232	89.6353	92.6232	89.6353	89.6353	92.6232	89.6353	92.6232	89.6353	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	177.7121	179.5562	174.9091	165.0161	152.5279	140.7907	132.9496	131.1055	135.7526	145.6456	158.1338	169.8710	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.1741	33.1741	33.1741	33.1741	33.1741	33.1741	33.1741	33.1741	33.1741	33.1741	33.1741	33.1741	(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)	-81.3925	-81.3925	-81.3925	-81.3925	-81.3925	-81.3925	-81.3925	-81.3925	-81.3925	-81.3925	-81.3925	-81.3925	(71)
Water heating gains (Table 5)	84.2382	82.0651	77.8785	68.7022	63.0817	57.2066	53.5980	56.5792	60.0744	66.5933	75.3898	83.0649	(72)
Total internal gains	405.1078	414.3826	395.9452	379.8637	358.7671	344.1428	329.7052	330.8422	341.9724	355.3965	379.6690	396.0934	(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	10.6500	19.6403	0.3800	0.7000	0.7700	38.5578	(76)
South	5.6000	46.7521	0.3800	0.7000	0.7700	48.2618	(78)

Solar gains	86.8196	154.4676	224.9013	294.9584	340.6042	341.3983	327.8803	294.1495	249.6462	174.7532	105.2837	73.4107	(83)
Total gains	491.9274	568.8502	620.8465	674.8221	699.3712	685.5411	657.5855	624.9917	591.6186	530.1497	484.9527	469.5041	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.3776	75.6569	75.9383	77.3772	77.6716	79.1776	79.1776	79.4858	78.5682	77.6716	77.0851	76.5074	
alpha	6.0252	6.0438	6.0626	6.1585	6.1781	6.2785	6.2785	6.2991	6.2379	6.1781	6.1390	6.1005	
util living area	0.9896	0.9749	0.9421	0.8471	0.6884	0.4908	0.3536	0.3872	0.6091	0.8836	0.9754	0.9918	(86)
MIT	20.1820	20.3753	20.6012	20.8449	20.9627	20.9962	20.9996	20.9993	20.9862	20.8279	20.4746	20.1559	(87)
Th 2	20.1696	20.1724	20.1753	20.1894	20.1922	20.2064	20.2064	20.2092	20.2007	20.1922	20.1866	20.1809	(88)
util rest of house	0.9866	0.9682	0.9272	0.8142	0.6373	0.4313	0.2900	0.3209	0.5436	0.8498	0.9675	0.9895	(89)
MIT 2	19.2263	19.4708	19.7499	20.0422	20.1632	20.2043	20.2063	20.2090	20.1922	20.0327	19.6089	19.2021	(90)
Living area fraction									fLA = Living area / (4) =			0.4701	(91)
MIT	19.6756	19.8960	20.1501	20.4195	20.5391	20.5766	20.5792	20.5805	20.5655	20.4066	20.0159	19.6505	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6756	19.8960	20.1501	20.4195	20.5391	20.5766	20.5792	20.5805	20.5655	20.4066	20.0159	19.6505	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9844	0.9655	0.9267	0.8240	0.6597	0.4592	0.3199	0.3521	0.5740	0.8595	0.9656	0.9875	(94)
Useful gains	484.2634	549.2397	575.3388	556.0855	461.4005	314.7756	210.3482	220.0497	339.5670	455.6782	468.2489	463.6507	(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	854.2110	830.0468	752.7483	623.4431	476.5617	316.0999	210.4602	220.2497	344.6096	528.7259	701.6650	845.6943	(97)
Space heating kWh	275.2411	188.7024	131.9926	48.4975	11.2799	0.0000	0.0000	0.0000	0.0000	54.3475	168.0596	284.2405	(98a)
Space heating requirement - total per year (kWh/year)												1162.3610	
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	275.2411	188.7024	131.9926	48.4975	11.2799	0.0000	0.0000	0.0000	0.0000	54.3475	168.0596	284.2405	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1162.3610	
Space heating per m2											(98c) / (4) =	18.7780	(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	275.2411	188.7024	131.9926	48.4975	11.2799	0.0000	0.0000	0.0000	0.0000	54.3475	168.0596	284.2405	(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)	275.2411	188.7024	131.9926	48.4975	11.2799	0.0000	0.0000	0.0000	0.0000	54.3475	168.0596	284.2405	(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	208.0767	183.5483	193.8463	167.7228	160.7369	142.8300	139.5164	146.1870	149.0399	168.5946	182.2042	205.4514	(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	81.6355	72.0122	76.0525	65.8033	63.0625	56.0371	54.7370	57.3541	58.4734	66.1454	71.4849	80.6055	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	13.5567	12.2447	13.5567	13.1193	13.5567	13.1193	13.5567	13.5567	13.1193	13.5567	13.1193	13.5567	(231)
Lighting	18.2545	14.6444	13.1857	9.6604	7.4620	6.0965	6.8071	8.8481	11.4928	15.0791	17.0318	18.7618	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-11.3726	-19.7083	-34.8834	-45.6116	-53.4916	-51.3164	-50.2784	-44.4089	-34.6827	-24.2493	-13.4086	-9.3246	(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	-1.7813	-4.9675	-13.6849	-27.8284	-43.6451	-46.6036	-45.3405	-35.0206	-21.6213	-9.1414	-2.7482	-1.2997	(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												1162.3610	(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	803.4033	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.6710)		
mechanical ventilation fans (SFP = 0.6710)	159.6186	(230a)
Total electricity for the above, kWh/year	159.6186	(231)
Electricity for lighting (calculated in Appendix L)	147.3242	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-646.4189	(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	1626.2882	(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	1162.3610	0.1572	182.7751	(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)	803.4033	0.1413	113.4850	(264)
Space and water heating			296.2601	(265)
Pumps, fans and electric keep-hot	159.6186	0.1387	22.1411	(267)
Energy for lighting	147.3242	0.1443	21.2634	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-392.7364	0.1317	-51.7140	
PV Unit electricity exported	-253.6825	0.1195	-30.3044	
Total			-82.0184	(269)
Total CO2, kg/year			257.6462	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.1600	(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	1162.3610	1.5821	1838.9751	(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)	803.4033	1.5223	1223.0440	(278)
Space and water heating			3062.0191	(279)
Pumps, fans and electric keep-hot	159.6186	1.5128	241.4711	(281)
Energy for lighting	147.3242	1.5338	225.9707	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-392.7364	1.4865	-583.8018	
PV Unit electricity exported	-253.6825	0.4382	-111.1534	
Total			-694.9552	(283)
Total Primary energy kWh/year			2834.5056	(286)
Dwelling Primary energy Rate (DPER)			45.7900	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	61.9000 (1b)	x	3.1500 (2b)	=	194.9850 (1b) - (3b)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 61.9000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	194.9850	(5)

2. Ventilation rate

		m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)	
Number of open flues	0 * 20 =	0.0000	(6b)	
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)	
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)	
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)	
Number of blocked chimneys	0 * 20 =	0.0000	(6f)	
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)	
Number of passive vents	0 * 10 =	0.0000	(7b)	
Number of flueless gas fires	0 * 40 =	0.0000	(7c)	
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1026	(8)	
Pressure test		Yes		
Pressure Test Method		Blower Door		
Measured/design AP50		5.0000	(17)	
Infiltration rate		0.3526	(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) = 0.2997 (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	0.3821	0.3746	0.3671	0.3297	0.3222	0.2847	0.2847	0.2772	0.2997	0.3222	0.3371	0.3521	(22b)
Effective ac	0.5730	0.5702	0.5674	0.5543	0.5519	0.5405	0.5405	0.5384	0.5449	0.5519	0.5568	0.5620	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.0700	1.0000	2.0700			(26)
TER Opening Type (Uw = 1.20)			13.4000	1.1450	15.3435			(27)
External Wall 1	52.6100	13.4000	39.2100	0.1800	7.0578			(29a)
Corridor Wall	16.0700	2.0700	14.0000	0.1800	2.5200			(29a)
Wall to Unheated	14.8100		14.8100	0.1800	2.6658			(29a)
Total net area of external elements Aum(A, m2)			83.4900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.6571			(33)
Party Wall 1			21.1100	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 223.5493 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	21.2000	0.0700	1.4840
E7 Party floor between dwellings (in blocks of flats)	10.2000	0.0700	0.7140
E16 Corner (normal)	9.4500	0.0900	0.8505
E18 Party wall between dwellings	3.1500	0.0600	0.1890
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	12.2000	0.0200	0.2440
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.4000	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)	9.4000	0.0700	0.6580
E25 Staggered party wall between dwellings	3.1500	0.0600	0.1890
E2 Other lintels (including other steel lintels)	9.3200	0.0500	0.4660
E3 Sill	8.3200	0.0500	0.4160
E4 Jamb	23.1400	0.0500	1.1570

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.0840 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 35.7411 (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	36.8697	36.6873	36.5085	35.6688	35.5117	34.7803	34.7803	34.6448	35.0620	35.5117	35.8295	36.1618	(38)
Heat transfer coeff	72.6108	72.4284	72.2497	71.4099	71.2528	70.5214	70.5214	70.3859	70.8031	71.2528	71.5706	71.9029	(39)
Average = Sum(39)m / 12 =												71.4091	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1730	1.1701	1.1672	1.1536	1.1511	1.1393	1.1393	1.1371	1.1438	1.1511	1.1562	1.1616	(40)
HLP (average)												1.1536	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.0348 (42)
Hot water usage for mixer showers

58.3367	57.4600	56.1825	53.7383	51.9344	49.9228	48.7794	50.0473	51.4371	53.5969	56.0937	58.1132	(42a)

Hot water usage for baths

25.2099	24.8355	24.3083	23.3362	22.6082	21.8011	21.3651	21.8887	22.4587	23.3224	24.3145	25.1247	(42b)

Hot water usage for other uses

35.4685	34.1788	32.8890	31.5992	30.3095	29.0197	29.0197	30.3095	31.5992	32.8890	34.1788	35.4685	(42c)

Average daily hot water use (litres/day) 109.4022 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	119.0152	116.4743	113.3798	108.6736	104.8521	100.7436	99.1643	102.2454	105.4950	109.8083	114.5870	118.7064	(44)
Energy conte	188.4909	165.8579	174.2605	148.7688	141.1511	123.8760	119.9306	126.6012	130.0859	149.0088	163.2502	185.8656	(45)
Energy content (annual)											Total = Sum(45)m =	1817.1475	
Distribution loss (46)m = 0.15 x (45)m	28.2736	24.8787	26.1391	22.3153	21.1727	18.5814	17.9896	18.9902	19.5129	22.3513	24.4875	27.8798	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.7527 (55)
Total storage loss

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

If cylinder contains dedicated solar storage

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

235.0858	207.9436	220.8554	193.8606	187.7460	168.9679	166.5255	173.1961	175.1777	195.6037	208.3420	232.4605	(62)
WWHRS -26.6691	-23.5864	-24.6983	-20.4512	-19.0598	-16.3096	-15.2876	-16.2568	-16.8745	-19.8932	-22.5366	-26.1752	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
208.4167	184.3572	196.1571	173.4094	168.6863	152.6583	151.2379	156.9392	158.3032	175.7105	185.8054	206.2852	(64)
										Total per year (kWh/year) = Sum(64)m =	2117.9667	(64)
12Total per year (kWh/year)											2118	(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

99.9492	88.8163	95.2176	85.5391	84.2087	77.2623	77.1528	79.3708	79.3270	86.8214	90.3542	99.0762	(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	101.7407	101.7407	101.7407	101.7407	101.7407	101.7407	101.7407	101.7407	101.7407	101.7407	101.7407	101.7407	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	89.7225	99.3356	89.7225	92.7132	89.7225	92.7132	89.7225	89.7225	92.7132	89.7225	92.7132	89.7225	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	177.7121	179.5562	174.9091	165.0161	152.5279	140.7907	132.9496	131.1055	135.7526	145.6456	158.1338	169.8710	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.1741	33.1741	33.1741	33.1741	33.1741	33.1741	33.1741	33.1741	33.1741	33.1741	33.1741	33.1741	(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)	-81.3925	-81.3925	-81.3925	-81.3925	-81.3925	-81.3925	-81.3925	-81.3925	-81.3925	-81.3925	-81.3925	-81.3925	(71)
Water heating gains (Table 5)	134.3403	132.1671	127.9806	118.8043	113.1837	107.3087	103.7000	106.6812	110.1764	116.6954	125.4919	133.1670	(72)
Total internal gains	458.2970	467.5811	449.1344	433.0558	411.9563	394.3349	379.8943	381.0314	392.1644	408.5857	432.8611	449.2826	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	8.7800	19.6403	0.6300	0.7000	0.7700	52.7004	(76)
South	4.6200	46.7521	0.6300	0.7000	0.7700	66.0107	(78)

Solar gains	118.7111	211.2017	307.4908	403.2570	465.6498	466.7309	448.2521	402.1460	341.3163	238.9339	143.9564	100.3776	(83)
Total gains	577.0081	678.7828	756.6252	836.3128	877.6061	861.0658	828.1465	783.1773	733.4808	647.5196	576.8175	549.6602	(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	52.9371	53.0704	53.2017	53.8273	53.9460	54.5055	54.5055	54.6104	54.2887	53.9460	53.7065	53.4583	
alpha	4.5291	4.5380	4.5468	4.5885	4.5964	4.6337	4.6337	4.6407	4.6192	4.5964	4.5804	4.5639	
util living area	0.9816	0.9623	0.9243	0.8342	0.6909	0.5113	0.3722	0.4094	0.6282	0.8719	0.9637	0.9848	(86)
MIT	19.7843	20.0345	20.3440	20.6857	20.8936	20.9791	20.9961	20.9940	20.9474	20.6666	20.1714	19.7430	(87)
Th 2	19.9416	19.9440	19.9463	19.9573	19.9593	19.9689	19.9689	19.9707	19.9652	19.9593	19.9552	19.9508	(88)
util rest of house	0.9765	0.9525	0.9054	0.7967	0.6312	0.4342	0.2863	0.3198	0.5477	0.8332	0.9525	0.9807	(89)
MIT 2	18.5602	18.8739	19.2540	19.6584	19.8755	19.9573	19.9676	19.9685	19.9322	19.6505	19.0575	18.5149	(90)
Living area fraction									fLA = Living area / (4) =			0.4701	(91)
MIT	19.1356	19.4195	19.7664	20.1414	20.3541	20.4377	20.4511	20.4506	20.4095	20.1282	19.5812	19.0923	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1356	19.4195	19.7664	20.1414	20.3541	20.4377	20.4511	20.4506	20.4095	20.1282	19.5812	19.0923	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9716	0.9467	0.9017	0.8038	0.6547	0.4698	0.3267	0.3619	0.5834	0.8402	0.9477	0.9762	(94)
Useful gains	560.6379	642.5722	682.2123	672.2640	574.5884	404.5345	270.5428	283.4338	427.8914	544.0375	546.6258	536.5883	(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	1077.2281	1051.6236	958.4961	802.7457	616.6301	411.6795	271.5863	285.1061	446.7312	678.9104	893.2870	1070.7967	(97)
Space heating kWh	384.3431	274.8826	205.5551	93.9468	31.2790	0.0000	0.0000	0.0000	0.0000	100.3454	249.5960	397.4511	(98a)
Space heating requirement - total per year (kWh/year)												1737.3991	
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	384.3431	274.8826	205.5551	93.9468	31.2790	0.0000	0.0000	0.0000	0.0000	100.3454	249.5960	397.4511	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1737.3991	
Space heating per m2											(98c) / (4) =	28.0678	(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	384.3431	274.8826	205.5551	93.9468	31.2790	0.0000	0.0000	0.0000	0.0000	100.3454	249.5960	397.4511	(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)	416.4064	297.8143	222.7033	101.7842	33.8884	0.0000	0.0000	0.0000	0.0000	108.7166	270.4183	430.6079	(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	208.4167	184.3572	196.1571	173.4094	168.6863	152.6583	151.2379	156.9392	158.3032	175.7105	185.8054	206.2852	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.4130	84.9537	84.1649	82.7470	81.0855	79.8000	79.8000	79.8000	79.8000	82.8524	84.7224	85.5050	(217)
Fuel for water heating, kWh/month													

