ENERGY STATEMENT

OCTOBER 2024

JAMESTOWN ROAD

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environmental building services

33-35 Jamestown Road, London, NW1 7DB and 211 Arlington Road, London, NW1 7HD

Energy Statement

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Issue / Revision Record

Issue	Date	By	Checked	Comment
P01	02.09.24	GO/JR	CD	Draft for review
P02	20.09.24	GO/JR	FTC	2nd Draft for review
P03	04.10.24	GO/JR	FTC	Final issue
P04	21.01.25	FTC	GO	Updated following Camden comments

Executive Summary

This Energy Statement has been prepared by Wallace Whittle on behalf of 4C - Jamestown Road Ltd (Freehold title BB23378) in support of an application for full planning permission for:

- Demolition of existing buildings and structures to facilitate the creation of a new building comprising basement, ground plus six storey building for a mix of Purpose Built Student Accommodation (Sui Generis), flexible commercial (Class E) and ground plus five Residential (Class C3) uses with ancillary plant, courtyards, access, hard and soft landscaping, cycle parking, highway works and all other works associated with the development.

The following areas of the proposed development were covered by the following approved software packages for Part L Volume 1 & 2 compliance calculations.

- PBSA – IES VE
- Domestic Element – SAP 10.2 (Elmhurst)

Sample floors of the PBSA and residential aspects were run using IES DSM for the purposes of an overheating analysis in line with TM59.

The Part L V1&2 carbon emission factors were used within this Energy Statement for the purpose of calculating Part L CO_2 emissions, and improvements against the Part L baseline at each stage of the energy hierarchy.

This report describes the assessment and proposals considered for reducing CO_2 emissions through energy efficiency measures, the efficient supply of heat and the use of on-site renewable energy technologies and taking into account of the site's characteristics and the local environment.

The Proposed Development CO_2 emission savings calculated are aligned to the adopted London Plan (2021)'s energy hierarchy. The London Plan sets the following zero-carbon targets for the development:

- CO_2 emissions savings of at least 15% from energy efficiency measures (Be Lean); and
- Total combined CO_2 emissions savings of at least 35% for all on-site carbon reduction measures including the Be Lean, Be Clean and Be Green design measures (with residential developments expected to be able to exceed this benchmark to 50%+).
- The difference between the total on-site emissions reduction and regulated zero-carbon must be reported and an offset payment agreed with the Local Authority's carbon offset fund.

The following summarises the proposed strategy at each energy hierarchy stage:

Be Lean

Airtightness - Target a low air permeability rate.
- Energy - less external air can make its way into the conditioned space, reducing uncontrolled heat loss and heat gain in the building.
- Thermal Comfort - reducing incoming cold external air creates a more pleasant internal environment for the occupants.
- General Occupant Wellbeing - external airborne pollutants are also kept out achieving an improved indoor air quality.

Solar Glass - The use of solar glass (low g-values) can further limit solar gains through the glazing itself.
- Daylighting - consideration of natural daylight access to daylight in all occupied areas.
- Visual Comfort and Overall Wellbeing - whilst allowing uncontrolled daylight to enter the space adds to beneficial solar gain in the winter, indirect or reflected external light can reduce the internal lighting requirement and improve overall visual environments for all occupants.

Efficient Lighting
- General lighting to be LED to minimise energy consumption from lighting.

Efficient Equipment
- Use energy efficient appliances and equipment wherever possible to reduce unregulated energy consumption.

Pumps and Fans
Low Energy Mixed Mode Ventilation Strategy (Using Mechanical Ventilation with Heat Recovery and openable windows to reduce overheating risk)
- Low energy MVHR has been recommended as an integral part of the energy strategy. This energy efficiency measure aims to provide an adequate indoor environment whilst also reducing the heat energy demand in the dwellings.
- Provide openable windows where possible to reduce overheating risk and reduce or remove any comfort cooling in the domestic element of the proposed development.

Wastewater Heat Recovery
- System incorporated to recover heat from showers of PBSA into supply water prior to heating to limit energy consumed to heat water.

Energy Monitoring
- An energy metering strategy to monitor energy use in the buildings. The proposals will allow for each dwelling to have an in-house display that shows their electricity usage.

Be Clean

The 'Be Clean' measures will not include connection to an existing or new district heating system.

In accordance with the London Plan Energy Guidance, the improvement achieved through the implementation of this system will be demonstrated within the Be Green section.

Be Green

After assessing the feasibility of the different Low and Zero Carbon (LZC) technologies; the following are recommended for the proposed development:

As mentioned in the previous section an Air Source Heat Pump to generate low carbon heat, to serve the buildings space heating and domestic hot water requirements has been proposed.

Photovoltaic Panel Array to generate renewable energy. At this stage, a 38.53 kWp system (Based on 94Nr 410 Wp Panels (182 m^2 Active area)) for the site with 62 panels being required for the PBSA to achieve the minimum London Plan requirements has been proposed based on the preliminary layout plan based on the available roof area. The panels will be incorporated into the roof design where they will operate at their maximum potential and not restrict other plant space or roof access.

Offset (Zero Carbon Standard)

On-site design measures to reduce the CO_2 emissions will be maximised and optimised limited only by the development constraints.

The calculations presented in this document show that if there is a shortfall to achieve the Zero Carbon target, this shortfall will be achieved by an offset payment in-lieu to the Camden offset fund.

Be Seen

The development is fully committed in recording, monitoring, and reporting actual energy consumption figures, with the aim of aligning design and in use operational energy in the path to Net Zero Carbon, under the requirements of the London Plan 2021.

The proposed energy strategy has been designed to meet London Borough of Camden and London Plan targets of zero carbon buildings, with a minimum on-site 45% reduction in regulated CO_2 emissions, for the whole development over 2013 Part L Building Regulations. **The on-site target has been achieved and reports a CO_2 emission reduction of 58% with a 19% through Be Lean measures and 39% through low or zero carbon generating technology.**

It should also be highlighted that by satisfying the above, the minimum requirements of Part L regarding carbon emissions, fabric energy efficiency and primary energy have been satisfied.

The table below summarises the regulated CO_2 emissions for the development.

	Regulated Carbon Dioxide Emissions		
	(Tonnes CO_2 per annum)	CO_2 Savings (Tonnes CO_2 per annum)	%
Part L 2021 Compliance baseline	51.1		
Be lean: Savings from energy demand reduction	41.4	9.7	19%
Be clean: Savings from heat network	41.4	0.0	0.0%
Be green: Savings from renewable energy	21.6	19.8	39%
Total Cumulative Savings	-	29.5	**58%**
Cumulative savings for offset payment	648.6 Tonnes CO_2		

Table 1 - Site Wide CO_2 Emissions Cumulative Savings

The cumulative off-set payment leads to a cash in-lieu contribution of £61,612 as per the GLA carbon emissions reporting tool, this is the cumulative savings for offset figure in tonnes of CO_2 quoted in the table above multiplied by £95 per tonne.

1.0 Introduction

1.1 General

This Energy Statement has been prepared by Wallace Whittle on behalf of 4C - Jamestown Road Ltd (Freehold title BB23378) in support of an application for full planning permission for:

- Demolition of existing buildings and structures to facilitate redevelopment comprising a Purpose Built Student Accommodation (Sui Generis) block over the basement, ground, plus six storeys and seventh-floor plant room with flexible commercial (Class E) on the ground floor and a residential (Class C3) block over the ground plus five storeys, each block has two private courtyards with hard and soft landscaping, cycle parking, and associated works.

To meet the net zero carbon target set out within the Greater London Authority guidance (The London Plan 2021 & Energy Assessment Guidance 2022), the development is required to achieve a minimum on-site carbon reduction of at least 35% (with residential developments expected to exceed this benchmark to 50%+) beyond the Building Regulations (Part L 2021) as per Policy SI2 of the London Plan.

This Energy Statement should be read in alongside the full suite of reports that have been prepared and submitted, particularly the Design and Access Statement, prepared Morris + Company and the Planning Statement, prepared by DP9.

1.2 Outline Project Description

The proposed Jamestown Road development comprises of buildings to deliver residential and purpose-built student accommodation (PBSA), and ancillary residential floorspace and/or non-residential floorspace, landscaping works and new external lighting; with associated utilities works incidental to the proposed development.

The development will deliver:

- Building 1 – (PBSA & Flexible Commercial) A total of 187 new student accommodation in a mix of room sizes and types, together with associated communal and private amenity spaces. This building will be assessed against Part L Volume 2 – Building other than dwellings.
- Building 2 (C3) – (Residential) A total of 27 mix tenure dwellings. This building will be assessed against Part L Volume 1 –Dwellings.

The proposal includes the following:

Proposed Key Figures	
Purpose Built Student Accommodation Units	187 Units
Residential Units	27 Units
Proposed Flexible Commercial (Class E) Floorspace (m^2)	326
Residential (Class C3) Floorspace (m^2)	2,816
Purpose Built Student Accommodation (Sui Generis) Floorspace (m^2)	6,459
Total Proposed Floorspace GIA (m^2)	9,601
Proposed Height and Storeys	56.37 m AOD (27.90 m above ground level building height from lowest FFL to highest top of plant) Ground plus six and five storey building

Table 1.2 - Jamestown Road Proposal Summary

1.3 Structure and Purpose of this Report

This Energy Statement has been prepared to provide an assessment of energy and carbon dioxide emission considerations relevant to the proposed development having regard to site specific considerations, including all national, regional and local planning policy framework as follows:

- Development Plan policies contained in:
  - London Plan (March 2021); and
  - Camden Local Plan (2017)
  - Camden Energy Efficiency CPG (January 2021)
  - National Planning Policy Framework (December 2023) (NPPF)

The National Planning Policy Framework, published in December 2023 and National Planning Practice Guidance (published first in 2014 and periodically updated on a topic by topic basis from time to time) are material considerations together with London Planning Guidance (“LPG”) and Supplementary Planning Guidance (“SPG”).

The following sections of this statement provide the following:

- Policy and Legislative Compliance.
- Energy Assessment Methodology.
- Energy Assessment (Which includes an Overheating Assessment).
- Energy Assessment Results.
- Conclusions.

1.4 Limitations

The information within this report reflects RIBA Stage 2 design information, and therefore a number of assumptions have been made in the absence of more detailed information. This will be refined and finalised through the detailed scheme design which will be developed in the subsequent stages.

2.0 Policy and Legislative Background

2.1 Planning Policy and Building Regulations Targets

The Proposed Development has been designed to meet sustainability and CO_2 targets outlined in the following table:

The summary presented below, provides a brief description of the regulatory (Building Regulations and Planning Policy) Energy and CO_2 emissions targets for the proposed development.