	244.0106	217.0090	233.0629	209.5660	208.0351	191.3011	189.5211	196.6657	198.3750	212.0767	219.3109	241.2551 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	18.6426	14.9558	13.4660	9.8658	7.6206	6.2261	6.9518	9.0362	11.7371	15.3997	17.3939	19.1607 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-11.7636	-17.8275	-27.5246	-33.3202	-38.0620	-36.3233	-35.8883	-32.8114	-27.7816	-21.3978	-13.3682	-10.0311 (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	-3.3420	-7.2527	-14.8397	-22.9266	-30.9498	-31.3265	-30.9523	-25.9088	-18.6081	-10.5702	-4.5246	-2.6262 (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	1882.3392 (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	2560.1892 (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)	150.4561 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-509.9271 (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	4169.0574 (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	1882.3392	0.2100	395.2912	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2560.1892	0.2100	537.6397	(264)
Space and water heating			932.9310	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	150.4561	0.1443	21.7155	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-306.0994	0.1331	-40.7405	
PV Unit electricity exported	-203.8277	0.1251	-25.4956	
Total			-66.2361	(269)
Total CO2, kg/year			900.3396	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.5500	(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	1882.3392	1.1300	2127.0433	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2560.1892	1.1300	2893.0138	(278)
Space and water heating			5020.0571	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	150.4561	1.5338	230.7746	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-306.0994	1.4918	-456.6432	
PV Unit electricity exported	-203.8277	0.4591	-93.5786	
Total			-550.2218	(283)
Total Primary energy kWh/year			4830.7107	(286)
Target Primary Energy Rate (TPER)			78.0400	(287)

Full SAP Calculation Printout

Property Reference	B2_04_2B__Copy_Copy_Copy	**Issued on Date**	29/08/2024
Assessment Reference	B2_04 (terrace above)	**Prop Type Ref**	
Property			

SAP Rating	77 C	**DER**	5.20	**TER**	16.63
Environmental	96 A	**% DER < TER**			68.73
CO_2 Emissions (t/year)	0.26	**DFEE**	43.69	**TFEE**	45.87
Compliance Check	See BREL	**% DFEE < TFEE**			4.77
% DPER < TPER	36.70	**DPER**	56.50	**TPER**	89.25

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	62.4700	(1b)	x 3.1500	(2b) =	196.7805	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.4700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	196.7805	(5)

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2. Ventilation rate

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

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		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) =												80.1000	(23c)
Effective ac	0.2764	0.2729	0.2695	0.2521	0.2487	0.2313	0.2313	0.2278	0.2382	0.2487	0.2556	0.2625	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Windows (Uw = 0.90)			15.5700	0.8687	13.5261			(27)
External Wall 1	57.4600	15.5700	41.8900	0.1800	7.5402	0.0000	0.0000	(29a)
Corridor wall	10.4300		10.4300	0.2000	2.0860	0.0000	0.0000	(29a)
External Roof	33.1000		33.1000	0.1500	4.9650	9.0000	297.9000	(30)
Total net area of external elements Aum(A, m2)			100.9900					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.1173			(33)
Party Wall 1			44.5100	0.0000	0.0000	20.0000	890.2000	(32)
Party Floor 1			62.4700			80.0000	4997.6000	(32d)
Internal Wall 1			50.0000			9.0000	450.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	6635.7000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		106.2222 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	18.2400	0.0580	1.0579

E15 Flat roof with parapet	18.2400	0.3000	5.4720	
E7 Party floor between dwellings (in blocks of flats)	6.6200	0.1100	0.7282	
E16 Corner (normal)	7.5000	0.1800	1.3500	
E18 Party wall between dwellings	2.5000	0.0250	0.0625	
E25 Staggered party wall between dwellings	10.0000	0.2400	2.4000	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	24.1900	0.0000	0.0000	
E2 Other lintels (including other steel lintels)	8.4200	0.0170	0.1431	
E3 Sill	8.4200	0.0300	0.2526	
E4 Jamb	21.6000	0.1200	2.5920	
E24 Eaves (insulation at ceiling level - inverted)	14.4900	0.1500	2.1735	
P4 Party wall - Roof (insulation at ceiling level)	3.4500	0.0300	0.1035	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.5500	0.1000	0.5550	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 16.8904 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 45.0076 (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	17.9491	17.7239	17.4986	16.3724	16.1471	15.0209	15.0209	14.7956	15.4714	16.1471	16.5976	17.0481	(38)
Heat transfer coeff	62.9568	62.7315	62.5063	61.3800	61.1548	60.0285	60.0285	59.8032	60.4790	61.1548	61.6053	62.0558	(39)
Average = Sum(39)m / 12 =												61.3237	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0078	1.0042	1.0006	0.9826	0.9789	0.9609	0.9609	0.9573	0.9681	0.9789	0.9862	0.9934	(40)
HLP (average)												0.9817	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.0505 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	58.6004	57.7198	56.4365	53.9812	52.1692	50.1485	48.9999	50.2735	51.6696	53.8392	56.3472	58.3759	(42a)
Hot water usage for baths	25.3233	24.9472	24.4176	23.4411	22.7099	21.8991	21.4612	21.9871	22.5597	23.4273	24.4239	25.2377	(42b)
Hot water usage for other uses	35.6296	34.3340	33.0383	31.7427	30.4471	29.1515	29.1515	30.4471	31.7427	33.0383	34.3340	35.6296	(42c)
Average daily hot water use (litres/day)												109.8969	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	119.5533	117.0010	113.8924	109.1650	105.3262	101.1991	99.6126	102.7077	105.9720	110.3048	115.1051	119.2432	(44)
Energy conte	189.3432	166.6078	175.0484	149.4414	141.7893	124.4361	120.4728	127.1736	130.6741	149.6826	163.9883	186.7060	(45)
Energy content (annual)										Total = Sum(45)m =		1825.3637	
Distribution loss (46)m = 0.15 x (45)m	28.4015	24.9912	26.2573	22.4162	21.2684	18.6654	18.0709	19.0760	19.6011	22.4524	24.5982	28.0059	(46)
Water storage 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	208.9290	184.2982	194.6342	168.3954	161.3751	143.3901	140.0586	146.7594	149.6281	169.2684	182.9423	206.2918	(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	208.9290	184.2982	194.6342	168.3954	161.3751	143.3901	140.0586	146.7594	149.6281	169.2684	182.9423	206.2918	(64)
										Total per year (kWh/year) = Sum(64)m =		2055.9707	(64)
12Total per year (kWh/year)												2056	(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	62.9566	55.3971	58.2036	49.6893	47.1449	41.3750	40.0572	42.2852	43.4491	49.7695	54.5261	62.0797	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	102.5270	102.5270	102.5270	102.5270	102.5270	102.5270	102.5270	102.5270	102.5270	102.5270	102.5270	102.5270	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	90.3508	100.0313	90.3508	93.3625	90.3508	93.3625	90.3508	90.3508	93.3625	90.3508	93.3625	90.3508	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	179.1306	180.9894	176.3052	166.3332	153.7454	141.9145	134.0108	132.1520	136.8362	146.8082	159.3960	171.2269	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.2527	33.2527	33.2527	33.2527	33.2527	33.2527	33.2527	33.2527	33.2527	33.2527	33.2527	33.2527	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-82.0216	-82.0216	-82.0216	-82.0216	-82.0216	-82.0216	-82.0216	-82.0216	-82.0216	-82.0216	-82.0216	-82.0216	(71)
Water heating gains (Table 5)	84.6191	82.4361	78.2307	69.0129	63.3669	57.4653	53.8403	56.8350	60.3460	66.8944	75.7307	83.4405	(72)
Total internal gains	407.8586	417.2149	398.6448	382.4667	361.2211	346.5004	331.9601	333.0959	344.3028	357.8115	382.2474	398.7763	(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	3.0700	19.6403	0.3800	0.7000	0.7700	11.1148	(76)
South	7.1900	46.7521	0.3800	0.7000	0.7700	61.9647	(78)
Southwest	3.7800	36.7938	0.3800	0.7000	0.7700	25.6379	(79)

West			1.5300		19.6403		0.3800		0.7000		0.7700		5.5393 (80)
Solar gains	104.2566	177.7319	242.6754	298.3889	331.0729	327.0138	315.9898	292.0461	262.1376	196.3812	124.9232	89.1794	(83)
Total gains	512.1152	594.9468	641.3202	680.8556	692.2940	673.5143	647.9498	625.1420	606.4404	554.1927	507.1706	487.9557	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	29.2780	29.3832	29.4890	30.0301	30.1407	30.7063	30.7063	30.8219	30.4775	30.1407	29.9203	29.7031	
alpha	2.9519	2.9589	2.9659	3.0020	3.0094	3.0471	3.0471	3.0548	3.0318	3.0094	2.9947	2.9802	
util living area	0.9348	0.9021	0.8596	0.7817	0.6727	0.5210	0.3915	0.4192	0.5994	0.7997	0.9031	0.9418	(86)
MIT	19.1083	19.4346	19.8240	20.2986	20.6562	20.8883	20.9650	20.9562	20.8197	20.3564	19.6742	19.0644	(87)
Th 2	20.0768	20.0798	20.0828	20.0979	20.1009	20.1160	20.1160	20.1191	20.1100	20.1009	20.0949	20.0889	(88)
util rest of house	0.9261	0.8895	0.8414	0.7537	0.6303	0.4612	0.3185	0.3459	0.5411	0.7680	0.8886	0.9339	(89)
MIT 2	17.8768	18.2844	18.7681	19.3529	19.7694	20.0277	20.0957	20.0923	19.9581	19.4355	18.6004	17.8296	(90)
Living area fraction									fLA = Living area / (4) =			0.4865	(91)
MIT	18.4759	18.8439	19.2817	19.8130	20.2008	20.4463	20.5186	20.5126	20.3772	19.8835	19.1228	18.4303	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4759	18.8439	19.2817	19.8130	20.2008	20.4463	20.5186	20.5126	20.3772	19.8835	19.1228	18.4303	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9069	0.8693	0.8233	0.7440	0.6353	0.4842	0.3523	0.3793	0.5593	0.7596	0.8699	0.9157	(94)
Useful gains	464.4538	517.2150	527.9729	506.5383	439.7896	326.1107	228.2761	237.1137	339.2054	420.9474	441.2008	446.8036	(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	892.4696	874.7247	798.9389	669.8371	519.8662	350.9467	235.2259	245.9468	379.6400	567.7314	740.6676	883.0693	(97)
Space heating kWh	318.4437	240.2465	201.5987	117.5751	59.5770	0.0000	0.0000	0.0000	0.0000	109.2073	215.6161	324.5817	(98a)
Space heating requirement - total per year (kWh/year)												1586.8462	
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	318.4437	240.2465	201.5987	117.5751	59.5770	0.0000	0.0000	0.0000	0.0000	109.2073	215.6161	324.5817	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1586.8462	
Space heating per m2											(98c) / (4) =	25.4017	(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	318.4437	240.2465	201.5987	117.5751	59.5770	0.0000	0.0000	0.0000	0.0000	109.2073	215.6161	324.5817	(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)	318.4437	240.2465	201.5987	117.5751	59.5770	0.0000	0.0000	0.0000	0.0000	109.2073	215.6161	324.5817	(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	208.9290	184.2982	194.6342	168.3954	161.3751	143.3901	140.0586	146.7594	149.6281	169.2684	182.9423	206.2918	(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	81.9699	72.3064	76.3616	66.0672	63.3129	56.2568	54.9497	57.5787	58.7042	66.4097	71.7745	80.9352	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	15.5471	14.0426	15.5471	15.0456	15.5471	15.0456	15.5471	15.5471	15.0456	15.5471	15.0456	15.5471	(231)
Lighting	18.4746	14.8210	13.3447	9.7769	7.5519	6.1700	6.8891	8.9548	11.6314	15.2610	17.2372	18.9881	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-11.4356	-19.9486	-35.7624	-47.7634	-56.2087	-51.5563	-50.5180	-44.5993	-34.8042	-24.8836	-13.5420	-9.3681	(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	-1.7184	-4.7272	-12.8059	-25.6766	-40.9279	-46.3637	-45.1009	-34.8302	-21.4998	-8.5071	-2.6148	-1.2562	(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												1586.8462	(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	806.6268	(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)	183.0551	(230a)
Total electricity for the above, kWh/year	183.0551	(231)
Electricity for lighting (calculated in Appendix L)	149.1007	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-646.4189	(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	2079.2099	(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	1586.8462	0.1551	246.1848	(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)	806.6268	0.1413	113.9414	(264)
Space and water heating			360.1263	(265)
Pumps, fans and electric keep-hot	183.0551	0.1387	25.3920	(267)
Energy for lighting	149.1007	0.1443	21.5198	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-400.3902	0.1318	-52.7686	
PV Unit electricity exported	-246.0287	0.1187	-29.2156	
Total			-81.9842	(269)
Total CO2, kg/year			325.0538	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.2000	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1586.8462	1.5744	2498.2541	(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)	806.6268	1.5223	1227.9551	(278)
Space and water heating			3726.2092	(279)
Pumps, fans and electric keep-hot	183.0551	1.5128	276.9257	(281)
Energy for lighting	149.1007	1.5338	228.6956	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-400.3902	1.4869	-595.3566	
PV Unit electricity exported	-246.0287	0.4354	-107.1297	
Total			-702.4864	(283)
Total Primary energy kWh/year			3529.3442	(286)
Dwelling Primary energy Rate (DPER)			56.5000	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	62.4700 (1b)	x	3.1500 (2b)	=	196.7805	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 62.4700						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	196.7805	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1016	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3516	(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) = 0.3253 (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	0.4147	0.4066	0.3984	0.3578	0.3497	0.3090	0.3090	0.3009	0.3253	0.3497	0.3659	0.3822	(22b)
Effective ac	0.5860	0.5827	0.5794	0.5640	0.5611	0.5477	0.5477	0.5453	0.5529	0.5611	0.5669	0.5730	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opening Type (Uw = 1.20)			15.5700	1.1450	17.8282			(27)
External Wall 1	57.4600	15.5700	41.8900	0.1800	7.5402			(29a)
Corridor wall	10.4300		10.4300	0.1800	1.8774			(29a)
External Roof	33.1000		33.1000	0.1100	3.6410			(30)
Total net area of external elements Aum(A, m2)			100.9900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.8868			(33)
Party Wall 1			44.5100	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 106.2222 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	18.2400	0.0700	1.2768
E15 Flat roof with parapet	18.2400	0.5600	10.2144
E7 Party floor between dwellings (in blocks of flats)	6.6200	0.0700	0.4634
E16 Corner (normal)	7.5000	0.0900	0.6750
E18 Party wall between dwellings	2.5000	0.0600	0.1500
E25 Staggered party wall between dwellings	10.0000	0.0600	0.6000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	24.1900	0.0000	0.0000
E2 Other lintels (including other steel lintels)	8.4200	0.0500	0.4210
E3 Sill	8.4200	0.0500	0.4210
E4 Jamb	21.6000	0.0500	1.0800
E24 Eaves (insulation at ceiling level - inverted)	14.4900	0.2400	3.4776
P4 Party wall - Roof (insulation at ceiling level)	3.4500	0.1200	0.4140
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.5500	0.0200	0.1110

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 19.3042 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 50.1910 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	38.0529	37.8361	37.6235	36.6252	36.4384	35.5689	35.5689	35.4079	35.9039	36.4384	36.8163	37.2113	(38)
Heat transfer coeff	88.2440	88.0271	87.8146	86.8163	86.6295	85.7600	85.7600	85.5990	86.0949	86.6295	87.0073	87.4024	(39)
Average = Sum(39)m / 12 =												86.8154	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4126	1.4091	1.4057	1.3897	1.3867	1.3728	1.3728	1.3702	1.3782	1.3867	1.3928	1.3991	(40)
HLP (average)												1.3897	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.0505 (42)
Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
58.6004	57.7198	56.4365	53.9812	52.1692	50.1485	48.9999	50.2735	51.6696	53.8392	56.3472	58.3759	(42a)

Hot water usage for baths

25.3233	24.9472	24.4176	23.4411	22.7099	21.8991	21.4612	21.9871	22.5597	23.4273	24.4239	25.2377	(42b)

Hot water usage for other uses

35.6296	34.3340	33.0383	31.7427	30.4471	29.1515	29.1515	30.4471	31.7427	33.0383	34.3340	35.6296	(42c)

Average daily hot water use (litres/day) 109.8969 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	119.5533	117.0010	113.8924	109.1650	105.3262	101.1991	99.6126	102.7077	105.9720	110.3048	115.1051	119.2432	(44)
Energy conte	189.3432	166.6078	175.0484	149.4414	141.7893	124.4361	120.4728	127.1736	130.6741	149.6826	163.9883	186.7060	(45)
Energy content (annual)											Total = Sum(45)m =	1825.3637	
Distribution loss (46)m = 0.15 x (45)m	28.4015	24.9912	26.2573	22.4162	21.2684	18.6654	18.0709	19.0760	19.6011	22.4524	24.5982	28.0059	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	235.9381	208.6935	221.6433	194.5333	188.3842	169.5280	167.0677	173.7685	175.7659	196.2775	209.0802	233.3009	(62)
WWHRS	-26.7897	-23.6930	-24.8099	-20.5436	-19.1459	-16.3833	-15.3567	-16.3303	-16.9508	-19.9831	-22.6384	-26.2936	(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	209.1485	185.0005	196.8334	173.9897	169.2383	153.1447	151.7110	157.4382	158.8151	176.2944	186.4417	207.0073	(64)
										Total per year (kWh/year) = Sum(64)m =		2125.0628	(64)
12Total per year (kWh/year)												2125	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	100.2325	89.0657	95.4795	85.7627	84.4209	77.4485	77.3331	79.5611	79.5226	87.0454	90.5996	99.3557	(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	102.5270	102.5270	102.5270	102.5270	102.5270	102.5270	102.5270	102.5270	102.5270	102.5270	102.5270	102.5270	(66)

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

	90.3508	100.0313	90.3508	93.3625	90.3508	93.3625	90.3508	90.3508	93.3625	90.3508	93.3625	90.3508	(67)

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

	179.1306	180.9894	176.3052	166.3332	153.7454	141.9145	134.0108	132.1520	136.8362	146.8082	159.3960	171.2269	(68)

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

	33.2527	33.2527	33.2527	33.2527	33.2527	33.2527	33.2527	33.2527	33.2527	33.2527	33.2527	33.2527	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)

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

	-82.0216	-82.0216	-82.0216	-82.0216	-82.0216	-82.0216	-82.0216	-82.0216	-82.0216	-82.0216	-82.0216	-82.0216	(71)

Water heating gains (Table 5)

	134.7212	132.5382	128.3327	119.1149	113.4689	107.5673	103.9424	106.9370	110.4481	116.9965	125.8328	133.5426	(72)

Total internal gains

	460.9607	470.3169	451.7469	435.5688	414.3232	396.6025	382.0621	383.1979	394.4048	410.9136	435.3494	451.8783	(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	3.0700	19.6403	0.6300	0.7000	0.7700	18.4271	(76)
South	7.1900	46.7521	0.6300	0.7000	0.7700	102.7310	(78)
Southwest	3.7800	36.7938	0.6300	0.7000	0.7700	42.5049	(79)
West	1.5300	19.6403	0.6300	0.7000	0.7700	9.1835	(80)

Solar gains	172.8465	294.6607	402.3302	494.6973	548.8840	542.1545	523.8777	484.1816	434.5965	325.5793	207.1096	147.8500	(83)
Total gains	633.8072	764.9777	854.0771	930.2661	963.2072	938.7570	905.9399	867.3796	829.0014	736.4929	642.4590	599.7284	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	20.8881	20.9396	20.9902	21.2316	21.2774	21.4931	21.4931	21.5336	21.4095	21.2774	21.1850	21.0892	
alpha	2.3925	2.3960	2.3993	2.4154	2.4185	2.4329	2.4329	2.4356	2.4273	2.4185	2.4123	2.4059	
util living area	0.9197	0.8802	0.8300	0.7488	0.6421	0.5065	0.3862	0.4152	0.5838	0.7748	0.8848	0.9280	(86)
MIT	18.4232	18.8457	19.3636	19.9691	20.4541	20.7850	20.9194	20.9014	20.6780	20.0369	19.1344	18.3513	(87)
Th 2	19.7537	19.7564	19.7590	19.7712	19.7735	19.7842	19.7842	19.7862	19.7801	19.7735	19.7689	19.7640	(88)
util rest of house	0.9075	0.8630	0.8055	0.7123	0.5882	0.4298	0.2899	0.3184	0.5096	0.7339	0.8652	0.9170	(89)
MIT 2	16.8268	17.3498	17.9868	18.7201	19.2766	19.6296	19.7448	19.7347	19.5302	18.8223	17.7281	16.7432	(90)
Living area fraction									fLA = Living area / (4) =			0.4865	(91)
MIT	17.6034	18.0775	18.6566	19.3277	19.8494	20.1917	20.3163	20.3023	20.0886	19.4132	18.4122	17.5255	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.6034	18.0775	18.6566	19.3277	19.8494	20.1917	20.3163	20.3023	20.0886	19.4132	18.4122	17.5255	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8799	0.8340	0.7797	0.6975	0.5918	0.4567	0.3333	0.3610	0.5295	0.7201	0.8382	0.8903	(94)
Useful gains	557.6646	638.0275	665.9641	648.8888	570.0474	428.7095	301.9762	313.1426	438.9959	530.3429	538.4808	533.9520	(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	1173.9444	1159.9806	1067.5259	905.2952	705.9776	479.5436	318.7056	334.0318	515.5871	763.4811	984.2484	1164.6812	(97)
Space heating kWh	458.5121	350.7525	298.7620	184.6126	101.1321	0.0000	0.0000	0.0000	0.0000	173.4548	320.9526	469.2625	(98a)
Space heating requirement - total per year (kWh/year)												2357.4412	
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	458.5121	350.7525	298.7620	184.6126	101.1321	0.0000	0.0000	0.0000	0.0000	173.4548	320.9526	469.2625	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2357.4412	
Space heating per m2											(98c) / (4) =	37.7372	(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	458.5121	350.7525	298.7620	184.6126	101.1321	0.0000	0.0000	0.0000	0.0000	173.4548	320.9526	469.2625	(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)	496.7629	380.0135	323.6858	200.0137	109.5689	0.0000	0.0000	0.0000	0.0000	187.9250	347.7276	508.4100	(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	209.1485	185.0005	196.8334	173.9897	169.2383	153.1447	151.7110	157.4382	158.8151	176.2944	186.4417	207.0073	(64)

Efficiency of water heater											79.8000	(216)
(217)m	85.7698	85.4713	84.9929	84.1929	82.9445	79.8000	79.8000	79.8000	79.8000	84.0234	85.2664	85.8367 (217)
Fuel for water heating, kWh/month												
	243.8486	216.4474	231.5880	206.6559	204.0381	191.9106	190.1140	197.2909	199.0165	209.8159	218.6579	241.1642 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	18.7731	15.0605	13.5603	9.9349	7.6740	6.2697	7.0005	9.0995	11.8193	15.5075	17.5157	19.2949 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-11.8690	-17.9857	-27.7662	-33.6094	-38.3890	-36.6337	-36.1945	-33.0927	-28.0221	-21.5857	-13.4873	-10.1211 (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	-3.3757	-7.3255	-14.9882	-23.1554	-31.2582	-31.6390	-31.2615	-26.1683	-18.7949	-10.6766	-4.5703	-2.6528 (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	2554.1074	(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	2550.5482	(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)	151.5098	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-514.6227	(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	4827.5426	(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	2554.1074	0.2100	536.3626	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2550.5482	0.2100	535.6151	(264)
Space and water heating			1071.9777	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	151.5098	0.1443	21.8675	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-308.7563	0.1331	-41.0948	
PV Unit electricity exported	-205.8664	0.1251	-25.7507	
Total			-66.8455	(269)
Total CO2, kg/year			1038.9290	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.6300	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2554.1074	1.1300	2886.1414	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2550.5482	1.1300	2882.1194	(278)
Space and water heating			5768.2608	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	151.5098	1.5338	232.3908	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-308.7563	1.4918	-460.6092	
PV Unit electricity exported	-205.8664	0.4591	-94.5149	
Total			-555.1241	(283)
Total Primary energy kWh/year			5575.6283	(286)
Target Primary Energy Rate (TPER)			89.2500	(287)

Full SAP Calculation Printout

Property Reference	B2_05_2B__Copy_Copy_Copy	**Issued on Date**	29/08/2024
Assessment Reference	B2_05_2B_TF_Copy_Copy	**Prop Type Ref**	
Property			

SAP Rating	75 C	**DER**	5.35	**TER**	16.23
Environmental	96 A	**% DER < TER**			67.04
CO_2 Emissions (t/year)	0.33	**DFEE**	45.05	**TFEE**	48.72
Compliance Check	See BREL	**% DFEE < TFEE**			7.53
% DPER < TPER	34.08	**DPER**	57.31	**TPER**	86.94

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	76.0600	(1b)	x 3.0200	(2b) =	229.7012	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	76.0600					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		229.7012	(5)

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2. Ventilation rate

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

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.0000 (17)
Infiltration rate		0.1500 (18)
Number of sides sheltered		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) =												80.1000	(23c)
Effective ac	0.2477	0.2448	0.2419	0.2274	0.2245	0.2099	0.2099	0.2070	0.2157	0.2245	0.2303	0.2361	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Window (Uw = 0.90)			17.2600	0.8687	14.9942			(27)
Door			1.6800	1.0000	1.6800			(26)
External Wall 1	54.7800	17.2600	37.5200	0.1800	6.7536	14.0000	525.2800	(29a)
Corridor Wall	32.1000	1.6800	30.4200	0.2000	6.0840	0.0000	0.0000	(29a)
External Roof 1	76.0600		76.0600	0.1100	8.3666	9.0000	684.5400	(30)
Total net area of external elements Aum(A, m2)			162.9400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		37.8784			(33)
Party Wall 1			38.9900	0.0000	0.0000	20.0000	779.8000	(32)
Party Floor 1			76.0600			80.0000	6084.8000	(32d)
Internal Wall 1			50.0000			9.0000	450.0000	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		8524.4200	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							112.0749	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E7 Party floor between dwellings (in blocks of flats)	5.8600	0.0580	0.3399	
E7 Party floor between dwellings (in blocks of flats)	10.6300	0.1100	1.1693	
E16 Corner (normal)	6.0400	0.1800	1.0872	
E18 Party wall between dwellings	6.0400	0.0250	0.1510	
E24 Eaves (insulation at ceiling level - inverted)	12.2800	0.0800	0.9824	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	12.9100	0.0000	0.0000	
E17 Corner (inverted - internal area greater than external area)	6.0400	0.0000	0.0000	
E25 Staggered party wall between dwellings	6.0400	0.2000	1.2080	
P4 Party wall - Roof (insulation at ceiling level)	12.9100	0.0300	0.3873	
E14 Flat roof	10.6300	0.1600	1.7008	
E15 Flat roof with parapet	18.1400	0.3000	5.4420	
E2 Other lintels (including other steel lintels)	9.1100	0.0170	0.1549	
E3 Sill	8.3000	0.0300	0.2490	
E4 Jamb	20.7800	0.1200	2.4936	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	5.5500	0.1000	0.5550	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.9204 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 53.7988 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	18.7774	18.5571	18.3368	17.2353	17.0150	15.9136	15.9136	15.6933	16.3542	17.0150	17.4556	17.8962	(38)
Heat transfer coeff	72.5762	72.3559	72.1356	71.0341	70.8138	69.7123	69.7123	69.4920	70.1529	70.8138	71.2544	71.6950	(39)
Average = Sum(39)m / 12 =												70.9790	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9542	0.9513	0.9484	0.9339	0.9310	0.9165	0.9165	0.9136	0.9223	0.9310	0.9368	0.9426	(40)
HLP (average)												0.9332	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3839 (42)
Hot water usage for mixer showers

64.1891	63.2245	61.8188	59.1293	57.1445	54.9311	53.6730	55.0681	56.5973	58.9738	61.7210	63.9432	(42a)

Hot water usage for baths

27.7266	27.3149	26.7350	25.6658	24.8652	23.9775	23.4980	24.0738	24.7008	25.6507	26.7419	27.6329	(42b)