The key documents relevant for the proposed development are as follows:

- Approved Document L: Volumes 1 and 2 – Dwelling and Buildings other than dwellings
  - This Approved Document gives guidance on how to comply with Part L of schedule 1 to the Building Regulations and the energy efficiency requirements for dwellings and buildings other than dwellings.
  - Metrics to be reported are:
    - Target and Dwelling / Building Emission Factor (TER & DER / BER) in $kgCO_2/m^2$ per year.
    - Target and Dwelling Fabric Energy Efficiency (TFEE & DFEE) in kWh/m^2.
    - Target and Dwelling / Building Primary Energy Rate (TPER & DPER / BPER) in $kWh.PE/m^2$ per year.
- The London Plan, March 2021
  - The London Plan 2021 is the Spatial Development Strategy for Greater London. It sets out a framework for how London will develop over the next 20-25 years and the Mayor's vision for Good Growth.
  - Key policies affecting the energy approach from the London Plan: Policy SI2 Minimizing greenhouse gas emissions, Policy SI3 Energy Infrastructure and Policy SI4 Managing Heat Risk.
- Camden Local Plan 2017
  - The Local Plan provides a locally specific spatial policy framework for planning and development for the areas of the borough where the council is the local planning authority.

The key targets for the proposed development are:

- 50% improvement of over Part L 2021 and 15% from be lean measures (London Plan 2021, Policy SI2)
- 20% reduction in carbon dioxide emissions through on-site renewable energy generation
- Maximise Opportunities for PVs (London Plan 2021, Policy SI2)
- Allow for connection to future DHN (London Plan 2021, Policy SI3)
- Be Seen reporting (London Plan 2021, Policy SI2)

Policy/Guidance	Summary
Climate Change Act 2008	On 26th November 2008, the UK Government published the Climate Change Act 2008; the world's first long-term legally binding framework to mitigate against climate change. Within this framework, the Act sets legally binding targets to increase greenhouse gas emission reductions through action in the UK and abroad from the 60% target set out in the Energy White Paper, to 80% by 2050. As required under Section 34 of the Climate Change Act, the Fifth Annual Carbon Budget was accepted by the Government in June 2016. This sets out a budget for UK emissions for the period 2028 - 2032. Following a commitment in June 2019, the Climate Change Act has been amended to target net zero carbon emissions by 2050.
National Planning Policy Framework	An effective planning system is required to contribute to achieving sustainable development. The National Planning Policy Framework (NPPF), 2023, outlines what the government deems sustainable development in England. ▪ Paragraph 8: Achieving Sustainable development means that the planning system has three overarching objectives; a) economic objective b) social objective and c) environmental objective focused on mitigating and adapting to climate change, including moving to a low carbon economy. ▪ Paragraph 20: Strategic policies should make sufficient provision for planning measures to address climate change mitigation and adaptation. ▪ Paragraph 157: The planning system should support the transition to a low-carbon future in a changing climate. It should help to shape places in ways that contribute to radical reductions in greenhouse gas emissions and support renewable and low-carbon energy. ▪ Paragraph 159: New development should be planned for in ways that avoid increased vulnerability to the impacts arising from climate change and can help to reduce greenhouse carbon emissions. ▪ Paragraph 162: When determining planning applications for renewable and low carbon development, local planning authorities should recognize that even small-scale projects provide a valuable contribution to cutting greenhouse gas emissions and approve the application if its impacts are or can be made acceptable. Achieving sustainable development means that the planning system has three overarching activities, which are interdependent and need to be pursued in mutually supportive ways, so that opportunities can be taken to secure net gains across each of the different objectives: ▪ An **Economic Role** - ensuring the provision of land and infrastructure needed to help build a strong, responsive, and competitive economy. ▪ A **Social Role** - supplying the required amount of housing while at the same time ensuring and building strong, vibrant and healthy communities. Ensuring that the built environment is sited around accessible local services which help support a community's health, social and cultural well-being. ▪ An **Environmental Role** - ensuring development contributes to the protection and enhancement of the natural, built and historic environment through the improvement of biodiversity, minimising the use of natural resources and production of pollution / waste, and guaranteeing sufficient adaptation to climate change.
The London Plan (2021)	The London Plan 2021 is the Spatial Development Strategy for Greater London. It sets out a framework for how London will develop over the next 20-25 years and the Mayor's vision for Good Growth. **Policy SI 2 within the Chapter 9: Sustainable Infrastructure confirms the London principles for minimising greenhouse gas emissions.** "Major development should be net zero-carbon. This means reducing greenhouse gas emissions in operation and minimising both annual and peak energy demand in accordance with the following energy hierarchy: 1. Be lean: use less energy and manage demand during operation. 2. Be clean: exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly 3. Be green: maximise opportunities for renewable energy by producing, storing and using renewable energy on-Site 4. Be seen: monitor, verify and report on energy performance. " "Major development proposals should include a detailed energy strategy to demonstrate

Policy/Guidance	Summary
	how the zero-carbon target will be met within the framework of the energy hierarchy. “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.” “Where it is clearly demonstrated that the zero-carbon target cannot be fully achieved onsite, any shortfall should be provided, in agreement with the borough, either: 1. Through a cash in lieu contribution to the borough’s carbon offset fund, or 2. Off-site provided that an alternative proposal is identified and delivery is certain.” “Boroughs must establish and administer a carbon offset fund. Offset fund payments must be ring-fenced to implement projects that deliver carbon reductions. The operation of offset funds should be monitored and reported on annually.” “Boroughs should ensure that all developments maximise opportunities for on-site electricity and heat production from solar technologies (photovoltaic and thermal) and use innovative building materials and smart technologies.” “To meet the zero-carbon target, an on-site reduction of at least 35 per cent beyond the baseline of Part L of the current Building Regulations is required.” **Policy SI 3 Energy infrastructure** “A Boroughs and developers should engage at an early stage with relevant energy companies and bodies to establish the future energy and infrastructure requirements arising from large-scale development proposals such as Opportunity Areas, Town Centres, other growth areas or clusters of significant new development.” “B Energy masterplans should be developed for large-scale development locations (such as those outlined in Part A and other opportunities) which establish the most effective energy supply options. Energy masterplans should identify: 1. major heat loads (including anchor heat loads, with particular reference to sites such as universities, hospitals and social housing) 2. heat loads from existing buildings that can be connected to future phases of a heat network 3. major heat supply plant including opportunities to utilise heat from energy from waste plants 4. secondary heat sources, including both environmental and waste heat 5. opportunities for low and ambient temperature heat networks 6. possible land for energy centres and/or energy storage 7. possible heating and cooling network routes 8. opportunities for futureproofing utility infrastructure networks to minimise the impact from road works 9. infrastructure and land requirements for electricity and gas supplies 10. implementation options for delivering feasible projects, considering issues of procurement, funding and risk, and the role of the public sector 11. opportunities to maximise renewable electricity generation and incorporate demand-side response measures.” “C Development Plans should: 1. identify the need for, and suitable sites for, any necessary energy infrastructure requirements including energy centres, energy storage and upgrades to existing infrastructure 2. identify existing heating and cooling networks, identify proposed locations for future heating and cooling networks and identify opportunities for expanding and inter-connecting existing networks as well as establishing new networks.” “D Major development proposals within Heat Network Priority Areas should have a communal low-temperature heating system: 1. 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, meet the development’s electricity demand and provide demand response to the local electricity network) d) use ultra-low NOx gas boilers 2. CHP and ultra-low NOx gas boiler communal or district heating systems should be designed to ensure that they meet the requirements in Part B of Policy SI 1 Improving air quality 3. where a heat network is planned but not yet in existence the development should be designed to allow for the cost-effective connection at a later date.” “E Heat networks should achieve good practice design and specification standards for primary, secondary and tertiary systems comparable to those set out in the CIBSE/ADE Code of Practice CP1 or equivalent.” **Policy SI 4 Managing heat risk** “A Development proposal should minimise adverse impacts on the urban heat island through design, layout, orientation, materials and the incorporation of green infrastructure.” “B Major development proposals should demonstrate through an energy strategy how they will reduce the potential for internal overheating and reliance on air conditioning systems in accordance with the following cooling hierarchy: 1. reduce the amount of heat entering a building through orientation, shading, high albedo materials, fenestration, insulation and the provision of green infrastructure. 2. minimise internal heat generation through energy efficient design 3. manage the heat within the building through exposed internal thermal mass and high ceilings 4. provide passive ventilation 5. provide mechanical ventilation 6. provide active cooling systems.”
Greater London Authority (GLA) Energy Assessment Guidance (June 2022)	The June 2022 revision to the GLA guidance on preparing energy statements confirms the calculation methodology for new developments and refurbishments and sets an expectation for all referable applications to use Part L 2021 emissions factors. It also further clarifies the carbon emission targets required for all types of developments. The Document confirms the New London Plan energy efficiency targets which require new referable developments to achieve: ▪ Major developments are required to achieve a minimum of 35% on-site carbon reduction of Part L 2021.
Camden Local Plan 2017	**Policy CC1 Climate change mitigation** The Council will require all development to minimise the effects of climate change and encourage all developments to meet the highest feasible environmental standards that are financially viable during construction and occupation.

Policy/Guidance	Summary
	We will: a. promote zero carbon development and require all development to reduce carbon dioxide emissions through following the steps in the energy hierarchy; b. require all major development to demonstrate how London Plan targets for carbon dioxide emissions have been met; c. ensure that the location of development and mix of land uses minimise the need to travel by car and help to support decentralised energy networks; d. support and encourage sensitive energy efficiency improvements to existing buildings; e. require all proposals that involve substantial demolition to demonstrate that it is not possible to retain and improve the existing building; and f. expect all developments to optimise resource efficiency. For decentralised energy networks, we will promote decentralised energy by: g. working with local organisations and developers to implement decentralised energy networks in the parts of Camden most likely to support them; h. protecting existing decentralised energy networks (e.g. at Gower Street, Bloomsbury, King's Cross, Gospel Oak and Somers Town) and safeguarding potential network routes; and Camden Local Plan | Sustainability and climate change 251 i. requiring all major developments to assess the feasibility of connecting to an existing decentralised energy network, or where this is not possible establishing a new network. To ensure that the Council can monitor the effectiveness of renewable and low carbon technologies, major developments will be required to install appropriate monitoring equipment. All developments involving five or more dwellings and/or more than 500 sqm of (gross internal) any floorspace will be required to submit an energy statement demonstrating how the energy hierarchy has been applied to make the fullest contribution to CO_2 reduction. All new residential development will also be required to demonstrate a 19% CO_2 reduction below Part L 2013 Building Regulations (in addition to any requirements for renewable energy). This can be demonstrated through an energy statement or sustainability statement. The Council will expect developments of five or more dwellings and/or more than 500 sqm of any gross internal floorspace to achieve a 20% reduction in carbon dioxide emissions from on-site renewable energy generation (which can include sources of site related decentralised renewable energy), unless it can be demonstrated that such provision is not feasible. This is in line with stage three of the energy hierarchy 'Be green'. The 20% reduction should be calculated from the regulated CO_2 emissions of the development after all proposed energy efficiency measures and any CO2 reduction from non-renewable decentralised energy (e.g. CHP) have been incorporated. All major developments will also be expected to demonstrate how relevant London Plan targets for CO_2 reduction, including targets for renewable energy, have been met. Where it is demonstrated that the required London Plan reductions in carbon dioxide emissions cannot be met on site, the Council will require a financial contribution to an agreed borough wide programme to provide for local low carbon projects. The borough wide programme will be connected to key projects identified in the Council's Green Action for Change.