Hot water usage for other uses

39.0431	37.6233	36.2036	34.7838	33.3641	31.9443	31.9443	33.3641	34.7838	36.2036	37.6233	39.0431	(42c)

Average daily hot water use (litres/day) 120.3809 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	130.9588	128.1626	124.7573	119.5789	115.3738	110.8529	109.1153	112.5059	116.0819	120.8280	126.0862	130.6191	(44)
Energy conte	207.4067	182.5019	191.7474	163.6976	155.3153	136.3066	131.9656	139.3058	143.1405	163.9625	179.6329	204.5180	(45)
Energy content (annual)										Total = Sum(45)m =		1999.5009	

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

31.1110	27.3753	28.7621	24.5546	23.2973	20.4460	19.7948	20.8959	21.4711	24.5944	26.9449	30.6777	(46)

Water storage 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)
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)
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)

Primary loss
Combi loss
Total heat required for water heating calculated for each month

226.9925	200.1923	211.3332	182.6516	174.9011	155.2606	151.5514	158.8916	162.0945	183.5483	198.5869	224.1038	(62)
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)
-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)
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)
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)

WWHRS
PV diverter
Solar input
FGHRS
Output from w/h

226.9925	200.1923	211.3332	182.6516	174.9011	155.2606	151.5514	158.8916	162.0945	183.5483	198.5869	224.1038	(64)
									Total per year (kWh/year) = Sum(64)m =		2230.1079	(64)

12Total per year (kWh/year) 2230 (64)
Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

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

Heat gains from water heating, kWh/month

68.9627	60.6819	63.7560	54.4294	51.6424	45.3220	43.8785	46.3192	47.5942	54.5175	59.7280	68.0022	(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	119.1928	119.1928	119.1928	119.1928	119.1928	119.1928	119.1928	119.1928	119.1928	119.1928	119.1928	119.1928	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	106.4087	117.8097	106.4087	109.9557	106.4087	109.9557	106.4087	106.4087	109.9557	106.4087	109.9557	106.4087	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	211.0096	213.1993	207.6815	195.9348	181.1067	167.1704	157.8601	155.6705	161.1883	172.9350	187.7630	201.6993	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.9193	34.9193	34.9193	34.9193	34.9193	34.9193	34.9193	34.9193	34.9193	34.9193	34.9193	34.9193	(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)	-95.3542	-95.3542	-95.3542	-95.3542	-95.3542	-95.3542	-95.3542	-95.3542	-95.3542	-95.3542	-95.3542	-95.3542	(71)
Water heating gains (Table 5)	92.6919	90.3004	85.6936	75.5965	69.4118	62.9472	58.9765	62.2570	66.1031	73.2762	82.9555	91.4009	(72)
Total internal gains	468.8680	480.0672	458.5416	440.2448	415.6850	398.8311	382.0032	383.0940	396.0049	411.3777	439.4320	458.2667	(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

West			17.2600		19.6403		0.3800		0.7000		0.7700		62.4889 (80)
Solar gains	62.4889	122.2416	201.3145	293.6051	359.8241	368.3440	350.6785	301.2277	234.1370	145.0499	77.9163	51.3878 (83)	
Total gains	531.3570	602.3087	659.8561	733.8499	775.5092	767.1751	732.6817	684.3217	630.1419	556.4277	517.3484	509.6546 (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, ni1,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	32.6263	32.7257	32.8256	33.3346	33.4383	33.9667	33.9667	34.0743	33.7533	33.4383	33.2316	33.0273	
alpha	3.1751	3.1817	3.1884	3.2223	3.2292	3.2644	3.2644	3.2716	3.2502	3.2292	3.2154	3.2018	
util living area	0.9577	0.9368	0.9006	0.8196	0.6978	0.5355	0.4041	0.4457	0.6561	0.8576	0.9367	0.9622 (86)	
MIT	19.1238	19.3956	19.7923	20.3066	20.6843	20.9045	20.9712	20.9603	20.8094	20.3026	19.6422	19.0870 (87)	
Th 2	20.1217	20.1241	20.1266	20.1388	20.1412	20.1535	20.1535	20.1559	20.1486	20.1412	20.1363	20.1314 (88)	
util rest of house	0.9515	0.9278	0.8863	0.7942	0.6566	0.4763	0.3315	0.3712	0.5986	0.8317	0.9263	0.9567 (89)	
MIT 2	17.9212	18.2641	18.7608	19.3958	19.8356	20.0780	20.1368	20.1316	19.9855	19.4064	18.5873	17.8812 (90)	
Living area fraction									fLA = Living area / (4) =			0.4449 (91)	
MIT	18.4563	18.7675	19.2197	19.8010	20.2132	20.4457	20.5080	20.5003	20.3521	19.8052	19.0566	18.4177 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.4563	18.7675	19.2197	19.8010	20.2132	20.4457	20.5080	20.5003	20.3521	19.8052	19.0566	18.4177 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9364	0.9106	0.8689	0.7832	0.6603	0.4973	0.3625	0.4022	0.6131	0.8201	0.9100	0.9425 (94)	
Useful gains	497.5842	548.4758	573.3300	574.7766	512.0353	381.5468	265.5638	275.2440	386.3383	456.3050	470.8021	480.3700 (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	1027.4086	1003.3935	917.5438	774.3429	602.8495	407.5206	272.4380	284.9356	438.6000	651.8535	851.9639	1019.3358 (97)	
Space heating kWh	394.1894	305.7047	256.0951	143.6878	67.5657	0.0000	0.0000	0.0000	0.0000	145.4880	274.4365	400.9906 (98a)	
Space heating requirement - total per year (kWh/year)												1988.1578	
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	394.1894	305.7047	256.0951	143.6878	67.5657	0.0000	0.0000	0.0000	0.0000	145.4880	274.4365	400.9906 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												1988.1578	
Space heating per m2										(98c) / (4) =		26.1393 (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	394.1894	305.7047	256.0951	143.6878	67.5657	0.0000	0.0000	0.0000	0.0000	145.4880	274.4365	400.9906 (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)	394.1894	305.7047	256.0951	143.6878	67.5657	0.0000	0.0000	0.0000	0.0000	145.4880	274.4365	400.9906 (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	226.9925	200.1923	211.3332	182.6516	174.9011	155.2606	151.5514	158.8916	162.0945	183.5483	198.5869	224.1038 (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	89.0568	78.5422	82.9132	71.6604	68.6196	60.9140	59.4587	62.3386	63.5952	72.0122	77.9124	87.9235 (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	18.1481	16.3919	18.1481	17.5627	18.1481	17.5627	18.1481	18.1481	17.5627	18.1481	17.5627	18.1481 (231)	
Lighting	23.4587	18.8194	16.9448	12.4145	9.5893	7.8345	8.7477	11.3706	14.7692	19.3780	21.8875	24.1106 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-11.5756	-20.3404	-36.7414	-49.3929	-58.3334	-53.8778	-52.7792	-46.4035	-35.9835	-25.5522	-13.7601	-9.4710 (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	-1.5783	-4.3354	-11.8269	-24.0471	-38.8032	-44.0422	-42.8397	-33.0260	-20.3205	-7.8386	-2.3967	-1.1533 (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												1988.1578 (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	874.9467	(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)	213.6795	(230a)
Total electricity for the above, kWh/year	213.6795	(231)
Electricity for lighting (calculated in Appendix L)	189.3248	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-646.4189	(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	2619.6900	(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	1988.1578	0.1551	308.4019	(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)	874.9467	0.1413	123.6140	(264)
Space and water heating			432.0160	(265)
Pumps, fans and electric keep-hot	213.6795	0.1387	29.6400	(267)
Energy for lighting	189.3248	0.1443	27.3254	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-414.2108	0.1317	-54.5335	
PV Unit electricity exported	-232.2080	0.1185	-27.5180	
Total			-82.0515	(269)
Total CO2, kg/year			406.9299	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.3500	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1988.1578	1.5743	3129.9236	(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)	874.9467	1.5224	1332.0431	(278)
Space and water heating			4461.9667	(279)
Pumps, fans and electric keep-hot	213.6795	1.5128	323.2544	(281)
Energy for lighting	189.3248	1.5338	290.3927	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-414.2108	1.4864	-615.6946	
PV Unit electricity exported	-232.2080	0.4345	-100.8998	
Total			-716.5944	(283)
Total Primary energy kWh/year			4359.0194	(286)
Dwelling Primary energy Rate (DPER)			57.3100	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	76.0600 (1b)	x	3.0200 (2b)	=	229.7012	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 76.0600						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	229.7012	(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)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1306	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3806	(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) = 0.2950 (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	0.3761	0.3687	0.3613	0.3245	0.3171	0.2802	0.2802	0.2728	0.2950	0.3171	0.3318	0.3466	(22b)
Effective ac	0.5707	0.5680	0.5653	0.5526	0.5503	0.5393	0.5393	0.5372	0.5435	0.5503	0.5551	0.5601	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.6800	1.0000	1.6800			(26)
TER Opening Type (Uw = 1.20)			17.2600	1.1450	19.7634			(27)
External Wall 1	54.7800	17.2600	37.5200	0.1800	6.7536			(29a)
Corridor Wall	32.1000	1.6800	30.4200	0.1800	5.4756			(29a)
External Roof 1	76.0600		76.0600	0.1100	8.3666			(30)
Total net area of external elements Aum(A, m2)			162.9400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.0392			(33)
Party Wall 1			38.9900	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 112.0749 (35)
List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E7	Party floor between dwellings (in blocks of flats)	5.8600	0.0700	0.4102
E7	Party floor between dwellings (in blocks of flats)	10.6300	0.0700	0.7441
E16	Corner (normal)	6.0400	0.0900	0.5436
E18	Party wall between dwellings	6.0400	0.0600	0.3624
E24	Eaves (insulation at ceiling level - inverted)	12.2800	0.2400	2.9472
P3	Party wall - Intermediate floor between dwellings (in blocks of flats)	12.9100	0.0000	0.0000
E17	Corner (inverted - internal area greater than external area)	6.0400	-0.0900	-0.5436
E25	Staggered party wall between dwellings	6.0400	0.0600	0.3624
P4	Party wall - Roof (insulation at ceiling level)	12.9100	0.1200	1.5492
E14	Flat roof	10.6300	0.0800	0.8504
E15	Flat roof with parapet	18.1400	0.5600	10.1584
E2	Other lintels (including other steel lintels)	9.1100	0.0500	0.4555
E3	Sill	8.3000	0.0500	0.4150
E4	Jamb	20.7800	0.0500	1.0390
E23	Balcony within or between dwellings, balcony support penetrates wall insulation	5.5500	0.0200	0.1110

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 19.4048 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 61.4440 (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	43.2614	43.0532	42.8492	41.8908	41.7115	40.8768	40.8768	40.7222	41.1983	41.7115	42.0742	42.4535	(38)
Heat transfer coeff	104.7053	104.4972	104.2931	103.3348	103.1554	102.3207	102.3207	102.1662	102.6423	103.1554	103.5182	103.8974	(39)
Average = Sum(39)m / 12 =												103.3339	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3766	1.3739	1.3712	1.3586	1.3562	1.3453	1.3453	1.3432	1.3495	1.3562	1.3610	1.3660	(40)
HLP (average)												1.3586	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.3839 (42)
Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
64.1891	63.2245	61.8188	59.1293	57.1445	54.9311	53.6730	55.0681	56.5973	58.9738	61.7210	63.9432	(42a)

Hot water usage for baths

27.7266	27.3149	26.7350	25.6658	24.8652	23.9775	23.4980	24.0738	24.7008	25.6507	26.7419	27.6329	(42b)

Hot water usage for other uses

39.0431	37.6233	36.2036	34.7838	33.3641	31.9443	31.9443	33.3641	34.7838	36.2036	37.6233	39.0431	(42c)

Average daily hot water use (litres/day) 120.3809 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	130.9588	128.1626	124.7573	119.5789	115.3738	110.8529	109.1153	112.5059	116.0819	120.8280	126.0862	130.6191	(44)
Energy conte	207.4067	182.5019	191.7474	163.6976	155.3153	136.3066	131.9656	139.3058	143.1405	163.9625	179.6329	204.5180	(45)
Energy content (annual)										Total = Sum(45)m =		1999.5009	
Distribution loss (46)m = 0.15 x (45)m	31.1110	27.3753	28.7621	24.5546	23.2973	20.4460	19.7948	20.8959	21.4711	24.5944	26.9449	30.6777	(46)

Water storage loss:
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.7527 (55)
Total storage loss

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

If cylinder contains dedicated solar storage

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss 23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

254.0016	224.5876	238.3423	208.7894	201.9102	181.3985	178.5605	185.9008	188.2324	210.5574	224.7248	251.1129	(62)
WWHRS -29.3446	-25.9526	-27.1760	-22.5028	-20.9718	-17.9458	-16.8213	-17.8877	-18.5674	-21.8889	-24.7974	-28.8012	(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

224.6571	198.6350	211.1663	186.2866	180.9384	163.4527	161.7392	168.0130	169.6650	188.6685	199.9273	222.3117	(64)

Total per year (kWh/year) = Sum(64)m = 2275.4608 (64)
12Total per year (kWh/year) 2275 (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

106.2387	94.3505	101.0319	90.5029	88.9183	81.3954	81.1545	83.5951	83.6677	91.7934	95.8014	105.2782	(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	119.1928	119.1928	119.1928	119.1928	119.1928	119.1928	119.1928	119.1928	119.1928	119.1928	119.1928	119.1928	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	106.4087	117.8097	106.4087	109.9557	106.4087	109.9557	106.4087	106.4087	109.9557	106.4087	109.9557	106.4087	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	211.0096	213.1993	207.6815	195.9348	181.1067	167.1704	157.8601	155.6705	161.1883	172.9350	187.7630	201.6993	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.9193	34.9193	34.9193	34.9193	34.9193	34.9193	34.9193	34.9193	34.9193	34.9193	34.9193	34.9193	(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)													
	-95.3542	-95.3542	-95.3542	-95.3542	-95.3542	-95.3542	-95.3542	-95.3542	-95.3542	-95.3542	-95.3542	-95.3542	(71)
Water heating gains (Table 5)													
	142.7939	140.4025	135.7956	125.6985	119.5138	113.0492	109.0786	112.3590	116.2051	123.3783	133.0575	141.5029	(72)
Total internal gains													
	521.9701	533.1692	511.6436	493.3468	468.7871	448.9331	432.1053	433.1961	446.1069	464.4798	492.5341	511.3688	(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	17.2600	19.6403	0.6300	0.7000	0.7700	103.6000	(80)

Solar gains	103.6000	202.6637	333.7582	486.7664	596.5505	610.6756	581.3881	499.4038	388.1746	240.4775	129.1771	85.1956	(83)
Total gains	625.5701	735.8329	845.4018	980.1132	1065.3376	1059.6087	1013.4933	932.5998	834.2815	704.9573	621.7111	596.5644	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	22.6148	22.6599	22.7042	22.9148	22.9546	23.1419	23.1419	23.1769	23.0694	22.9546	22.8742	22.7907	
alpha	2.5077	2.5107	2.5136	2.5277	2.5303	2.5428	2.5428	2.5451	2.5380	2.5303	2.5249	2.5194	
util living area													
	0.9499	0.9254	0.8826	0.7974	0.6783	0.5331	0.4110	0.4560	0.6565	0.8467	0.9280	0.9549	(86)
MIT	18.3114	18.6656	19.2127	19.9022	20.4452	20.7886	20.9208	20.8949	20.6230	19.8847	18.9830	18.2528	(87)
Th 2	19.7813	19.7834	19.7855	19.7952	19.7970	19.8055	19.8055	19.8071	19.8023	19.7970	19.7934	19.7895	(88)
util rest of house													
	0.9415	0.9133	0.8633	0.7642	0.6253	0.4550	0.3110	0.3536	0.5824	0.8134	0.9142	0.9474	(89)
MIT 2	16.6971	17.1415	17.8225	18.6630	19.2886	19.6532	19.7668	19.7518	19.5027	18.6685	17.5546	16.6279	(90)
Living area fraction									fLA = Living area / (4) =			0.4449	(91)
MIT	17.4154	17.8196	18.4411	19.2143	19.8032	20.1583	20.2802	20.2604	20.0012	19.2096	18.1901	17.3508	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.4154	17.8196	18.4411	19.2143	19.8032	20.1583	20.2802	20.2604	20.0012	19.2096	18.1901	17.3508	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9191	0.8875	0.8369	0.7459	0.6256	0.4793	0.3521	0.3942	0.5958	0.7938	0.8899	0.9262	(94)
Useful gains	574.9410	653.0542	707.5027	731.0440	666.4761	507.8727	356.8879	367.6719	497.0811	559.5991	553.2512	552.5191	(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													
	1373.2476	1350.0595	1245.3695	1065.8259	835.8859	568.7337	376.5656	394.4004	605.7079	888.1257	1148.0271	1366.3380	(97)
Space heating kWh													
	593.9401	468.3876	400.1729	241.0430	126.0409	0.0000	0.0000	0.0000	0.0000	244.4238	428.2386	605.4813	(98a)
Space heating requirement - total per year (kWh/year)												3107.7282	
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													
	593.9401	468.3876	400.1729	241.0430	126.0409	0.0000	0.0000	0.0000	0.0000	244.4238	428.2386	605.4813	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3107.7282	
Space heating per m2											(98c) / (4) =	40.8589	(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													
	593.9401	468.3876	400.1729	241.0430	126.0409	0.0000	0.0000	0.0000	0.0000	244.4238	428.2386	605.4813	(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)													
	643.4887	507.4622	433.5568	261.1516	136.5557	0.0000	0.0000	0.0000	0.0000	264.8145	463.9638	655.9927	(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													
	224.6571	198.6350	211.1663	186.2866	180.9384	163.4527	161.7392	168.0130	169.6650	188.6685	199.9273	222.3117	(64)

Efficiency of water heater											79.8000	(216)
(217)m	86.1340	85.9145	85.4704	84.6387	83.2649	79.8000	79.8000	79.8000	79.8000	84.6415	85.7230	86.1894 (217)
Fuel for water heating, kWh/month												
	260.8228	231.2008	247.0637	220.0962	217.3045	204.8280	202.6807	210.5426	212.6128	222.9032	233.2250	257.9339 (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	22.1096	17.7372	15.9704	11.7006	9.0379	7.3840	8.2446	10.7167	13.9199	18.2637	20.6288	22.7241 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-14.3666	-21.7239	-33.4633	-40.4076	-46.0586	-43.9074	-43.3706	-39.6944	-33.6787	-26.0224	-16.3064	-12.2553 (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	-4.1946	-9.0937	-18.5920	-28.7060	-38.7400	-39.2177	-38.7601	-32.4584	-23.3230	-13.2585	-5.6795	-3.2975 (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	3366.9861	(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	2721.2141	(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)	178.4374	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-626.5760	(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	5726.0615	(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	3366.9861	0.2100	707.0671	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2721.2141	0.2100	571.4550	(264)
Space and water heating			1278.5220	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	178.4374	0.1443	25.7540	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-371.2551	0.1331	-49.4320	
PV Unit electricity exported	-255.3209	0.1251	-31.9393	
Total			-81.3713	(269)
Total CO2, kg/year			1234.8340	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.2300	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3366.9861	1.1300	3804.6943	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2721.2141	1.1300	3074.9719	(278)
Space and water heating			6879.6662	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	178.4374	1.5338	273.6932	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-371.2551	1.4920	-553.9168	
PV Unit electricity exported	-255.3209	0.4591	-117.2292	
Total			-671.1460	(283)
Total Primary energy kWh/year			6612.3142	(286)
Target Primary Energy Rate (TPER)			86.9400	(287)

Full SAP Calculation Printout

Property Reference	Gate House__Copy_Copy	**Issued on Date**	29/08/2024
Assessment Reference	Gate House_Copy_Copy_Copy	**Prop Type Ref**	
Property			

SAP Rating	87 B	**DER**	2.09	**TER**	13.33
Environmental	98 A	**% DER < TER**			84.32
CO_2 Emissions (t/year)	0.13	**DFEE**	44.94	**TFEE**	50.49
Compliance Check	See BREL	**% DFEE < TFEE**			10.99
% DPER < TPER	51.87	**DPER**	33.64	**TPER**	69.90

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	48.4200 (1b)	x	2.5000 (2b)	=	121.0500	(1b) - (3b)
First floor	48.4200 (1c)	x	2.8200 (2c)	=	136.5444	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	96.8400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	257.5944	(5)

2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2000	(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) =	0.1850	(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	0.2359	0.2313	0.2266	0.2035	0.1989	0.1758	0.1758	0.1711	0.1850	0.1989	0.2081	0.2174	(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	0.3354	0.3307	0.3261	0.3030	0.2984	0.2752	0.2752	0.2706	0.2845	0.2984	0.3076	0.3169	(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	
Window (Uw = 0.90)			23.4900	0.8687	20.4064			(27)
Door			1.9200	1.0000	1.9200			(26)
Heatloss Floor 1			48.4200	0.1000	4.8420	0.0000	0.0000	(28a)
External Wall 1	167.8500	25.4100	142.4400	0.1800	25.6392	0.0000	0.0000	(29a)
External Roof 1	48.4200		48.4200	0.0900	4.3578	0.0000	0.0000	(30)
Total net area of external elements Aum(A, m2)			264.6900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		57.1654			(33)
Internal Wall 1			60.0000			9.0000	540.0000	(32c)
Internal Floor 1			48.4200			18.0000	871.5600	(32d)
Internal Ceiling 1			48.4200			9.0000	435.7800	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 1847.3400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	19.0762 (35)
List of Thermal Bridges	

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	15.1100	0.0170	0.2569	
E3 Sill	14.2000	0.0300	0.4260	
E4 Jamb	35.0200	0.1200	4.2024	
E5 Ground floor (normal)	31.5500	0.1000	3.1550	
E6 Intermediate floor within a dwelling	31.5500	0.0000	0.0000	
E16 Corner (normal)	31.8000	0.1270	4.0386	
E17 Corner (inverted - internal area greater than external area)	10.6000	0.0000	0.0000	
E15 Flat roof with parapet	31.0000	0.3000	9.3000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			21.3789	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	78.5442	(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	28.5089	28.1158	27.7226	25.7569	25.3637	23.3979	23.3979	23.0048	24.1843	25.3637	26.1500	26.9363	(38)
Heat transfer coeff	107.0532	106.6600	106.2669	104.3011	103.9080	101.9422	101.9422	101.5490	102.7285	103.9080	104.6943	105.4806	(39)
Average = Sum(39)m / 12 =												104.2028	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1055	1.1014	1.0973	1.0770	1.0730	1.0527	1.0527	1.0486	1.0608	1.0730	1.0811	1.0892	(40)
HLP (average)												1.0760	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy											2.7083	(42)
Hot water usage for mixer showers	69.6288	68.5824	67.0576	64.1402	61.9872	59.5863	58.2215	59.7348	61.3936	63.9715	66.9516	69.3620	(42a)
Hot water usage for baths	30.0659	29.6194	28.9906	27.8312	26.9631	26.0004	25.4805	26.1049	26.7847	27.8148	28.9980	29.9642	(42b)
Hot water usage for other uses	42.3655	40.8250	39.2844	37.7438	36.2033	34.6627	34.6627	36.2033	37.7438	39.2844	40.8250	42.3655	(42c)
Average daily hot water use (litres/day)												130.5854	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	142.0602	139.0267	135.3326	129.7152	125.1536	120.2494	118.3647	122.0429	125.9222	131.0707	136.7746	141.6918	(44)
Energy conte	224.9887	197.9722	208.0012	177.5737	168.4808	147.8607	143.1519	151.1146	155.2746	177.8617	194.8605	221.8551	(45)
Energy content (annual)										Total = Sum(45)m =		2168.9955	
Distribution loss (46)m = 0.15 x (45)m	33.7483	29.6958	31.2002	26.6361	25.2721	22.1791	21.4728	22.6672	23.2912	26.6793	29.2291	33.2783	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6300	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8802	(55)
Total storage loss	27.2862	24.6456	27.2862	26.4060	27.2862	26.4060	27.2862	27.2862	26.4060	27.2862	26.4060	27.2862	(56)
If cylinder contains dedicated solar storage	27.2862	24.6456	27.2862	26.4060	27.2862	26.4060	27.2862	27.2862	26.4060	27.2862	26.4060	27.2862	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	275.5373	243.6290	258.5498	226.4917	219.0294	196.7787	193.7005	201.6632	204.1926	228.4103	243.7785	272.4037	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	275.5373	243.6290	258.5498	226.4917	219.0294	196.7787	193.7005	201.6632	204.1926	228.4103	243.7785	272.4037	(64)
										Total per year (kWh/year) = Sum(64)m =		2764.1645	(64)
12Total per year (kWh/year)												2764	(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	115.2476	102.3512	109.5993	98.1776	96.4587	88.2981	88.0369	90.6845	90.7632	99.5779	103.9255	114.2057	(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	135.4142	135.4142	135.4142	135.4142	135.4142	135.4142	135.4142	135.4142	135.4142	135.4142	135.4142	135.4142	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	126.6590	140.2296	126.6590	130.8810	126.6590	130.8810	126.6590	126.6590	130.8810	126.6590	130.8810	126.6590	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	251.1156	253.7214	247.1549	233.1756	215.5292	198.9440	187.8641	185.2583	191.8249	205.8042	223.4506	240.0357	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.5414	36.5414	36.5414	36.5414	36.5414	36.5414	36.5414	36.5414	36.5414	36.5414	36.5414	36.5414	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-108.3314	-108.3314	-108.3314	-108.3314	-108.3314	-108.3314	-108.3314	-108.3314	-108.3314	-108.3314	-108.3314	-108.3314	(71)
Water heating gains (Table 5)	154.9027	152.3083	147.3108	136.3578	129.6488	122.6362	118.3291	121.8878	126.0600	133.8412	144.3410	153.5023	(72)
Total internal gains	596.3016	609.8836	584.7490	564.0386	535.4612	516.0855	496.4765	497.4294	512.3901	529.9287	562.2968	583.8213	(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	4.7400	10.6334	0.3800	0.7000	0.7700	9.2911	(74)
East	11.6000	19.6403	0.3800	0.7000	0.7700	41.9972	(76)
South	1.6600	46.7521	0.3800	0.7000	0.7700	14.3062	(78)
West	5.4900	19.6403	0.3800	0.7000	0.7700	19.8763	(80)