Policy/Guidance	Summary
Camden Planning Guidance Energy efficiency and adaption (January 2021)	The Council has prepared this Camden Planning Guidance (CPG) on Energy and resources to support the policies in the Camden Local Plan 2017. This guidance is therefore consistent with the Local Plan and forms a Supplementary Planning Document (SPD) which is an additional "material consideration" in planning decisions. This guidance provides information on key energy and resource issues within the borough and supports Local Plan Policies CC1 Climate change mitigation and CC2 Adapting to climate change.
'Be Seen' Energy Monitoring Guidance (September 2021)	▪ 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. ▪ 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. ▪ 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.
Building Regulations Part L 2021 with 2023 amendments	Part L of the Building Regulations relates to the conservation of fuel and power, and applies to both new and existing buildings. The current edition (2021 with 2023 amendments) covers the energy efficiency requirements of the building regulations as set out in Part L of Schedule 1 to the Building Regulations. **Approved Document L Volume 1 & 2** ▪ This provides the methodology for new build, domestic (Volume 1) and non-domestic (Volume 2) buildings to meet current energy efficiency standards, including backstop U-values, carbon dioxide emissions calculations and minimising the risk of overheating. Carbon dioxide emissions reductions are prescribed for 'regulated' emissions only, and relate to heating, hot water, lighting, auxiliary and cooling (where specified). Emissions from other equipment (computers, for example) are considered to be unregulated emissions, and are excluded from the analysis.

Table 2.1 - Policy and Target Summary

3.0 Energy Assessment Methodology

The following section describes the methodology and software used to assess the regulated energy performance of the development in line with the London Plan 2021 and Camden Local Plan 2017.

3.1 Methodology for Dwellings (SAP) & Non-Dwellings (SBEM & DSM)

The Standard Assessment Procedure (SAP), Simplified Building Energy Model and Dynamic Simulation Model (SBEM/DSM) is an analysis process used to estimate the environmental impact and energy consumption of a dwelling / non-dwelling so it can be assessed and compared with other dwellings/buildings. It is used to demonstrate compliance with the UK Building Regulations Part L Conservation of Fuel and Power. SAP and SBEM/DSM calculates the Target Emissions Rate (TER) and Primary Energy Rate (TPER) alongside the Dwelling/Building Emissions Rate (DER/BER) and Primary Energy Rate (DPER/BPER). Both metrics are then used to assess the dwelling/building performance based on these calculations. Building Regulations state that each building must have a (DER/BER) and (DPER/BPER) that equals or is lower than the (TER) and (TPER).

SAP/SBEM quantifies a dwelling or building performance in terms of energy use per unit floor area, a fuel cost-based energy efficiency rating (the SAP rating) and CO_2 emissions. It considers the energy needed to provide space heating, lighting, domestic hot water and cooling systems as well as estimating the heat loss through construction materials. The reports generated by SAP/SBEM/DSM provides engineers and architects with information to ensure that dwellings/buildings are built to the required efficiency standards. Importantly the calculations done at these early stages can be taken forward into full building regulations if the planning application is successful. SAP 10.2/SBEM/DSM software has been used for calculations within this assessment for Part L 2021 compliance.

3.2 Low Carbon Design Principles

This section presents the energy efficiency design measures evaluated and recommended to reduce the developments energy demand with the aim to create an energy efficient design solution. The implications in relation to Part L 2021 (Approved document Volume 1 and Volume 2) of the Building Regulations are explored with reference to the technical and functional feasibility of various energy efficiency measures. Figure 3.2.1 below illustrates the building and environmental considerations evaluated at this stage to develop the proposed energy strategy.

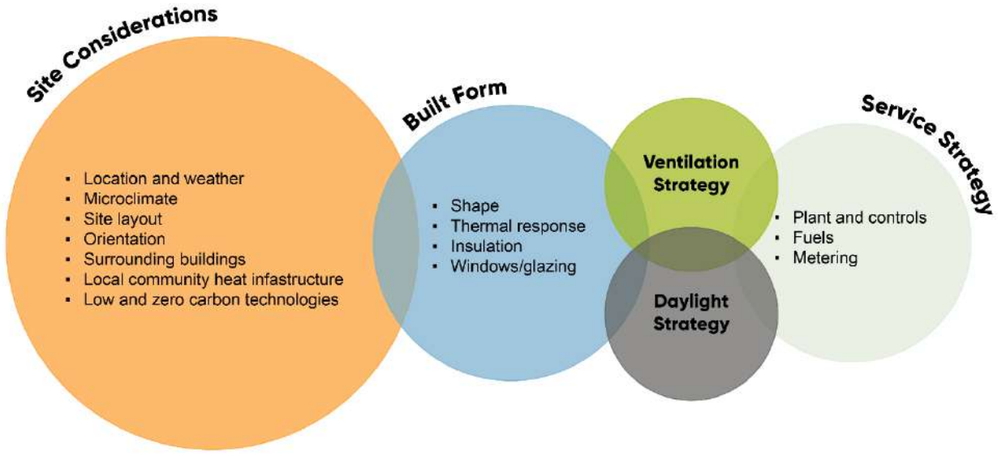

Figure 3.2.1 - CIBSE Guide F Concept Design (Source CIBSE Guide F 2012)

A preliminary design energy assessment was carried out to determine the key design principles to consider when developing a low carbon energy strategy. The sequence was carried out to develop the proposed energy strategy for the Jamestown Road in London.

- Understand the proposed developments regulated Energy demand by completing an energy demand assessment.
- Assess the impact of the proposed measures in terms of reduction of energy demand for the proposed building.
- Evaluate the efficiency of fixed building services against current UK Building Regulation Standards.
- Study the feasibility of implementing LZC technologies.

The “Energy Hierarchy” methodology described in the London Plan provides a design framework that was used to develop the low carbon energy strategy for the proposed development. The approach described by this methodology provides a stage process: BE LEAN, BE CLEAN, BE GREEN and BE SEEN (Illustrated in below) to assess energy efficiency design measures.

Each stage would focus on the following:

- Be Lean - Aim: to reduce the buildings energy demand through “passive design measures”. This step of the energy hierarchy focussed on a “Fabric First Approach”.
- Be Clean - Aim: to meet the reduced energy demand in the most efficient way possible using “active measures”.
- Be Green - Assess the technical feasibility of incorporating a low or zero carbon technology to further reduce the CO_2 emissions “green measures “.
- Be Seen - Monitor, verify and report on energy performance through the Mayor’s post construction monitoring platform.

Figure 3.2.2 - GLA Plan Energy Hierarchy

4.0 Energy Assessment

4.1 Energy Consumption and CO_2 Emissions Improvements

The energy consumption and CO_2 emissions are based on the entire Site emissions of the proposed development. The planning policy context advocates the Energy Hierarchy to ensure that carbon requirements are met in the most efficient manner when assessed against Part L of Building Regulations.

4.1.1 Baseline

The "Baseline" scenario incorporates Part L reference/notional U-values, air permeability rates, with natural ventilation and generic heating and cooling provided in the notional building specification.

The CO_2 emissions were calculated using the UK Government approved software (SAP 10.2 and SBEM/DSM) to generate the 'target' emissions for the residential elements as dictated by the Building Regulations Part L Volume 1 (for the domestic element) and Part L Volume 2(for the non-domestic element) 2021 of the Building Regulations.

4.2 Be Lean Measures

The 'Be Lean' measures proposed will reduce the energy consumption and CO_2 emissions for the proposed development, so the proposed dwellings achieve a substantial reduction beyond Part L without the reliance on 'Be Clean and Be Green' measures. The proposed development has focused on 'lean' design measures by maximising the opportunities available in energy efficient design.

The 'Be Lean' measures include:

- Improved U-values beyond minimum Part L compliance.
- Improve thermal bridging y-value.
- Improved glazing G-values beyond minimum Part L compliance.
- Significant reduction in Part L Air Permeability levels.
- Lean design measures were applied to the baseline design to reduce the overall energy demands.

4.2.1 Fabric Thermal Performance

The following table outlines the proposed thermal fabric performance requirements to ensure compliance with the minimum Fabric Energy Efficiency (FEE) requirements of Part L Volume 1 2021.

Element	Target Thermal Performance	
	New-Build Domestic Element	New-Build Non-Domestic Element
Ground / exposed upper floor	0.10 W/m²K	0.10 W/m²K
External walls	0.15 W/m²K	0.15 W/m²K
Main roof	0.10 W/m²K	0.10 W/m²K
Soffits	0.10 W/m²K	0.10 W/m²K
Window/Balcony Doors[1)]	1.20 W/m²K (g-value = 0.4; Frame Factor = 0.75) [4)]	1.20 W/m²K (g-value = 0.4; Light Transmittance Factor = 0.71; Average Frame Factor = 0.75)
External Solid Doors	N/A	1.20 W/m²K
Element	Target Thermal Performance	
	New-Build Domestic Element	New-Build Non-Domestic Element
Party walls between dwellings and heated circulation areas [2)]	(Cavity fully filled and sealed with insulation). Includes heated corridors, lobbies and stair cores.	N/A
Walls to risers/lift shafts/ Unheated elements.	0.20 W/m²K	N/A
Air permeability [3)]	3.0 m³/h/m²@50Pa All dwellings to be tested	3.0 m³/h/m²@50Pa
Thermal Bridging	Psi value calcs to be reviewed. Refer to Table 4.2.4 Below (Values TBC at detailed design)	10% Thermal Bridging Coefficient / Y-Value

Table 4.2.1 - Target Fabric Thermal Performance

Table Comments:

[1)] Window U_w value corresponds to the average frame and glazing value, not centre pane. It is important to define g values based on thermal comfort analysis. Using low g values worsens the SAP CO_2 calculations so should only be used where it is necessary to mitigate overheating.
[2)] Party walls that are fully sealed with no cavities, cavity sealed top and bottom, are defined as zero heat-loss. It is important that these walls are designed accordingly to meet the thermal and acoustic requirements. It applies to walls between apartments and apartment walls to a heated corridor or circulation space. Heating the corridor/stairwell typically improves the SAP calc by a significant margin.
[3)] All dwellings will require testing.
[4)] It should be noted that BFRC certified windows are to be considered at the next stages of design as part of the proposed thermal performance.