Solar gains	85.4707	162.2231	259.3483	372.9079	456.7145	468.4320	445.5259	382.1258	299.2837	190.0284	105.5683	70.9890	(83)
Total gains	681.7722	772.1067	844.0973	936.9465	992.1758	984.5175	942.0024	879.5552	811.6738	719.9571	667.8651	654.8103	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	4.7934	4.8111	4.8289	4.9199	4.9385	5.0337	5.0337	5.0532	4.9952	4.9385	4.9014	4.8649	
alpha	1.3196	1.3207	1.3219	1.3280	1.3292	1.3356	1.3356	1.3369	1.3330	1.3292	1.3268	1.3243	
util living area	0.8059	0.7730	0.7289	0.6532	0.5631	0.4537	0.3637	0.3927	0.5325	0.6820	0.7699	0.8128	(86)
Living	16.2757	16.7119	17.4459	18.4630	19.4038	20.1809	20.5782	20.5136	19.9058	18.6910	17.3391	16.2083	
Non living	14.7639	15.2786	16.1460	17.3431	18.4297	19.3083	19.7263	19.6693	19.0197	17.6319	16.0386	14.6895	
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	19.9964	19.9997	20.0030	20.0196	20.0230	20.0397	20.0397	20.0430	20.0330	20.0230	20.0163	20.0096	(88)
util rest of house	0.7938	0.7591	0.7117	0.6303	0.5313	0.4085	0.3029	0.3324	0.4890	0.6560	0.7538	0.8013	(89)
MIT 2	19.9964	19.9997	20.0030	20.0196	20.0230	20.0397	20.0397	20.0430	20.0330	20.0230	20.0163	20.0096	(90)
Living area fraction									fLA = Living area / (4) =			0.4671	(91)
MIT	20.4651	20.4669	20.4687	20.4775	20.4793	20.4882	20.4882	20.4900	20.4846	20.4793	20.4757	20.4722	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.4651	20.4669	20.4687	20.4775	20.4793	20.4882	20.4882	20.4900	20.4846	20.4793	20.4757	20.4722	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.7996	0.7658	0.7200	0.6413	0.5466	0.4303	0.3324	0.3617	0.5101	0.6686	0.7616	0.8068	(94)
Useful gains	545.1564	591.2584	607.7240	600.8709	542.3378	423.6683	313.0941	318.1031	414.0155	481.3483	508.6204	528.3033	(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	1730.5281	1660.3651	1484.4057	1207.5478	912.2384	600.2555	396.3711	415.3335	655.8834	1026.5371	1400.3634	1716.4006	(97)
Space heating kWh	881.9165	718.4397	652.2512	436.8074	275.2061	0.0000	0.0000	0.0000	0.0000	405.6205	642.0550	883.9444	(98a)
Space heating requirement - total per year (kWh/year)												4896.2408	
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	881.9165	718.4397	652.2512	436.8074	275.2061	0.0000	0.0000	0.0000	0.0000	405.6205	642.0550	883.9444	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4896.2408	
Space heating per m2										(98c) / (4) =		50.5601	(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 %) 284.6584 (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	881.9165	718.4397	652.2512	436.8074	275.2061	0.0000	0.0000	0.0000	0.0000	405.6205	642.0550	883.9444	(98)
Space heating efficiency (main heating system 1)	284.6584	284.6584	284.6584	284.6584	284.6584	0.0000	0.0000	0.0000	0.0000	284.6584	284.6584	284.6584	(210)
Space heating fuel (main heating system)	309.8157	252.3866	229.1347	153.4497	96.6794	0.0000	0.0000	0.0000	0.0000	142.4937	225.5528	310.5281	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	275.5373	243.6290	258.5498	226.4917	219.0294	196.7787	193.7005	201.6632	204.1926	228.4103	243.7785	272.4037	(64)
Efficiency of water heater												178.1250	(216)
(217)m	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250	178.1250	(217)
Fuel for water heating, kWh/month	154.6876	136.7742	145.1507	127.1532	122.9638	110.4722	108.7441	113.2145	114.6344	128.2303	136.8581	152.9284	(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	17.9097	16.1765	17.9097	17.3319	17.9097	17.3319	17.9097	17.9097	17.3319	17.9097	17.3319	17.9097	(231)
Lighting	29.9196	24.0026	21.6117	15.8337	12.2304	9.9923	11.1570	14.5022	18.8370	24.7151	27.9157	30.7512	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-42.8838	-70.8568	-119.0577	-147.5408	-163.4757	-139.4194	-137.0005	-126.3726	-105.4923	-85.0566	-49.6263	-35.5201	(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	-12.8269	-33.6527	-86.6434	-163.4992	-247.9265	-275.3006	-267.9736	-210.0344	-132.9717	-56.3629	-18.8025	-9.4770	(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												1720.0406	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												178.1250	
Water heating fuel used												1551.8117	(219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.6710)		
mechanical ventilation fans (SFP = 0.6710)	210.8719	(230a)
Total electricity for the above, kWh/year	210.8719	(231)
Electricity for lighting (calculated in Appendix L)	241.4686	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2737.7741	(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	986.4187	(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	1720.0406	0.1539	264.6981	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1551.8117	0.1410	218.7451	(264)
Space and water heating			483.4432	(265)
Pumps, fans and electric keep-hot	210.8719	0.1387	29.2505	(267)
Energy for lighting	241.4686	0.1443	34.8514	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1222.3028	0.1334	-163.0324	
PV Unit electricity exported	-1515.4713	0.1200	-181.8868	
Total			-344.9191	(269)
Total CO2, kg/year			202.6260	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.0900	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1720.0406	1.5697	2700.0088	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1551.8117	1.5212	2360.6563	(278)
Space and water heating			5060.6651	(279)
Pumps, fans and electric keep-hot	210.8719	1.5128	319.0071	(281)
Energy for lighting	241.4686	1.5338	370.3726	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1222.3028	1.4929	-1824.7973	
PV Unit electricity exported	-1515.4713	0.4402	-667.1059	
Total			-2491.9033	(283)
Total Primary energy kWh/year			3258.1415	(286)
Dwelling Primary energy Rate (DPER)			33.6400	(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)	
Ground floor	48.4200 (1b)	x	2.5000 (2b)	=	121.0500	(1b) - (3b)
First floor	48.4200 (1c)	x	2.8200 (2c)	=	136.5444	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 96.8400						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	257.5944	(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)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1165	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3665	(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) =	0.3390	(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	0.4322	0.4237	0.4152	0.3729	0.3644	0.3220	0.3220	0.3136	0.3390	0.3644	0.3813	0.3983	(22b)
Effective ac	0.5934	0.5898	0.5862	0.5695	0.5664	0.5519	0.5519	0.5492	0.5575	0.5664	0.5727	0.5793	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.9200	1.0000	1.9200			(26)
TER Opening Type (Uw = 1.20)			22.3000	1.1450	25.5344			(27)
Heatloss Floor 1			48.4200	0.1300	6.2946			(28a)
External Wall 1	167.8500	24.2200	143.6300	0.1800	25.8534			(29a)
External Roof 1	48.4200		48.4200	0.1100	5.3262			(30)
Total net area of external elements Aum(A, m2)			264.6900					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		64.9286			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 19.0762 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	15.1100	0.0500	0.7555
E3 Sill	14.2000	0.0500	0.7100
E4 Jamb	35.0200	0.0500	1.7510
E5 Ground floor (normal)	31.5500	0.1600	5.0480
E6 Intermediate floor within a dwelling	31.5500	0.0000	0.0000
E16 Corner (normal)	31.8000	0.0900	2.8620
E17 Corner (inverted - internal area greater than external area)	10.6000	-0.0900	-0.9540
E15 Flat roof with parapet	31.0000	0.5600	17.3600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 27.5325 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 92.4611 (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	50.4424	50.1341	49.8319	48.4125	48.1470	46.9107	46.9107	46.6818	47.3869	48.1470	48.6842	49.2458	(38)
Heat transfer coeff	142.9034	142.5951	142.2930	140.8736	140.6080	139.3718	139.3718	139.1429	139.8480	140.6080	141.1452	141.7069	(39)
Average = Sum(39)m / 12 =												140.8723	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4757	1.4725	1.4694	1.4547	1.4520	1.4392	1.4392	1.4368	1.4441	1.4520	1.4575	1.4633	(40)
HLP (average)												1.4547	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.7083 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	69.6288	68.5824	67.0576	64.1402	61.9872	59.5863	58.2215	59.7348	61.3936	63.9715	66.9516	69.3620	(42a)
Hot water usage for baths	30.0659	29.6194	28.9906	27.8312	26.9631	26.0004	25.4805	26.1049	26.7847	27.8148	28.9980	29.9642	(42b)
Hot water usage for other uses	42.3655	40.8250	39.2844	37.7438	36.2033	34.6627	34.6627	36.2033	37.7438	39.2844	40.8250	42.3655	(42c)
Average daily hot water use (litres/day)												130.5854	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	142.0602	139.0267	135.3326	129.7152	125.1536	120.2494	118.3647	122.0429	125.9222	131.0707	136.7746	141.6918	(44)
Energy conte	224.9887	197.9722	208.0012	177.5737	168.4808	147.8607	143.1519	151.1146	155.2746	177.8617	194.8605	221.8551	(45)
Energy content (annual)										Total = Sum(45)m =		2168.9955	
Distribution loss (46)m = 0.15 x (45)m	33.7483	29.6958	31.2002	26.6361	25.2721	22.1791	21.4728	22.6672	23.2912	26.6793	29.2291	33.2783	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	271.5836	240.0579	254.5961	222.6655	215.0757	192.9525	189.7468	197.7095	200.3665	224.4566	239.9523	268.4500	(62)
WWHRS	-31.8314	-28.1519	-29.4791	-24.4098	-22.7491	-19.4666	-18.2468	-19.4036	-20.1409	-23.7438	-26.8989	-31.2419	(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	239.7522	211.9060	225.1170	198.2557	192.3266	173.4859	171.5000	178.3059	180.2256	200.7127	213.0534	237.2081	(64)
										Total per year (kWh/year) = Sum(64)m =		2421.8491	(64)
12Total per year (kWh/year)												2422	(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	112.0846	99.4943	106.4363	95.1167	93.2958	85.2371	84.8739	87.5215	87.7023	96.4149	100.8646	111.0427	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	135.4142	135.4142	135.4142	135.4142	135.4142	135.4142	135.4142	135.4142	135.4142	135.4142	135.4142	135.4142	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	126.6590	140.2296	126.6590	130.8810	126.6590	130.8810	126.6590	126.6590	130.8810	126.6590	130.8810	126.6590	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													

	251.1156	253.7214	247.1549	233.1756	215.5292	198.9440	187.8641	185.2583	191.8249	205.8042	223.4506	240.0357 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	36.5414	36.5414	36.5414	36.5414	36.5414	36.5414	36.5414	36.5414	36.5414	36.5414	36.5414	36.5414 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
	-108.3314	-108.3314	-108.3314	-108.3314	-108.3314	-108.3314	-108.3314	-108.3314	-108.3314	-108.3314	-108.3314	-108.3314 (71)
Water heating gains (Table 5)												
	150.6514	148.0571	143.0596	132.1066	125.3975	118.3849	114.0779	117.6365	121.8087	129.5900	140.0897	149.2510 (72)
Total internal gains												
	595.0503	608.6323	583.4977	562.7873	534.2100	511.8342	492.2252	493.1781	508.1388	528.6774	561.0455	582.5700 (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	4.5000	10.6334	0.6300	0.7000	0.7700	14.6237	(74)
East	11.0100	19.6403	0.6300	0.7000	0.7700	66.0855	(76)
South	1.5800	46.7521	0.6300	0.7000	0.7700	22.5751	(78)
West	5.2100	19.6403	0.6300	0.7000	0.7700	31.2721	(80)

Solar gains	134.5564	255.3709	408.2317	586.9430	718.8265	737.2600	701.2117	601.4415	471.0785	299.1323	166.1929	111.7602 (83)
Total gains	729.6067	864.0033	991.7294	1149.7304	1253.0364	1249.0942	1193.4370	1094.6196	979.2173	827.8097	727.2384	694.3301 (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	3.5909	3.5987	3.6063	3.6426	3.6495	3.6819	3.6819	3.6879	3.6693	3.6495	3.6356	3.6212	
alpha	1.2394	1.2399	1.2404	1.2428	1.2433	1.2455	1.2455	1.2459	1.2446	1.2433	1.2424	1.2414	
util living area													
	0.8281	0.7909	0.7404	0.6598	0.5660	0.4611	0.3733	0.4071	0.5504	0.7033	0.7944	0.8362	(86)
MIT	15.7501	16.2412	17.0701	18.1771	19.2112	20.0477	20.4947	20.4131	19.7204	18.3692	16.8765	15.6571	(87)
Th 2	19.7058	19.7082	19.7106	19.7216	19.7237	19.7334	19.7334	19.7352	19.7297	19.7237	19.7195	19.7151	(88)
util rest of house													
	0.8142	0.7744	0.7193	0.6308	0.5251	0.4015	0.2918	0.3258	0.4938	0.6712	0.7754	0.8231	(89)
MIT 2	14.0335	14.6080	15.5782	16.8638	18.0392	18.9610	19.4141	19.3467	18.6361	17.1187	15.3747	13.9286	(90)
Living area fraction										fLA = Living area / (4) =		0.4671	(91)
MIT	14.8353	15.3708	16.2750	17.4772	18.5866	19.4685	19.9188	19.8448	19.1425	17.7027	16.0761	14.7359	(92)
Temperature adjustment												0.0000	
adjusted MIT	14.8353	15.3708	16.2750	17.4772	18.5866	19.4685	19.9188	19.8448	19.1425	17.7027	16.0761	14.7359	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.7383	0.6973	0.6450	0.5679	0.4825	0.3877	0.3048	0.3336	0.4633	0.6057	0.6998	0.7479	(94)
Useful gains	538.6916	602.4443	639.6224	652.8999	604.6450	484.2285	363.7903	365.1457	453.6484	501.3649	508.9196	519.2736	(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													
	1505.5273	1493.0812	1390.9172	1208.2981	968.3095	678.5349	462.5461	479.3147	705.1823	998.7019	1266.9392	1493.0122	(97)
Space heating kWh													
	719.3258	598.5080	558.9633	399.8868	270.5664	0.0000	0.0000	0.0000	0.0000	370.0187	545.7741	724.4615	(98a)
Space heating requirement - total per year (kWh/year)												4187.5045	
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													
	719.3258	598.5080	558.9633	399.8868	270.5664	0.0000	0.0000	0.0000	0.0000	370.0187	545.7741	724.4615	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4187.5045	
Space heating per m2											(98c) / (4) =	43.2415	(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													
	719.3258	598.5080	558.9633	399.8868	270.5664	0.0000	0.0000	0.0000	0.0000	370.0187	545.7741	724.4615	(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)													
	779.3345	648.4377	605.5941	433.2468	293.1380	0.0000	0.0000	0.0000	0.0000	400.8870	591.3046	784.8987	(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													
	239.7522	211.9060	225.1170	198.2557	192.3266	173.4859	171.5000	178.3059	180.2256	200.7127	213.0534	237.2081	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.3651	86.2563	86.0148	85.6001	84.8251	79.8000	79.8000	79.8000	79.8000	85.4123	86.0744	86.3965	(217)
Fuel for water heating, kWh/month													
	277.6032	245.6702	261.7190	231.6068	226.7330	217.4009	214.9123	223.4410	225.8466	234.9927	247.5223	274.5575	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	26.3172	21.1127	19.0096	13.9273	10.7578	8.7892	9.8136	12.7561	16.5690	21.7394	24.5546	27.0487	(232)

Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-44.4142	-62.1696	-88.7317	-99.0284	-106.1445	-98.8118	-97.5406	-92.3579	-83.1693	-70.6854	-48.6490	-38.4470 (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	-26.4822	-55.5416	-110.0998	-164.9589	-217.7536	-218.6942	-216.1672	-183.2381	-134.5553	-79.3525	-35.3286	-20.9585 (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	4536.8413	(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	2882.0054	(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)	212.3952	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2393.2798	(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	5323.9621	(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	4536.8413	0.2100	952.7367	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2882.0054	0.2100	605.2211	(264)
Space and water heating			1557.9578	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	212.3952	0.1443	30.6552	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-930.1493	0.1347	-125.3360	
PV Unit electricity exported	-1463.1305	0.1260	-184.3010	
Total			-309.6370	(269)
Total CO2, kg/year			1290.9053	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.3300	(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	4536.8413	1.1300	5126.6307	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2882.0054	1.1300	3256.6661	(278)
Space and water heating			8383.2968	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	212.3952	1.5338	325.7788	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-930.1493	1.4980	-1393.3783	
PV Unit electricity exported	-1463.1305	0.4624	-676.5154	
Total			-2069.8937	(283)
Total Primary energy kWh/year			6769.2827	(286)
Target Primary Energy Rate (TPER)			69.9000	(287)

Full SAP Calculation Printout

Property Reference	Maisonette__Copy_Copy	**Issued on Date**	29/08/2024
Assessment Reference	Maisonette__Copy	**Prop Type Ref**	
Property			

SAP Rating	90 B	**DER**	2.18	**TER**	12.77
Environmental	99 A	**% DER < TER**			82.93
CO_2 Emissions (t/year)	0.06	**DFEE**	33.11	**TFEE**	37.09
Compliance Check	See BREL	**% DFEE < TFEE**			10.71
% DPER < TPER	51.89	**DPER**	32.18	**TPER**	66.89