The materials constructions within the thermal model and SAP and SBEM are all compliant with the maximum U-values stipulated in the Building Regulations Part L 2021.

Specific attention should be given to compliance with Criterion 2 (Regulation 26A) of Part L Vol 1. This Criterion concerns the average Fabric Energy Efficiency Rate (FEE) of each residential dwelling within scheme and is assessed using SAP.

This regulation has been introduced into Part L Vol 1 to appropriately limit heat gains and losses through the building's structure by calculating the total CO_2 emissions arising from fabric performance. Similar to Criterion 1; the calculated Dwelling Fabric Energy Efficiency Rating (DFEE) rate must not be greater that the Target Fabric Energy Efficiency (TFEE).

The proposed fabric parameters confirm the Target Fabric Energy Efficiency Rating (TFEE) is achieved when assessed on a block average basis.

4.2.2 Residential Party Wall Definition

The SAP convention outlines criteria that categorise the u-value of party walls between dwellings and other heated spaces based on their construction type.

Our calculations have determined the party walls in the residential component of the development application design must qualify for the U = 0.00 W/m²K u-value to demonstrate compliance with the FEE criteria of Building Regulations Part L Vol 1 and London Plan 2021 with respect to the 'Be Lean' stage of the Energy Hierarchy. To achieve this a party wall must be considered fully filled and sealed top and bottom between two adjacent heated spaces.

4.2.3 Air Permeability

An Air permeability rate of 3.0 m³/(h.m²) @50Pa has been set for the domestic plots and a rate of 3.0 m³/(h.m²) @50Pa has been set for the non-domestic aspect in line with the current Part L Building Regulations.

It should be noted that each new-build dwelling and non-domestic aspect of the development will be required to be air tested in accordance with Part L.

4.2.4 Thermal Bridging

A thermal bridge (sometimes referred to as cold bridge) is an area of construction which has higher heat transfer than the surrounding materials. It typically occurs where there is a break in insulation, less insulation or insulation is penetrated by an element or material with higher thermal conductivity (such as a metal cladding bracket). Where these thermal bridges occur, there is additional heat loss from the fabric resulting in increased heating requirements and in some cases result in surface condensation. Careful and simplified construction details are required to ensure the junctions do not create unnecessary heat loss paths. Thermal bridges are potentially one of the main sources of unquantified thermal losses in low energy buildings. There are three types of thermal bridges:

- Repeating thermal bridge: which are usually evenly distributed over the building envelope and are a recurring feature. Examples include insulated cold pitched roofs at ceiling joists, insulated suspended timber floor at ground floor joists, timber frame constructions, steel wall ties in masonry walls or mortar joints in inner wall leaves. Heat loss associated with the repeating thermal bridges should be included in the u-value calculation of the construction element.

- Linear thermal bridge: Are most caused by discontinuities in the building envelope and can appear around openings such as windows and door openings, around loft hatches, rooflights, internal walls and floors junctions. Heat loss associated with linear thermal bridge is described as linear thermal transmittance (ψ (psi) – value (W/mK)).

- Nodal (Point) thermal bridge: depend on the shape of the structure and can appear as two-dimensional or three-dimensional, usually occurring at external wall corners, and at junctions including window and wall or door and wall junctions, wall and roof junctions, wall and floor junctions, or adjacent wall junctions. Heat loss associated with thermal bridge is described as point thermal transmittance (χ (chi) – value (W/K)).

In low energy or carbon building design the aim is to design out or limit these thermal bridges to a minimum. As a "thermal bridge free" design target is recommended. Typical linear thermal bridges occurring in a building are shown in the figure below. This figure below illustrates all typical linear thermal bridges.

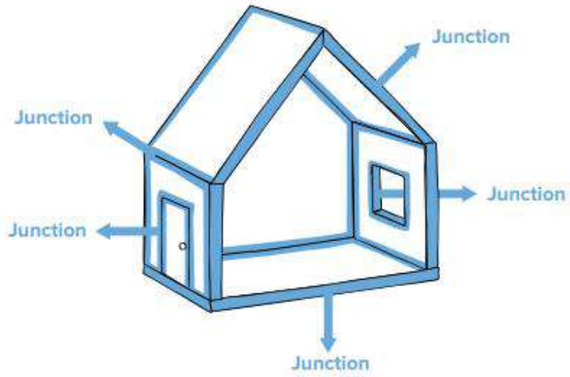

Figure 4.2.4.1 - Linear Thermal bridging (Ref: Thermal Bridging Guide: An introductory guide to thermal bridging in homes. Zero Carbon Hub)

Non-repeating thermal bridges can form up to 25% extra heat loss, the figure below illustrates the impact thermal bridges can have on the energy compliance calculations in a building. At this stage it is recommended to pay careful attention to all non-repeating thermal bridges to reduce heat demand in the proposed building and target thermal bridging Y-value is presented in the table below. It must be noted that this is subject to design development on the following stages of design.

Figure 4.2.4.2 - Thermal Bridging Impact in SAP (Ref: Thermal Bridging Guide, Zero Carbon Hub)

Junction Detail Applicable to the Whole Junction	Assumed Thermal Bridging Ψ (W/mK)
E2 – Other lintels (including other steel lintels)	0.03
E3 – Sill	0.03
E4 – Jamb	0.03
E5 – Ground Floor (normal)	0.10
E20 – Exposed floor (normal)	0.11
E21 – Exposed floor (inverted)	0.16
E6 – Intermediate floor within a dwelling	0.07
E7 – Party Floor between dwellings	0.1
E14 – Flat roof	0.08
E15 – Flat roof with parapet	0.20
E16 – Corner	0.09
E17 – Corner (inverted-internal area greater than external area)	-0.029
E18 – Party wall between dwellings	0.09
E24 – Eaves (insulation at ceiling level – inverted)	0.14
E25 – Staggered party wall between dwellings	0.24
P1 – Ground Floor	0.12
P7 – Party Wall – Exposed Floor (normal)	0.16
P5 – Roof (insulation at rafter level)	0.08

Table 4.2.4 - Domestic element Thermal bridging performance targets

To note that these figures have been used as an indicator for performance based on previous project experience and previous Accredited Construction Details. The actual fabric details are to be assessed during detailed design stage.

4.2.5 Ventilation

In addition to the measures discussed above, a mixed mode ventilation strategy which combines the energy efficiency of a mechanical ventilation with heat recovery (MVHR) system and natural ventilation through openable windows. This concept aims to fulfil ventilation requirements by reducing ventilation heat loss during the winter and during the summer windows provide passive cooling to achieve adequate comfort levels.

4.2.6 Cooling Hierarchy

The hierarchy to minimize the need for artificial cooling has been followed and is summarised as:

- Minimise internal heat generation (i.e. reduce the demand for cooling)
- Reduce the heat entering the building in summer
- Manage heat within the building Passive ventilation
- Mechanical ventilation
- Tempered air ventilation systems (include use of FCU's / Comfort cooling) as a final measure

The design for the development benefits from passive design solutions including reduction of single aspect apartments, deep reveals providing shading to domestic dwellings, windows glazing, g-values and other measures. The glazing has been specified with low g-values limiting the amount of heat entering dwellings as per Section 4.2.1.

When feasible, corridors will benefit from natural ventilation. The table below presents a response to the GLA Cooling Hierarchy for the proposed development.

Cooling Hierarchy	Jamestown Road Response
Reduce the amount of heat entering the building through orientation, shading, high albedo materials, fenestration, insulation and the provision of green infrastructure.	The proposals for the development include: ▪ High levels of insultation. ▪ External shading via external walkways and deep 225mm reveals. ▪ Reduced g-values to windows. At this stage a g-value of 0.4 has been applied to all windows.
Minimise internal heat generation through energy efficient design.	The proposals include the following measures: ▪ LED Lighting through the building to reduce heat gains. ▪ Insulated flow returns pipework to further reduce heat gains from LTHW circuits.
Manage the heat within the building through exposed internal thermal mass and high ceilings.	At this stage no exposed thermal mass has been accounted for due to the assumed finishes.
Provide passive ventilation.	Passive ventilation strategy (i.e. provision of openable windows) is to be used where acoustic/air quality constraints allow so.
Provide mechanical ventilation.	Mechanical Ventilation with Heat Recovery, summer bypass and summer boost must be incorporated for all dwellings/PBSA units proposed.
Provide active cooling systems.	The measures detailed above have been prioritised and are included in the design to reduce the buildings cooling requirements. However, due to acoustic constraints and security/safety concerns this building is subject to there is still a need for active cooling systems. The proposals include: ▪ All PBSA units on the Jamestown Road elevation require tempered ventilation. ▪ All residential units will require tempered ventilation. ▪ All PBSA units on all courtyard elevations will incorporate an individual MVHR unit with summer bypass and boost capability.

Table 4.2.6 - GLA Plan 2021 Cooling Hierarchy

4.2.7 General Lighting

It is recommended that all light fittings are specified as dedicated energy efficient lights (LED). For the Domestic elements the efficacy of all fittings should be >110lumens/circuit Watt.

For the non-domestic elements, the efficacy of all fittings should be >110lumens/circuit Watt. Appropriate controls such as PIR/ movement and daylight controls should be fitted where practical.

4.2.8 Solar Control Glazing

Solar controlled glazing with low g-values will limit the amount of solar gain transmittance into a dwelling. For compliance with Criterion 3 of Part L Building Regulations a g-value 0.40 for all windows has been used for the overheating calculation for the development.

The g-value also limits the impact of overheating within the dwelling and contributes to Fabric Energy Efficiency (FEE) compliance by reducing heat demand through the capitalisation of solar heat gains.

4.2.9 Fans, Pumps and Controls

Pumps and fans - Variable speed drives should be considered for pumps and fans to reduce energy consumption.

Energy monitoring – An energy sub-metering strategy is recommended to be used to monitor energy use in the building. This system will allow for an understanding of out-of-range values and any anomality's that could identify faults which may cause the building to use more energy.

4.2.10 Unregulated Energy

'Unregulated Emissions', i.e. those not covered by the Building Regulations assessments, are uncontrolled and are occupant led energy consumptions. The energy consumption and associated carbon dioxide emissions from corridor lighting, external lighting, small power and equipment within dwellings.

This report will detail the energy consumption associated with unregulated energy including for the following scenarios:

- Scenario 1: Dishwasher & Tumble Dryer included.
- Scenario 2: Dishwasher and no Tumber Dryer.
- Scenario 3: No Dishwasher and no Tumbler Dryer.

Each scenario accounts for unregulated energy associated with clothes washing, combined fridge/freezer, cooking, consumer electronics and small appliances.

As part of the GLA requirements, this report will cover in detail the Energy Use Intensity (EUI) which will include the unregulated energy as detailed above to demonstrate how the proposed development compares to the GLA target of 35 kWh/m^2.yr.

4.3 Be Clean Measures

The 'Be Clean' measures include provision for connection to existing district heating systems and local energy generation technologies. District heating works by the supply of hot water distributed from a central source, typically a CHP/heat-pump / Boiler set within a borough or large distribution centre as per London Plan 2021.

The mayor's adopted London Plan (2021) favour these heating systems as referenced within Policy SI 2 of the London Plan and Section 9.1 – 9.5 within the Energy Assessment Guidance because they offer:

- Potential economies of scale in respect of efficiency and therefore reduced carbon emissions.
- Better economic life cycle costs through efficiencies associated with planning and maintenance requirements.
- Increased opportunities for future proofing the development to react to energy supply market factors.
- Greater potential for further replacement with LZC technologies.
- Safety as no flue gases nor fuel explosion risk at customer premises.
- Reliability: Having several heat sources and looped networks interconnected, the reliability is very high.
- Maintenance: Centralised plant can be continuously monitored and pro-actively maintained.

The 'Be Clean' measures will not include connection to an existing or new district heating system as there are no existing DHN's in close proximity to this development.

The proposed site will allow for future connection to a District Heating Network.

4.3.1 District Heating and Cooling

The mayor has developed an online London Heat Map Tool which identifies key Decentralised Energy opportunities in the capital as shown below.

However, there are currently no existing or proposed district heating networks in the immediate area of the site. An extract from the London Heat Map has been highlighted in Figure 4.3.1 indicating the nearest proposed route. Therefore, the proposal includes measures for a future heat network connection, with the provision of spatial planning for a future heat exchanger.

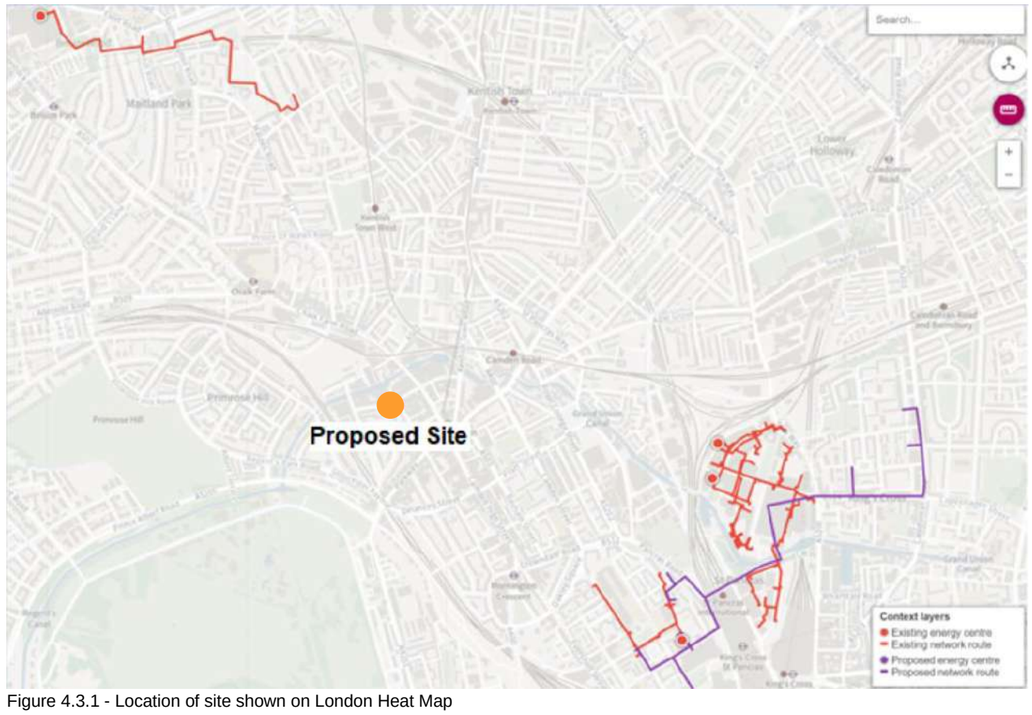

Figure 4.3.1 - Location of site shown on London Heat Map

4.3.2 Communal Heating System

A wide variety of low carbon technologies and heat network systems have been assessed for viability for the proposed scheme. The key considerations for the development which these systems have been measured against include:

- Policy Compliance
- Performance and Losses
- Ability to Connect to DHN
- Spatial Requirements – Common Plant Areas
- Spatial Requirements – within Dwellings
- Customer Experience
- Future Proofing
- Metering and Billing Implications
- Phasing Implications

The proposed system will be based on a ASHP solution following an options appraisal of potential systems. These have been adopted by the design team and considered within the energy calculations. The space heating and domestic hot water requirements for the development will be served by ASHPs.

The proposed heating and hot water strategy consists of a centralised Air Source Heat Pump (ASHP) serving space heating and hot water within the PBSA aspect of the Proposed Development and a centralised ASHP plant serving the residential unit with an individual WSHP in each residential unit.

4.4 Be Green Measures

4.4.1 General

The low carbon design approach followed to develop the Jamestown Road development's energy strategy incorporates the use of on-site renewable energy generation. A range of technologies have been studied to identify the most adequate renewable energy generation system in relation to the site, these include:

- Site mounted wind turbines
- Solar Photovoltaics (PV)
- Solar Hot Water
- Roof mounted wind turbines
- Biomass / Biomass CHP
- Fuel cells
- Direct Air Source Heat Pumps
- Ground Source Heat Pumps

A low and zero carbon (LZC) technology options assessment has been undertaken to evaluate which of these technologies would be feasible in terms of economic, environmental, and practical considerations. The study provides a clear understanding of the constraints and opportunities associated with a variety of different renewable energy technologies.

The choice of technology will be dependent upon a range of factors including orientation, height, window size, surrounding buildings and environment, site size and layout, geology, conservation and biodiversity.

Technology	Characteristics	Comments	Feasibility
Solar Technologies			
Photovoltaics (PV)	Photovoltaic (Solar PV) systems use solar cells to convert sunlight into electricity.	▪ Requires careful orientation and tilt to obtain optimum generation performance. ▪ Specialist maintenance is required. Access should be considered. Low carbon savings compared to capital cost of installation. ▪ Further Civil Aviation Authority recommendations are to be considered when location and system proposed is finalised. ▪ The roofs of the site and surrounding site including their heights and anticipated shading, have been analysed during to assess their suitability for the implementation of PV, at this stage PV Arrays on the roofs of are proposed. A 38.53 kWp PV array has been proposed at this stage for the whole development.	**Feasible and recommended**
Solar Thermal	Solar thermal is a system for generating hot water from the sun.	▪ Consideration of adequate DHW demand is required. ▪ Specialist maintenance is required. ▪ Medium carbon savings. ▪ The proposals currently do not allow for sufficient roof space to accommodate this technology efficiently. ▪ At this stage this technology has not been recommended for the site.	**Feasible but not recommended for this site**
Wind Technologies			
Wind Turbines	Wind turbines convert the wind's kinetic energy into electrical power.	▪ Ideally located in open non-urban areas. ▪ Regular maintenance is required, and special consideration for safe access is required. ▪ Low to medium carbon savings depending on the scale of the system. ▪ This technology is not viable for the proposed development.	**Deemed not technically feasible for the site**
Bio-fuel Technologies			
Biomass Boilers / CHP	Biomass boilers generate heat through burning organic matter.	▪ Direct replacement to existing gas fired system	**Deemed not technically feasible for the site**

Technology	Characteristics	Comments	Feasibility
		▪ Careful consideration should be given to fuel storage and availability. ▪ Medium maintenance requirements. ▪ Some technologies are self-cleaning. ▪ Quality of fuel might increase the maintenance requirements for these systems. ▪ High carbon savings are linked to the type of fuel used. ▪ Local air quality is to be considered carefully. ▪ This technology has not been recommended for the proposed development.	
Technology	**Characteristics**	**Comments**	**Feasibility**
Low Carbon Technologies			
Fuel Cells	A fuel cell is a device that generates electricity by a chemical reaction.	▪ Requires predictable and relatively high constant loads for an efficient operation. ▪ Specialist maintenance is required. ▪ Please note that technology is not common. ▪ Carbon savings depend on fuel source. ▪ Large storage tanks with hydrogen would also have to be located within the site hence it is considered as a significant safety concern due the volatility properties. ▪ This technology has not been recommended for the proposed development.	**Deemed not technically feasible for the site**

Technology	Characteristics	Comments	Feasibility
Air to Air / Air to water heat pumps (electric or gas)	Low-temperature heat, which occurs naturally in the air, is converted to high-grade heat by using an electrically driven or gas-powered pump.	▪ Specialist maintenance is required. ▪ Environmental impacts and high GWP of refrigerants require careful consideration. ▪ System can provide both low carbon heating and cooling. ▪ At this stage this technology has been proposed for generating low carbon heating at a community level, each dwelling will contain a WSHP that connects to the community heating system to satisfy the dwellings space heating and DHW requirements.	**Feasible and recommended**
Ground to air/water heat pumps (Electric)	The principle of operation revolves around the refrigerant (with a very low boiling point) being heated by the ground through an evaporator heat exchanger and pumped by a compressor to the indoor heat exchanger whereby it cools and condenses back to a liquid whilst expelling heat into the space.	▪ System can provide low carbon heating and cooling. ▪ Ground conditions will dictate the systems technical feasibility. ▪ Low maintenance requirements. ▪ Medium-High carbon savings. Efficiency of the system is highly dependent on heating and cooling flow and return temperatures and ground conditions. ▪ Please note it is often associated with high capital costs of installation. ▪ Planned maintenance is required. ▪ At this stage this technology has not been proposed for the building.	**Deemed not technically feasible for the site**

Table 4.4.1 - Low and Zero Carbon Technology Feasibility

After assessing the feasibility of the different LZC technologies; the following are recommended for the proposed development:

- As detailed in the section above an Air Source Heat pump (5th generation) community heat networks operate at ultra-low temperatures often in the form of ‘ambient loops’, these are suitable for energy recovery and are more suited to lower density developments. The use of low temperature heat networks increases the opportunity to utilise low carbon technologies such as heat pumps as the lead heat source for the district energy network. The development will incorporate WSHPs within each dwelling to satisfy the space heating and domestic hot water requirements.
- A Photovoltaic Panel Array, to generate renewable energy. At this stage a 182 m^2 (active) PV array has been proposed for the total site.

4.4.2 Roof Mounted Photovoltaic System

This section presents the proposed PV solution for the development. The figures below present the location of the PV proposed for the development and an indicative indication of output.