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	61.7000	(1b)	x 2.5000	(2b) =	154.2500	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	154.2500	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2000	(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) =	0.1700	(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	0.2167	0.2125	0.2083	0.1870	0.1827	0.1615	0.1615	0.1573	0.1700	0.1827	0.1913	0.1998	(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	0.3162	0.3120	0.3077	0.2865	0.2823	0.2610	0.2610	0.2568	0.2695	0.2823	0.2907	0.2993	(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	
Window (Uw = 0.90)			10.3600	0.8687	9.0000			(27)
door			1.9200	1.0000	1.9200			(26)
Heatloss Floor 1			61.7000	0.1000	6.1700	0.0000	0.0000	(28a)
External Wall 1	56.3200	12.2800	44.0400	0.1800	7.9272	0.0000	0.0000	(29a)
Total net area of external elements Aum(A, m2)			118.0200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	25.0172			(33)
Party Wall 1			26.6500	0.0000	0.0000	70.0000	1865.5000	(32)
Party Floor 1			61.7000			80.0000	4936.0000	(32d)
Party Ceiling 1			61.7000			30.0000	1851.0000	(32b)
Internal Wall 1			50.0000			9.0000	450.0000	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	9102.5000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		147.5284 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E18 Party wall between dwellings	15.0000	0.0250	0.3750	
P1 Party wall - Ground floor	10.6600	0.0500	0.5330	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.6600	0.0000	0.0000	
E1 Steel lintel with perforated steel base plate	6.9100	0.0200	0.1382	
E7 Party floor between dwellings (in blocks of flats)	22.5300	0.0580	1.3067	
E3 Sill	5.9800	0.0300	0.1794	
E4 Jamb	18.9600	0.1200	2.2752	
E5 Ground floor (normal)	22.5300	0.1000	2.2530	
E16 Corner (normal)	5.0000	0.1270	0.6350	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.6955 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 32.7127 (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	16.0979	15.8816	15.6652	14.5836	14.3672	13.2856	13.2856	13.0692	13.7182	14.3672	14.7999	15.2326	(38)
Heat transfer coeff	48.8107	48.5943	48.3780	47.2963	47.0800	45.9983	45.9983	45.7820	46.4310	47.0800	47.5126	47.9453	(39)

Average = Sum(39)m / 12 = 47.2422

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7911	0.7876	0.7841	0.7666	0.7630	0.7455	0.7455	0.7420	0.7525	0.7630	0.7701	0.7771	(40)
HLP (average)												0.7657	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.0293 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	58.2438	57.3685	56.0930	53.6526	51.8517	49.8433	48.7017	49.9675	51.3551	53.5115	56.0043	58.0206	(42a)
Hot water usage for baths	25.1700	24.7961	24.2697	23.2992	22.5724	21.7665	21.3312	21.8539	22.4231	23.2854	24.2760	25.0849	(42b)
Hot water usage for other uses	35.4117	34.1240	32.8363	31.5486	30.2609	28.9732	28.9732	30.2609	31.5486	32.8363	34.1240	35.4117	(42c)

Average daily hot water use (litres/day) 109.2278 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	118.8255	116.2887	113.1991	108.5004	104.6850	100.5831	99.0062	102.0824	105.3268	109.6333	114.4043	118.5172	(44)
Energy conte	188.1905	165.5935	173.9828	148.5316	140.9261	123.6786	119.7394	126.3994	129.8785	148.7713	162.9899	185.5693	(45)
Energy content (annual)										Total = Sum(45)m =		1814.2510	
Distribution loss (46)m = 0.15 x (45)m	28.2286	24.8390	26.0974	22.2797	21.1389	18.5518	17.9609	18.9599	19.4818	22.3157	24.4485	27.8354	(46)
Water storage 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	207.7763	183.2839	193.5686	167.4856	160.5119	142.6326	139.3252	145.9852	148.8325	168.3571	181.9439	205.1551	(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	207.7763	183.2839	193.5686	167.4856	160.5119	142.6326	139.3252	145.9852	148.8325	168.3571	181.9439	205.1551	(64)
										Total per year (kWh/year) = Sum(64)m =		2044.8580	(64)
12Total per year (kWh/year)												2045	(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	62.5733	55.0598	57.8493	49.3868	46.8579	41.1231	39.8134	42.0278	43.1846	49.4665	54.1942	61.7018	(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	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	92.3959	102.2954	92.3959	95.4757	92.3959	95.4757	92.3959	92.3959	95.4757	92.3959	95.4757	92.3959	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	177.2131	179.0520	174.4180	164.5527	152.0996	140.3954	132.5763	130.7374	135.3714	145.2367	157.6898	169.3940	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	(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)	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	(71)
Water heating gains (Table 5)	84.1039	81.9343	77.7544	68.5927	62.9811	57.1155	53.5126	56.4890	59.9786	66.4872	75.2697	82.9325	(72)
Total internal gains	407.1520	416.7208	398.0073	382.0603	360.9157	346.4257	331.9238	333.0613	344.2648	357.5588	381.8743	398.1614	(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	1.7600	10.6334	0.3800	0.7000	0.7700	3.4498	(74)
East	6.3000	19.6403	0.3800	0.7000	0.7700	22.8088	(76)
West	2.3000	19.6403	0.3800	0.7000	0.7700	8.3270	(80)

Solar gains	34.5857	67.5011	111.5101	164.2869	203.5270	209.4818	198.9574	169.3118	130.1310	80.1207	43.0786	28.4806	(83)

Total gains	441.7377	484.2219	509.5175	546.3471	564.4427	555.9075	530.8812	502.3731	474.3958	437.6795	424.9528	426.6420	(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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	51.8016	52.0323	52.2649	53.4602	53.7059	54.9688	54.9688	55.2286	54.4566	53.7059	53.2168	52.7366	
alpha	4.4534	4.4688	4.4843	4.5640	4.5804	4.6646	4.6646	4.6819	4.6304	4.5804	4.5478	4.5158	
util living area													
	0.9690	0.9519	0.9211	0.8388	0.7040	0.5164	0.3786	0.4150	0.6353	0.8636	0.9474	0.9725	(86)
MIT	19.8985	20.0844	20.3380	20.6731	20.8838	20.9788	20.9960	20.9939	20.9454	20.6796	20.2618	19.8840	(87)
Th 2	20.2611	20.2641	20.2671	20.2824	20.2855	20.3008	20.3008	20.3039	20.2947	20.2855	20.2794	20.2732	(88)
util rest of house													
	0.9638	0.9440	0.9082	0.8142	0.6640	0.4641	0.3196	0.3539	0.5813	0.8372	0.9376	0.9679	(89)
MIT 2	18.9709	19.2060	19.5233	19.9384	20.1771	20.2852	20.2987	20.3005	20.2508	19.9557	19.4426	18.9617	(90)
Living area fraction										fLA = Living area / (4) =		0.4768	(91)
MIT	19.4132	19.6248	19.9118	20.2887	20.5141	20.6159	20.6312	20.6311	20.5820	20.3009	19.8332	19.4015	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4132	19.6248	19.9118	20.2887	20.5141	20.6159	20.6312	20.6311	20.5820	20.3009	19.8332	19.4015	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9565	0.9360	0.9011	0.8144	0.6772	0.4879	0.3476	0.3828	0.6039	0.8378	0.9305	0.9610	(94)
Useful gains	422.5051	453.2212	459.1241	444.9465	382.2331	271.2497	184.5314	192.3298	286.4686	366.6961	395.4235	410.0173	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	737.6872	715.5420	648.8351	538.6458	414.9667	276.7222	185.4263	193.7096	300.9657	456.7162	604.9881	728.8396	(97)
Space heating kWh													
	234.4955	176.2796	141.1450	67.4635	24.3538	0.0000	0.0000	0.0000	0.0000	66.9750	150.8865	237.2038	(98a)
Space heating requirement - total per year (kWh/year)												1098.8026	
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													
	234.4955	176.2796	141.1450	67.4635	24.3538	0.0000	0.0000	0.0000	0.0000	66.9750	150.8865	237.2038	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1098.8026	
Space heating per m2											(98c) / (4) =	17.8088	(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													
	234.4955	176.2796	141.1450	67.4635	24.3538	0.0000	0.0000	0.0000	0.0000	66.9750	150.8865	237.2038	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	234.4955	176.2796	141.1450	67.4635	24.3538	0.0000	0.0000	0.0000	0.0000	66.9750	150.8865	237.2038	(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													
	207.7763	183.2839	193.5686	167.4856	160.5119	142.6326	139.3252	145.9852	148.8325	168.3571	181.9439	205.1551	(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													
	81.5177	71.9085	75.9435	65.7103	62.9743	55.9596	54.6620	57.2749	58.3920	66.0522	71.3828	80.4893	(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	12.1869	11.0075	12.1869	11.7938	12.1869	11.7938	12.1869	12.1869	11.7938	12.1869	11.7938	12.1869	(231)
Lighting	18.8056	15.0866	13.5838	9.9521	7.6873	6.2806	7.0126	9.1152	11.8398	15.5344	17.5461	19.3283	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-24.4969	-40.7810	-68.7534	-84.2357	-92.4331	-84.4197	-82.8597	-75.7291	-62.4176	-48.2801	-28.3067	-20.2448	(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	-6.4535	-17.2798	-45.5250	-88.5643	-136.1237	-145.9803	-142.1259	-111.1637	-70.0624	-30.2863	-9.7093	-4.7536	(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												1098.8026	(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												802.2669	(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)	143.4911	(230a)
Total electricity for the above, kWh/year	143.4911	(231)
Electricity for lighting (calculated in Appendix L)	151.7723	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1520.9856	(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	675.3473	(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	1098.8026	0.1560	171.4413	(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)	802.2669	0.1413	113.3242	(264)
Space and water heating			284.7655	(265)
Pumps, fans and electric keep-hot	143.4911	0.1387	19.9040	(267)
Energy for lighting	151.7723	0.1443	21.9054	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-712.9578	0.1330	-94.8488	
PV Unit electricity exported	-808.0278	0.1200	-96.9766	
Total			-191.8254	(269)
Total CO2, kg/year			134.7495	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.1800	(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	1098.8026	1.5776	1733.5102	(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)	802.2669	1.5223	1221.3126	(278)
Space and water heating			2954.8228	(279)
Pumps, fans and electric keep-hot	143.4911	1.5128	217.0733	(281)
Energy for lighting	151.7723	1.5338	232.7934	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-712.9578	1.4916	-1063.4591	
PV Unit electricity exported	-808.0278	0.4402	-355.7180	
Total			-1419.1771	(283)
Total Primary energy kWh/year			1985.5124	(286)
Dwelling Primary energy Rate (DPER)			32.1800	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	61.7000 (1b)	x	2.5000 (2b)	=	154.2500	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 61.7000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	154.2500	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1297	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3797	(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) =	0.3227	(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	0.4115	0.4034	0.3953	0.3550	0.3469	0.3066	0.3066	0.2985	0.3227	0.3469	0.3630	0.3792	(22b)
Effective ac	0.5846	0.5814	0.5781	0.5630	0.5602	0.5470	0.5470	0.5446	0.5521	0.5602	0.5659	0.5719	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.9200	1.0000	1.9200			(26)
TER Opening Type (Uw = 1.20)			10.3600	1.1450	11.8626			(27)
Heatloss Floor 1			61.7000	0.1300	8.0210			(28a)
External Wall 1	56.3200	12.2800	44.0400	0.1800	7.9272			(29a)
Total net area of external elements Aum(A, m2)			118.0200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.7308			(33)
Party Wall 1			26.6500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 157.5284 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E18 Party wall between dwellings	15.0000	0.0600	0.9000
P1 Party wall - Ground floor	10.6600	0.0800	0.8528
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.6600	0.0000	0.0000
E1 Steel lintel with perforated steel base plate	6.9100	0.0500	0.3455
E7 Party floor between dwellings (in blocks of flats)	22.5300	0.0700	1.5771
E3 Sill	5.9800	0.0500	0.2990
E4 Jamb	18.9600	0.0500	0.9480
E5 Ground floor (normal)	22.5300	0.1600	3.6048
E16 Corner (normal)	5.0000	0.0900	0.4500

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.9772 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 38.7080 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	29.7600	29.5927	29.4287	28.6584	28.5143	27.8434	27.8434	27.7191	28.1018	28.5143	28.8059	29.1107	(38)
Heat transfer coeff	68.4680	68.3007	68.1367	67.3664	67.2223	66.5514	66.5514	66.4271	66.8098	67.2223	67.5138	67.8187	(39)

Average = Sum(39)m / 12 = 67.3657

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1097	1.1070	1.1043	1.0918	1.0895	1.0786	1.0786	1.0766	1.0828	1.0895	1.0942	1.0992	(40)
HLP (average)												1.0918	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.0293 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	58.2438	57.3685	56.0930	53.6526	51.8517	49.8433	48.7017	49.9675	51.3551	53.5115	56.0043	58.0206	(42a)
Hot water usage for baths	25.1700	24.7961	24.2697	23.2992	22.5724	21.7665	21.3312	21.8539	22.4231	23.2854	24.2760	25.0849	(42b)
Hot water usage for other uses	35.4117	34.1240	32.8363	31.5486	30.2609	28.9732	28.9732	30.2609	31.5486	32.8363	34.1240	35.4117	(42c)

Average daily hot water use (litres/day) 109.2278 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	118.8255	116.2887	113.1991	108.5004	104.6850	100.5831	99.0062	102.0824	105.3268	109.6333	114.4043	118.5172	(44)
Energy conte	188.1905	165.5935	173.9828	148.5316	140.9261	123.6786	119.7394	126.3994	129.8785	148.7713	162.9899	185.5693	(45)
Energy content (annual)										Total = Sum(45)m =		1814.2510	
Distribution loss (46)m = 0.15 x (45)m	28.2286	24.8390	26.0974	22.2797	21.1389	18.5518	17.9609	18.9599	19.4818	22.3157	24.4485	27.8354	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	234.7854	207.6792	220.5777	193.6235	187.5211	168.7704	166.3343	172.9943	174.9704	195.3662	208.0818	232.1642	(62)
WWHRS	-26.6266	-23.5488	-24.6589	-20.4186	-19.0294	-16.2836	-15.2633	-16.2309	-16.8476	-19.8615	-22.5006	-26.1335	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	208.1588	184.1304	195.9187	173.2049	168.4917	152.4869	151.0711	156.7633	158.1228	175.5047	185.5811	206.0307	(64)
									Total per year (kWh/year) = Sum(64)m =			2115.4650	(64)
12Total per year (kWh/year)												2115	(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	99.8493	88.7284	95.1252	85.4602	84.1339	77.1966	77.0893	79.3037	79.2581	86.7424	90.2676	98.9777	(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	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	92.3959	102.2954	92.3959	95.4757	92.3959	95.4757	92.3959	92.3959	95.4757	92.3959	95.4757	92.3959	(67)

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

	177.2131	179.0520	174.4180	164.5527	152.0996	140.3954	132.5763	130.7374	135.3714	145.2367	157.6898	169.3940 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463 (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)												
	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708 (71)
Water heating gains (Table 5)												
	134.2060	132.0363	127.8564	118.6948	113.0832	107.2175	103.6146	106.5910	110.0807	116.5892	125.3717	133.0346 (72)
Total internal gains												
	460.2540	469.8228	451.1094	435.1623	414.0177	396.5277	382.0259	383.1633	394.3669	410.6608	434.9763	451.2635 (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	1.7600	10.6334	0.6300	0.7000	0.7700	5.7195	(74)
East	6.3000	19.6403	0.6300	0.7000	0.7700	37.8146	(76)
West	2.3000	19.6403	0.6300	0.7000	0.7700	13.8053	(80)