The estimated areas are based on the dimensions of 1708mm x 1134mm (1.94m²) for a 410Wp panel.

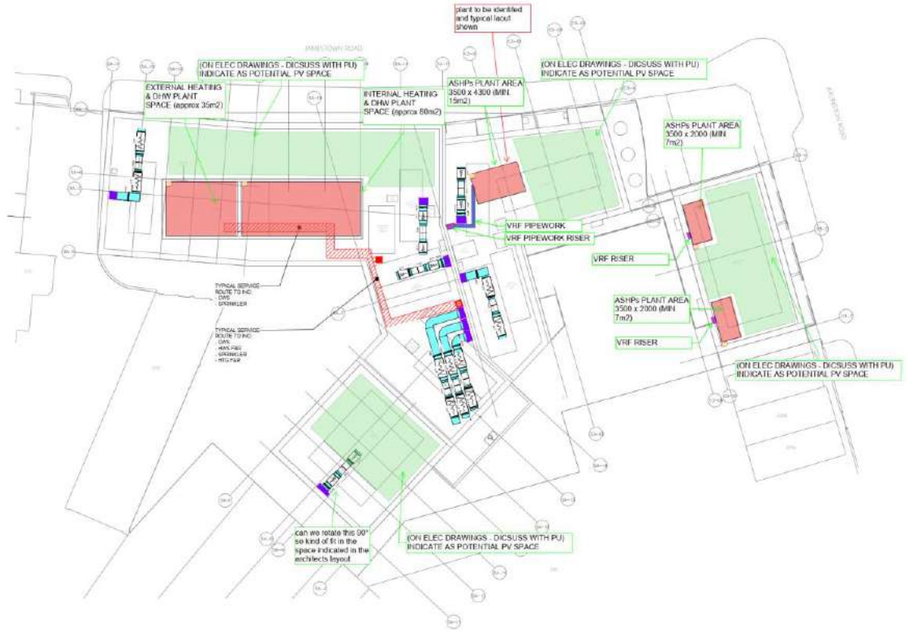

Figure 4.4.2.1 - Jamestown Road Indicative Roof Plan Markup (JATRD-WWL-DR-CS-XX-11-1071)

The table below provides the breakdown of indicative PV that can be allocated to each roof of the proposed development taking into account area restrictions as per the architect's initial locations of PV.

Location	Number of Panels	Estimated Active PV Area (m^2)	Rated Maximum Power (kWp)
PBSA Roof Allocation (**Not sufficient**)	30	58.1	12.30
Minimum required PBSA PV for compliance	62	120	25.42
Block C3 Roof	32	62.0	13.12
Site Total	**94**	**182.0**	**38.53**

Table 4.4.2 - Jamestown Road PV Provision

For the purpose of the compliance calculation for the PBSA aspect of the Proposed development, only the PV allocated to the PBSA roof is taken into account. It should be highlighted that the proposed 58.1 m^2 is considered insufficient in order to allow the PBSA aspect to satisfy the minimum 35% improvement the London Plan 2021 requires. **To achieve this target a minimum Active PV area of 120 m^2 to the PBSA aspect of the Proposed Development is required. The figure above shows indicatively available area to locate PV however, this is subject to detailed design.**

4.5 Be Seen Measures

This section presents the measures for development in response to the new London 2021 Be Seen requirements. Figure 4.5 presents the sequence of the Be Seen process with associated responsibilities.

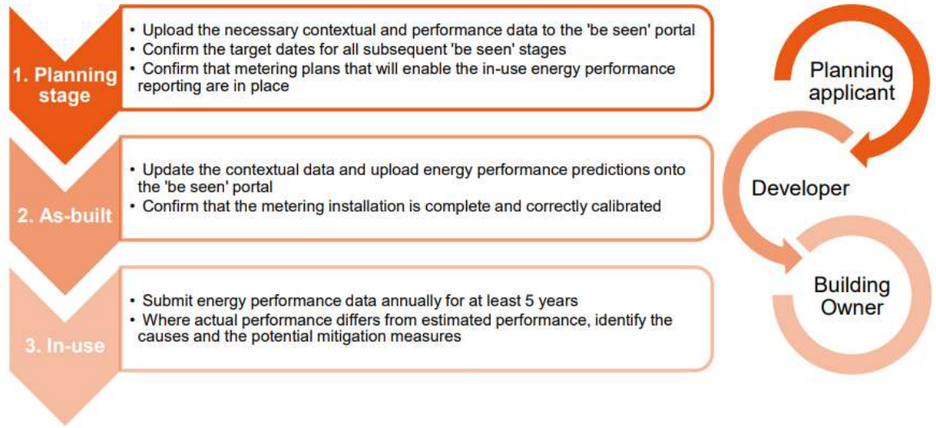

Figure 4.5 - Be Seen Process and Responsibilities

Be Seen Stage	Owner Occupied	Private Rented Sector	Social Housing
Planning	Planning Applicant		
As-built	Developer		
In-use	Freeholder (i.e.: via building management company)	Freeholder (i.e.: via building management company)	Freeholder (i.e.: via building management company)

Table 4.5.1 - Responsibility for providing data associated with residential reportable units (RUs)

Be Seen Stage	Owner Occupied	Private Rented Sector	Social Housing
Planning	Planning Applicant		
As-built	Developer		
In-use	Building Owner		

Table 4.5.2 - Responsibility for providing Data associated with Non-residential RUs

For the first step of the Be Seen process, the following information is to be gathered and submitted once planning consent is awarded on all subsequent reserve matters applications. The key performance indicators that are required are detailed in the table below.

Performance Indicator Group	Description
Contextual data	Contextual data relating to the development's reportable units (RUs) includes non-energy information such as data on location and typology/use of buildings. The following preliminary RUs for the Proposed Development are anticipated: 1. Each Block will have a RU. 2. All flexible commercial and community unit includes a non-residential RU. 3. Energy centres include one non-residential RU each.
Building energy use	The energy and fuel imports into each RU of a development including data from national energy grids (for example, electricity, gas etc.) and district heating connections. This information will enable the building owner to report on the amount of energy being consumed on-site for distinct building uses. Proposed Development, Energy Uses: ▪ Electricity. ▪ Heat Energy for DHW. ▪ Heat Energy for Space Heating.
Renewable energy	The renewable energy generation within the development will identify how much energy is being generated on-site and where this is used. Renewable Energy generation for development: Photovoltaic Panels.
Energy storage equipment	Data on the building's energy storage equipment.
Plant parameters	Plant parameters relate to the performance of heat or cooling generation plant within energy centres that form part of a development. This will include energy inputs and outputs of energy centres, energy use and contribution of heating and cooling technologies, and network efficiency data to monitor losses in district and communal energy networks.
Carbon emissions	The development's estimated carbon emissions at planning stage based on the appropriate carbon emission factors, as set out in the GLA's Energy Assessment Guidance. When on-site carbon reductions have been maximised, but a carbon shortfall still exists, applicants will be expected to report on and confirm the carbon offsetting contribution to the relevant local authority's fund in line with the net zero carbon target.

Table 4.5.3 - Be Seen Performance Indicators

The following table presents a list of RUs for the development.

Aspect	RUs
Block C3 Residential	**1.** Residential Element RU **2.** Common areas Element RU
PBSA Block	**3.** PBSA Element RU **4.** Common areas Element RU **5.** Self-contained Retail/Commercial Units RU

Table 4.5.4 - Jamestown Road RUs Schedule

4.6 Energy Use Intensity and Heat Energy Demand

This section presents the operational energy assessment carried out for the proposed development. The assessment carried out has been developed following SAP 10.2 and Passive House Planning Package (PHPP) Methodology for the domestic aspect and utilising IES VE and the TM54 methodology for the PBSA aspect.

To conduct this assessment, the Part L SAP 10.2 and IES VE models prepared for this stage (RIBA Stage 2) were used as a starting point and modified based on the SAP 10.2 and PHPP information, which includes occupancy patterns, operating hours, internal heat gains and controls. This was then used to estimate the operational energy for the proposed development as assess the Energy Use Intensity (in kWh/m^2) and space heating demand (kWh/m^2) of the proposed development. All the Energy Hierarchy design measures described in this report have been applied to the model and the results of the assessment are presented below.

Please note that the results presented are indicative only based on information available at the time of the assessment and assumptions. If any of the inputs change, the result will alter.

As part of GLA requirements, applicants are required to report the EUI and space heating demand of the development. Applicants are encouraged to achieve the values as per the below table.

Building Type	Energy Use Intensity (kWh/m^2/year)	Space Heating (kWh/m^2/year)
Residential	35	15
School	65	15
Office	55	15
Hotel	55	15
All other non-residential	55	15

Table 4.6.1 - London Plan Target EUI & Space Heating Requirement

The results tables presented below have been included to demonstrate the EUI and space heating demand for the Proposed Development.

4.6.1 Results

Energy End Use (kWh/m²/year)	Estimated Performance	
	Residential	PBSA
Space Heating Consumption	3.54	2.47
Comfort Cooling & Tempered Ventilation Consumption	4.39	3.15
Auxiliary Energy Consumption	3.08	12.12
General Lighting	2.16	5.49
Domestic Hot Water	13.54	13.26
Unregulated Energy (Equipment) (Scenario 1 / 2 / 3)	19.65 / 12.94 / 11.09	29.19
Annual Space Heating Demand	9.90	8.24

Table 4.6.1.1 - Estimate EUI and Annual Heat Demand

Aspect	Unregulated Energy Scenario	EUI (kWh/m²/year excluding renewable energy)	Space Heating Demand (kWh/m²/year) (excluding renewable energy)	Methodology Used	Explanatory notes (if expected differs from the values in Table 4).
Residential Block C3	1	46.36	9.90	SAP 10.2 Methodology	SAP software utilised for regulated energy, PHPP utilised to calculate unregulated energy.
	2	39.65			
	3	37.80			
PBSA Block	N/A	65.68	8.24	Part L2 - approved DSM	IES DSM and TM54 methodology

Table 4.6.1.2 - EUI and space heating GLA

As demonstrated using the GLA EUI & space heating demand calculator both blocks of the Proposed Development show a significant reduction on the minimum space heating requirement of 15 kWh/m^2. yr. It should be highlighted neither the residential nor PBSA aspects are shown to satisfy the energy use intensity of the GLA. Within the residential aspect the main contributors are seen to be the domestic hot water and the unregulated energy, the latter is based on general assumptions of what is included and the general energy consumed by each appliance which will be refined as the design develops. For the PBSA aspect the main contributors are the ventilation which is based on worst case assumptions made for the units used to reduce the risk of overheating and the assumptions made for the laundry within the PBSA which again will be refined as the design develops.

4.6.2 Residential Building User "Affordability"

The main objective of the proposed energy strategy for the development was to develop a low energy and low carbon solution following the GLA's Energy Hierarchy framework. The proposed strategy optimised the Be Lean, Be Clean and Be Green measures to ensure a low energy and carbon operation through reduced demand and meeting this demand effectively. A preliminary "Affordability" assessment was carried out to demonstrate how the strategy offers a sustainable solution both in terms of environmental impact and economic impact for the building users.

The proposed energy strategy includes passive and active measures that aim to reduce the buildings overall energy demand. These measures included: improved fabric thermal performance, reduced infiltration and mechanical ventilation with heat recovery (These measures will reduce the space heating demand). LED Lighting, energy efficient appliances (these measures reduce the dwellings electrical energy demand).

The estimated average annual energy demand by end use was calculated and presented in the section above which present the savings potential the recommended measures have. These results illustrate the reduction in energy which will result in reduced operation costs for the Residential Building users confirming that the proposed measures have the capability of reducing the energy demand.

The applicant will ensure that the Energy Services Company (ESCo) contracted to run the on-site network serving the Proposed Development will be registered with the Heat Trust and will also register the on-site network with the Heat Trust. The Heat Trust is an independent quality assurance accreditation for heat networks that meet the Heat Trust Scheme's rules, which will ensure that:

- Consumers are treated fairly.
- Clear and transparent information is provided to consumers.
- Consumers in vulnerable circumstances, in need of additional support or in payment difficulty will be supported.
- High customer service standards are provided, including handling faults, emergencies, and access to homes.
- Performance standards are guaranteed and where they are not, consumers are compensated for outages.
- A high standard is set around the use and maintenance of metering, including the use of pre-payment meters.
- Standardised methods are used for calculating heat charges, changing tariffs, billing, back-billing and payment; and
- Rules are set around the disconnection and reconnection of supply.

Heat Trust registration ensures customers on the Network will benefit from these independently verified standards as well as access to an independent complaint handling service and Energy Ombudsman.

Occupants will be provided with guidance on how to reduce reliance on cooling systems and minimise their running costs via consideration of internal blinds and openable windows. Aftercare support will also be provided regarding the communal heating system.

4.7 Overheating Risk Assessment

4.7.1 Overview

This section presents the overheating risk analysis and mitigation strategies. A preliminary overheating risk analysis, using TM59, for representative sample residential units, was undertaken during RIBA Stage 2.

Wallace Whittle's Dynamic Overheating Assessment details the methodologies used in assessing the overheating potential of the scheme and identifies possible overheating risk areas and design strategies for overheating reduction. All recommendations from the Dynamic Overheating Assessment have been adopted by the design team to mitigate any overheating risk to the proposed scheme.

Domestic overheating has not always been a problem in the UK but climate change, increased urbanisation, construction of high-rise apartment blocks and winter energy efficiency measures have all contributed to the amplification of high internal temperatures.

The CIBSE weather file DSY1 (moderately warm summer, with a return period of seven years) (2020) for London has been used for this analysis.

The overheating performance for the development has been assessed at a high level against the requirements under Approved Document Part O (ADO) and CIBSE TM49, TM59 Design methodology for overheating in homes which contains three criteria for overheating in domestic developments:

a) *Criteria (a) For living rooms, kitchens and bedrooms:* the number of hours during which ΔT is greater than or equal to one degree (K) during the period May to September inclusive shall not be more than 3% of occupied hours.

b) *Criteria (b) For bedrooms only: the guaranteed comfort during the sleeping hours the operative temperature in* the bedroom from 10pm to 7am shall not exceed 26°C for more the 1% of annual hours.

c) Criteria for homes predominantly mechanically ventilated: all occupied rooms should not exceed an operative temperature of 26°C for more than 3% of the annual occupied hours.

Detailed overheating analysis was undertaken for the Jamestown Road proposals. For this study, the following assessment method has been followed.

- Residential areas – Approved Document Part O (2021), and CIBSE TM59: Design methodology for the assessment of overheating risk in homes (2017).
- PBSA areas – Approved Document Part O (2021), and CIBSE TM59: Design methodology for the assessment of overheating risk in homes (2017) due to similar usages of PBSA spaces.

Thermal modelling assessments have been completed for the residential and PBSA elements of the site assessing a representative sample (Ground, 2nd, 1st, 5th and 6th floor full floor plates). Overheating analysis has been carried out using dynamic simulation modelling software IES VE 2023 This software tool is fully compliant with the CIBSE Applications Manual 11: Building Energy and Environment Modelling.

Ventilation Strategy

A mixed mode strategy is proposed for the C3 residential, PBSA and communal elements of the development. The strategy which consists generally of MVHR providing minimum Part F ventilation rates with a summer bypass and boost mode to remove excess heat from the occupied spaces.

It must be noted that due to the acoustic window opening constraints on the site, the development cannot rely on openable windows alone to reduce overheating risk for any elevation facing Jamestown Rd or Arlington Rd and the East/West facing courtyard areas of the C3 development. In addition, to minimise the risk of falling from a height in the PBSA units all windows have an opening restriction of 200mm.

Therefore, the proposal includes a cooling coil attached to the MVHR which aims to provide temperate air to the residential and PBSA spaces where required. This coil reduces the output air temperature from the MVHR and helps mitigate the risk of overheating in these areas.

The acoustic constraints applicable for the proposed development are shown in the figure shown below.

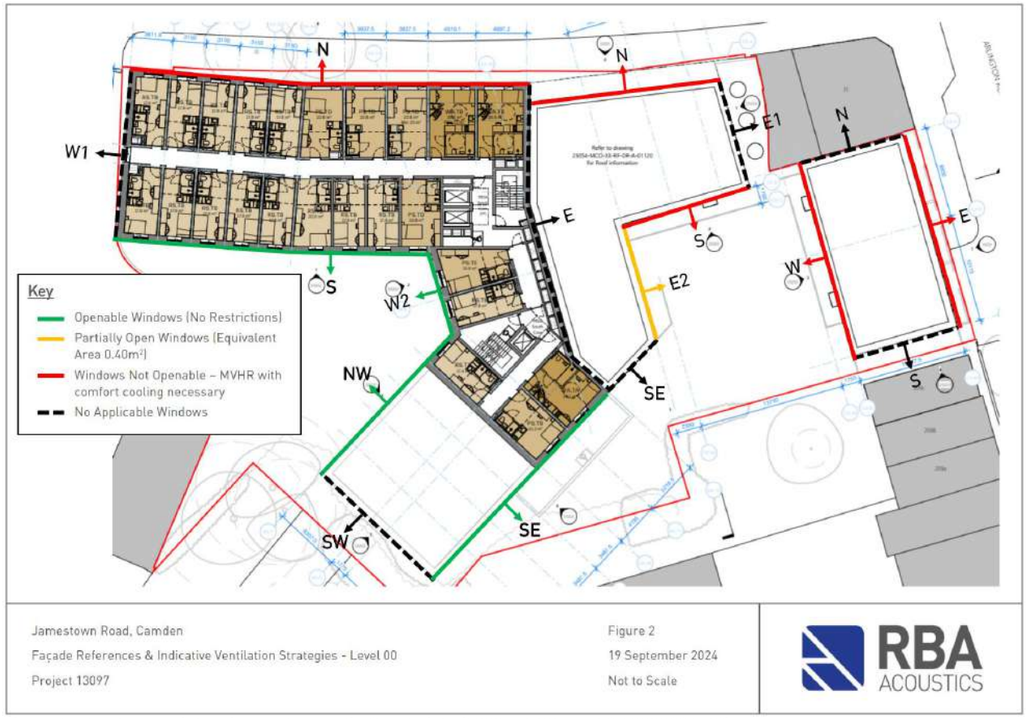

Figure 4.7.1 - Proposed Development Acoustic Constraints (13097.RP01.AAR.0.19092024.PS)

4.7.2 Overheating Measures

Insultation Levels:

- High levels of insultation to external walls and roofs.

Shading:

- External walkways and deep 225mm window recesses.
- Any modelling undertaken within this report does not account for internal blinds in adherence with Approved Document Part O (DSY1 only).

Glazing thermal and energy performance.

- Low g-values have been used to further reduce the overheating risk and at this stage all windows have been set to 0.4.

Natural Ventilation:

- Whilst due to the site's acoustic and opening constraints, operable windows have been provided, and this will add an element to the response to climate change of the building adding flexibility for occupants.

Internal Corridors

- Where applicable internal corridors are to be naturally ventilated.

4.7.3 Modelling Assumptions

Weather Information

The assessments were conducted using the following weather information.

CIBSE approved Design Summer Year (DSY) weather files: London_LWC_DSY1_2020High50, also including DSY2 & DSY3.

Occupancy Patterns

Occupancy patterns and internal gains for the domestic areas are prescribed by the CIBSE TM59 methodology. The occupancy patterns and internal gains specified in the National Calculation Methodology for non-domestic buildings has been applied to the ground and first floor communal areas of the building.

Window Opening Profiles

Subject to acoustic limitations where openable windows were shown on the elevations provided windows were operated as per Part O and section 3.3 of CIBSE TM59.

4.7.4 "Residential" Element Overheating Sample

Sample assessments have been carried out on a ground/mid floor/top floor level of each aspect of the proposed development to cover a wide variety of orientations and unit sizes as shown in the below figure. This representative sample was selected to evaluate the overheating risk in the "residential" element (inclusive of the PBSA spaces) of the proposed development and is illustrated below.

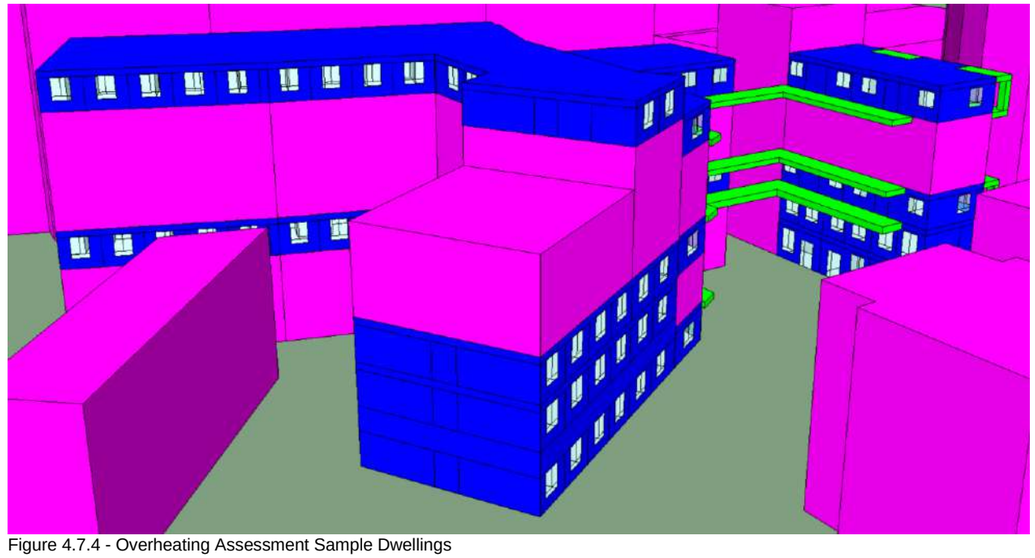

Figure 4.7.4 - Overheating Assessment Sample Dwellings

Units include studios and accessible studios as part of the PBSA aspects and kitchen/living/dining & bedroom areas within the residential aspects.