Solar gains	57.3394	111.9098	184.8721	272.3703	337.4264	347.2988	329.8505	280.7012	215.7435	132.8318	71.4197	47.2178	(83)
Total gains	517.5934	581.7326	635.9815	707.5326	751.4441	743.8266	711.8763	663.8646	610.1104	543.4926	506.3960	498.4813	(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	39.4324	39.5290	39.6242	40.0773	40.1632	40.5681	40.5681	40.6440	40.4112	40.1632	39.9897	39.8100	
alpha	3.6288	3.6353	3.6416	3.6718	3.6775	3.7045	3.7045	3.7096	3.6941	3.6775	3.6660	3.6540	
util living area													
	0.9684	0.9509	0.9177	0.8378	0.7088	0.5392	0.4022	0.4459	0.6660	0.8726	0.9492	0.9720	(86)
MIT	19.4066	19.6432	19.9954	20.4457	20.7692	20.9378	20.9837	20.9762	20.8634	20.4391	19.8596	19.3708	(87)
Th 2	19.9929	19.9951	19.9973	20.0075	20.0094	20.0183	20.0183	20.0200	20.0149	20.0094	20.0056	20.0015	(88)
util rest of house													
	0.9621	0.9415	0.9018	0.8074	0.6579	0.4671	0.3164	0.3568	0.5950	0.8414	0.9378	0.9664	(89)
MIT 2	18.1576	18.4553	18.8937	19.4413	19.8040	19.9761	20.0110	20.0085	19.9117	19.4487	18.7384	18.1183	(90)
Living area fraction										fLA = Living area / (4) =		0.4768	(91)
MIT	18.7531	19.0217	19.4190	19.9202	20.2642	20.4347	20.4748	20.4699	20.3655	19.9209	19.2730	18.7155	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7531	19.0217	19.4190	19.9202	20.2642	20.4347	20.4748	20.4699	20.3655	19.9209	19.2730	18.7155	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9522	0.9301	0.8909	0.8044	0.6717	0.4985	0.3568	0.3985	0.6215	0.8383	0.9274	0.9571	(94)
Useful gains	492.8607	541.0952	566.6047	569.1621	504.7499	370.7789	254.0196	264.5463	379.2029	455.5983	469.6200	477.1082	(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													
	989.5787	964.5217	880.2584	742.3914	575.7046	388.3046	257.8748	270.3523	418.5967	626.5751	821.8458	984.4227	(97)
Space heating kWh													
	369.5582	284.5426	233.3584	124.7251	52.7903	0.0000	0.0000	0.0000	0.0000	127.2068	253.6026	377.4420	(98a)
Space heating requirement - total per year (kWh/year)												1823.2259	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	369.5582	284.5426	233.3584	124.7251	52.7903	0.0000	0.0000	0.0000	0.0000	127.2068	253.6026	377.4420	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1823.2259	
Space heating per m2											(98c) / (4) =	29.5499	(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													
	369.5582	284.5426	233.3584	124.7251	52.7903	0.0000	0.0000	0.0000	0.0000	127.2068	253.6026	377.4420	(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)													
	400.3881	308.2802	252.8259	135.1302	57.1942	0.0000	0.0000	0.0000	0.0000	137.8188	274.7590	408.9296	(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													
	208.1588	184.1304	195.9187	173.2049	168.4917	152.4869	151.0711	156.7633	158.1228	175.5047	185.5811	206.0307	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.3324	85.0323	84.4530	83.3359	81.7773	79.8000	79.8000	79.8000	79.8000	83.3499	84.7606	85.3990	(217)
Fuel for water heating, kWh/month													
	243.9388	216.5418	231.9856	207.8395	206.0372	191.0863	189.3121	196.4453	198.1488	210.5638	218.9475	241.2565	(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	19.1980	15.4014	13.8672	10.1597	7.8477	6.4116	7.1589	9.3054	12.0868	15.8586	17.9122	19.7316	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													

(233a)m	-29.1594	-41.2621	-59.5420	-67.2392	-72.7825	-68.0683	-67.2584	-63.3754	-56.5389	-47.3457	-32.1235	-25.1946	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-16.0111	-33.7357	-67.1402	-100.9560	-133.5837	-134.2254	-132.6153	-112.2161	-82.1807	-48.2485	-21.3814	-12.6546	(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	1975.3260	(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	2552.1032	(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)	154.9392	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1524.8385	(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	3243.5299	(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	1975.3260	0.2100	414.8185	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2552.1032	0.2100	535.9417	(264)
Space and water heating			950.7601	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	154.9392	0.1443	22.3625	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-629.8899	0.1345	-84.7134	
PV Unit electricity exported	-894.9486	0.1259	-112.6452	
Total			-197.3586	(269)
Total CO2, kg/year			787.6933	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.7700	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1975.3260	1.1300	2232.1184	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2552.1032	1.1300	2883.8766	(278)
Space and water heating			5115.9950	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	154.9392	1.5338	237.6509	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-629.8899	1.4970	-942.9727	
PV Unit electricity exported	-894.9486	0.4620	-413.4848	
Total			-1356.4575	(283)
Total Primary energy kWh/year			4127.2892	(286)
Target Primary Energy Rate (TPER)			66.8900	(287)

Full SAP Calculation Printout

Property Reference	Be Green_Copy	**Issued on Date**	29/08/2024
Assessment Reference	Be Green_Copy	**Prop Type Ref**	
Property			

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

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1. Overall dwelling characteristics

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

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2. Ventilation rate

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			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		6 * 10 =	60.0000	(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) =	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)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Window (Uw = 1.70)			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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	150.9156	147.9564	144.9973	130.2073	127.3089	113.8165	113.8165	111.3179	119.0136	127.3089	133.1608	139.0790	(38)

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:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.9000	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.0260	(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)
										Total per year (kWh/year) = Sum(64)m =		2761.5729	(64)
12Total per year (kWh/year)												2762	(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													
	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)

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

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) =		0.0992	(91)
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	(92)
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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	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												112.5000	(216)
(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	(217)
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)

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)	
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)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1004	(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	
TER Opaque door			3.8800	1.0000	3.8800			(26)
TER Opening Type (Uw = 1.20)			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
Total fabric heat loss (33) + (36) + (36a) = 107.6622 (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	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)
Heat transfer coeff	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)

Average = Sum(39)m / 12 = 183.1346

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	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)
HLP (average)												0.9289	
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)

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

Energy content (annual) Total = Sum(45)m = 2007.5275

Distribution loss (46)m = 0.15 x (45)m	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:
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	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)
12Total per year (kWh/year) 2556 (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	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	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)	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	0.7000	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	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)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, ni1,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										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)

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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												79.8000	(216)
(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)													
(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 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)

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)

Appendix E

GLA carbon emissions spreadsheet summary for new and refurbished dwellings

Part L 2021 Performance

Residential

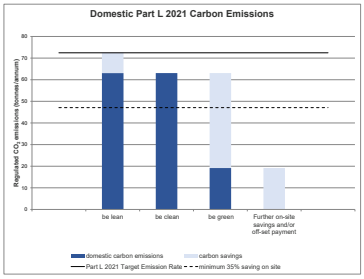
Table 1: Carbon Dioxide Emissions after each stage of the Energy Hierarchy for residential buildings

	Carbon Dioxide Emissions for residential buildings (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	72.4	13.4
After energy demand reduction (be lean)	63.1	13.4
After heat network connection (be clean)	63.1	13.4
After renewable energy (be green)	19.1	13.4

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	9.4	13%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	43.9	61%
Cumulative on site savings	**53.3**	**74%**
Annual savings from off-set payment	19.1	-
	(Tonnes CO_2)	
Cumulative savings for off-set payment	**574**	-
Cash in-lieu contribution (£)	**54,575**	

*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



Non-residential

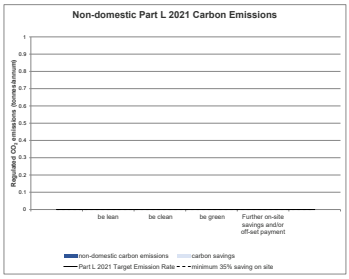
Table 3: Carbon Dioxide Emissions after each stage of the Energy Hierarchy for non-residential buildings

	Carbon Dioxide Emissions for non-residential buildings (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	0.0	
After energy demand reduction (be lean)	0.0	
After heat network connection (be clean)	0.0	
After renewable energy (be green)	0.0	

Table 4: Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for non-residential buildings

	Regulated non-residential carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Be lean: savings from energy demand reduction	0.0	0%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	0.0	0%
Total Cumulative Savings	**0.0**	**0%**
Annual savings from off-set payment	0.0	-
	(Tonnes CO_2)	
Cumulative savings for off-set payment	**0**	-
Cash in-lieu contribution (£)	**0**	

*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



SITE-WIDE

	Total regulated emissions (Tonnes CO_2 / year)	CO_2 savings (Tonnes CO_2 / year)	Percentage savings (%)
Part L 2021 baseline	72.4		
Be lean	63.1	9.4	13%
Be clean	63.1	0.0	0%
Be green	19.1	43.9	61%
Total Savings	-	53.3	74%
	-	**CO_2 savings off-set (Tonnes CO_2)**	-
Off-set	-	**574.5**	-

	Target Fabric Energy Efficiency (kWh/m²)	Dwelling Fabric Energy Efficiency (kWh/m²)	Improvement (%)
Development total	39.64	38.26	4%

	Area weighted non-residential cooling demand (MJ/m²)	Total non-residential cooling demand (MJ/year)
Actual		
Notional		

EUI & space heating demand (predicted energy use)

Residential

Building type	EUI (kWh/m²/year) (excluding renewable energy)	Space heating demand (kWh/m²/year) (excluding renewable energy)	EUI value from Table 4 of the guidance (kWh/m²/year) (excluding renewable energy)	Space heating demand from Table 4 of the guidance(kWh/m²/year) (excluding renewable energy)	Methodology used (e.g. 'be seen' methodology or an alternative predictive energy modelling methodology)	Explanatory notes (IF expected performance differs from the Table 4 values in the guidance)
Residential	56.6330548	18.91149787	35	15	Part L1 - SAP 10.2 & Other (provide details in column T) dwellings / & Landlord Circulation	PHPP calculations of unregulated energy uses, figures exceed the benchmark due to assumptions used at planning stage and assumed systems' efficiencies. Significant PV system size proposed will generate circa 64MWh of electricity per annum. This will be used on-site in houses and maisonettes and in communal areas of blocks of flats reducing overall energy demand. &

Non-residential

Building type	EUI (kWh/m²/year) (excluding renewable energy)	Space heating demand (kWh/m²/year) (excluding renewable energy)	EUI value from Table 4 of the guidance (kWh/m²/year) (excluding renewable energy)	Space heating demand from Table 4 of the guidance(kWh/m²/year) (excluding renewable energy)	Methodology used (e.g. 'be seen' methodology or an alternative predictive energy modelling methodology)	Explanatory notes (IF expected performance differs from the Table 4 values in the guidance)

Part L 2021 Performance

Residential

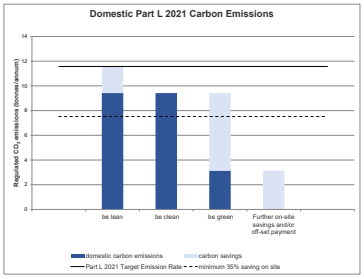
Table 1: Carbon Dioxide Emissions after each stage of the Energy Hierarchy for residential buildings

	Carbon Dioxide Emissions for residential buildings (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	11.6	0.8
After energy demand reduction (be lean)	9.4	0.8
After heat network connection (be clean)	9.4	0.8
After renewable energy (be green)	3.1	0.8

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	2.2	19%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	6.3	54%
Cumulative on site savings	**8.4**	**73%**
Annual savings from off-set payment	3.1	-
	(Tonnes CO_2)	
Cumulative savings for off-set payment	**94**	-
Cash in-lieu contribution (£)	**8,950**	

*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



Non-residential

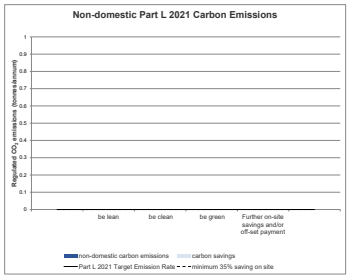
Table 3: Carbon Dioxide Emissions after each stage of the Energy Hierarchy for non-residential buildings

	Carbon Dioxide Emissions for non-residential buildings (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	0.0	
After energy demand reduction (be lean)	0.0	
After heat network connection (be clean)	0.0	
After renewable energy (be green)	0.0	

Table 4: Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for non-residential buildings

	Regulated non-residential carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Be lean: savings from energy demand reduction	0.0	0%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	0.0	0%
Total Cumulative Savings	**0.0**	**0%**
Annual savings from off-set payment	0.0	-
	(Tonnes CO_2)	
Cumulative savings for off-set payment	**0**	-
Cash in-lieu contribution (£)	**0**	

*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



SITE-WIDE

	Total regulated emissions (Tonnes CO_2 / year)	CO_2 savings (Tonnes CO_2 / year)	Percentage savings (%)
Part L 2021 baseline	11.6		
Be lean	9.4	2.2	19%
Be clean	9.4	0.0	0%
Be green	3.1	6.3	54%
Total Savings	-	8.4	73%
	-	**CO_2 savings off-set (Tonnes CO_2)**	-
Off-set	-	**94.2**	-

	Target Fabric Energy Efficiency (kWh/m²)	Dwelling Fabric Energy Efficiency (kWh/m²)	Improvement (%)
Development total	0.00	0.00	

	Area weighted non-residential cooling demand (MJ/m²)	Total non-residential cooling demand (MJ/year)
Actual		
Notional		

EUI & space heating demand (predicted energy use)

Residential

Building type	EUI (kWh/m²/year) (excluding renewable energy)	Space heating demand (kWh/m²/year) (excluding renewable energy)	EUI value from Table 4 of the guidance (kWh/m²/year) (excluding renewable energy)	Space heating demand from Table 4 of the guidance(kWh/m²/year) (excluding renewable energy)	Methodology used (e.g. 'be seen' methodology or an alternative predictive energy modelling methodology)	Explanatory notes (if expected performance differs from the Table 4 values in the guidance)
Residential	58.15797317	29.68277198	35	15	Part L1 - SAP 10.2 & Other (provide details in column T) dwellings / & Landlord Circulation	PHPP for unregulated energy use; space heating demand exceeds the benchmark figure due to the limited scope for improvement to building fabric (Grade II listed buildings). &

Non-residential

Building type	EUI (kWh/m²/year) (excluding renewable energy)	Space heating demand (kWh/m²/year) (excluding renewable energy)	EUI value from Table 4 of the guidance (kWh/m²/year) (excluding renewable energy)	Space heating demand from Table 4 of the guidance(kWh/m²/year) (excluding renewable energy)	Methodology used (e.g. 'be seen' methodology or an alternative predictive energy modelling methodology)	Explanatory notes (if expected performance differs from the Table 4 values in the guidance)