4.7.5 Passive Baseline Scenario

The below presents the results for scenario 1 which was designed to show how the proposed development would perform if there were no acoustic or window opening restrictions. In this scenario windows were allowed to open freely regardless of acoustic, safety or security concerns. Scenario 1 demonstrates that if there were no window opening constraints, then the dwellings would not show a risk of overheating.

Scenario 1: Passive Baseline & Part F min MVHR Flow Rates		**Weather File: DSY1**			
Total Rooms Assessed	**116**	**Criteria a: Average percentage of hours Operative Temperature is above 26°C (Threshold: 3%)**		**Criteria b: Average number of hours Operative Temperature is above 26°C (22:00 - 07:00) (Bedrooms Only) (Threshold: 32 hours)**	
KLR	14	1.21	Pass (100%)	N/A	N/A
Double Bedroom	19	0.58	Pass (100%)	12.05	Pass (100%)
Single Bedroom	16	0.68	Pass (100%)	10.44	Pass (100%)
Studios	67	0.56	Pass (100%)	25.37	Pass (100%)

Table 4.7.5.1 - CIBSE TM59 Scenario 1 Summary of Results

However, because some of the windows have opening restrictions due to acoustic, safety and security concerns it was not possible to overcome the risk of overheating. The below table presents the results when there are window opening restrictions.

Scenario 2: Window Opening Restrictions & Part F min MVHR Flow Rates		**Weather File: DSY1**			
Total Rooms Assessed	**127**	**Criteria a: Average percentage of hours Operative Temperature is above 26°C (Threshold: 3%)**		**Criteria b: Average number of hours Operative Temperature is above 26°C (22:00 - 07:00) (Bedrooms Only) (Threshold: 32 hours)**	
KLR	14	1.34	Pass (100%)	N/A	N/A
Double Bedroom	19	0.77	Pass (100%)	56.89	Fail (68%)
Single Bedroom	16	0.77	Pass (100%)	40.00	Fail (63%)
Studios	78	1.49	Pass (100%)	106.55	Fail (100%)

Table 4.7.5.2 - CIBSE TM59 Scenario 2 Summary of Results

The following section includes the addition design features that are required to overcome the risk of overheating.

4.7.6 Mixed Mode Ventilation Strategy Scenario

The information presented in the below table demonstrates that the recommended mixed mode ventilation strategy can provide compliance with CIBSE TM59. The mixed mode ventilation strategy uses openable windows and an MVHR system delivering Part F min flow rates with boosted summer bypass and incorporated tempered ventilation (where required). The incorporated tempered ventilation was only required in units that had an acoustic window opening restriction. **For emphasis, the unit serves to temper incoming air and is not considered as comfort cooling.**

Scenario 3: Window Opening Restrictions & Mixed Mode Ventilation Strategy		Weather File: DSY1			
Total Rooms Assessed	127	Criteria a: Average percentage of hours Operative Temperature is above 26°C (Threshold: 3%)		Criteria b: Average number of hours Operative Temperature is above 26°C (22:00 - 07:00) (Bedrooms Only) (Threshold: 32 hours)	
KLR	14	1.17	Pass (100%)	N/A	N/A
Double Bedroom	19	0.42	Pass (100%)	9.42	Pass (100%)
Single Bedroom	16	0.50	Pass (100%)	9.13	Pass (100%)
Studios	78	0.42	Pass (100%)	19.44	Pass (100%)

Table 4.7.6 - CIBSE TM59 DSY1 Scenario 3 Summary of Results

4.7.7 Additional Overheating Scenarios

The below tables illiterate how the proposed building would perform under the DSY2 & DSY3 weather file scenarios while using additional passive measures to show future adaptation to climate change. The additional passive measures used were included as they are outside of CIBSE TM59/Part O requirements for compliance with DSY1.

- Removal of the 200mm window opening restriction to the PBSA units.
- C3 internal doors were allowed to open day and night.
- Internal blinds were used site wide.

Scenario 4: Additional Passive Measures & Mixed Mode Ventilation Strategy		Weather File: DSY2			
Total Rooms Assessed	127	Criteria a: Average percentage of hours Operative Temperature is above 26°C (Threshold: 3%)		Criteria b: Average number of hours Operative Temperature is above 26°C (22:00 - 07:00) (Bedrooms Only) (Threshold: 32 hours)	
KLR	14	2.81	Fail (36%)	N/A	N/A
Double Bedroom	19	1.15	Pass (100%)	32.74	Fail (47%)
Single Bedroom	16	1.33	Pass (100%)	27.69	Fail (19%)
Studios	78	1.34	Pass (100%)	42.04	Fail (74%)

Table 4.7.7.1 - CIBSE TM59 DSY1 Scenario 4 Summary of Results

Scenario 5: Additional Passive Measures & Mixed Mode Ventilation Strategy		Weather File: DSY3			
Total Rooms Assessed	127	Criteria a: Average percentage of hours Operative Temperature is above 26°C (Threshold: 3%)		Criteria b: Average number of hours Operative Temperature is above 26°C (22:00 - 07:00) (Bedrooms Only) (Threshold: 32 hours)	
KLR	14	3.73	Fail (79%)	N/A	N/A
Double Bedroom	19	1.52	Pass (100%)	30.32	Fail (37%)
Single Bedroom	16	1.79	Pass (100%)	27.25	Fail (19%)
Studios	78	1.52	Pass (100%)	43.72	Fail (74%)

Table 4.7.7.2 - CIBSE TM59 DSY1 Scenario 5 Summary of Results

4.7.8 Corridors Summary

As this development contains community heating pipework, the communal corridors should also be analysed for overheating risk. While a design cannot fail due to overheating corridors, it would be a cause for concern. A corridor is defined as overheating if it exceeds an operative temperature of 28°C for more than 3% of annual hours, or 262 hours.

For this analysis, a sample of corridors across multiple floors has been analysed under the DSY1 weather condition. Corridors were modelled to account for natural infiltration and gains accounting for lighting, heating and losses from heating pipework. As the system is an ambient loop system, the gain from pipework has been adapted to suit the proposal.

Description: TM59 Criteria 4.5 Circulation Space Overheating		Weather File: DSY1	
Total Rooms Assessed:	2	Criteria 4.5: Average percentage of annual hours Operative Temperature is above 28°C (Threshold: 3%)	
Circulation Spaces	2	0.00	Pass (100%)

Table 4.7.8 - CIBSE TM59 DSY1 Corridor Summary of Results

As shown within the results, no sample corridors are shown to present a risk of overheating thereby satisfying the conditions of TM59.

5.0 Energy Assessment Results

The information presented in this report aimed to address all local policy and statutory energy and CO_2 emissions requirements. With the following design measures are recommended for the proposed development:

Be Lean

Airtightness - Target a low air permeability rate.
- Energy - less external air can make its way into the conditioned space, reducing uncontrolled heat loss and heat gain in the building.
- Thermal Comfort - reducing incoming cold external air creates a more pleasant internal environment for the occupants.
- General Occupant Wellbeing - external airborne pollutants are also kept out achieving an improved indoor air quality.

Solar Glass - The use of solar glass (low g-values) can further limit solar gains through the glazing itself.
- Daylighting - consideration of natural daylight access to daylight in all occupied areas.
- Visual Comfort and Overall Wellbeing - whilst allowing uncontrolled daylight to enter the space adds to beneficial solar gain in the winter, indirect or reflected external light can reduce the internal lighting requirement and improve overall visual environments for all occupants.

Efficient Lighting
- General lighting to be LED to minimise energy consumption from lighting.

Efficient Equipment
- Use energy efficient appliances and equipment wherever possible to reduce unregulated energy consumption.

Pumps and Fans

Low Energy Mixed Mode Ventilation Strategy (Using Mechanical Ventilation with Heat Recovery and openable windows to reduce overheating risk)
- Low energy MVHR has been recommended as an integral part of the energy strategy. This energy efficiency measure aims to provide an adequate indoor environment whilst also reducing the heat energy demand in the dwellings.
- Provide openable windows where possible to reduce overheating risk and reduce or remove any comfort cooling in the domestic element of the proposed development.

Wastewater Heat Recovery
- System incorporated to recover heat from showers of PBSA into supply water prior to heating to limit energy consumed to heat water.

Energy Monitoring
- An energy metering strategy to monitor energy use in the buildings. The proposals will allow for each dwelling to have an in-house display that shows their electricity usage.

Be Clean

The 'Be Clean' measures will not include connection to an existing or new district heating system.

The proposed heating and hot water strategy consists of a centralised Air Source Heat Pump (ASHP) serving space heating and hot water within the PBSA aspect of the Proposed Development and a centralised ASHP plant serving the residential unit with an individual WSHP in each residential unit. In accordance with the London Plan Energy Guidance, the improvement achieved through the implementation of this system will be demonstrated within the Be Green section.

Be Green

After assessing the feasibility of the different Low and Zero Carbon (LZC) technologies; the following are recommended for the proposed development:

As mentioned in the previous section an Air Source Heat Pump to generate low carbon heat, to serve the buildings space heating and domestic hot water requirements has been proposed.

Photovoltaic Panel Array to generate renewable energy. At this stage, a 38.53 kWp system (Based on 94Nr 410 Wp Panels (182 m^2 Active area)) has been proposed based on the preliminary layout plan based on the available roof area. The panels will be incorporated into the roof design where they will operate at their maximum potential and not restrict other plant space or roof access.

Energy Hierarchy Stage	Design Measures	Domestic	Non-Domestic
Be Lean	External Wall (U-Value)	0.15 W/m^2K	
	Ground Contact and Exposed Floors (U-Value)	0.10 W/m^2K	
	Roof (Flat/Sloping) (U-Value)	0.10 W/m^2K	
	Windows (U-Value including frame)	1.20 W/m^2K (g-value = 0.4; Frame Factor = 0.75)	1.20 W/m^2K (g-value = 0.4; Light Transmittance Factor = 0.71; Average Frame Factor = 0.75)
	External Door	N/A	1.20 W/m^2K
	Air Permeability	3.0 m^3/(h.m^2) @50Pa	3.0 m^3/(h.m^2) @50Pa
	Lighting	▪ LED Lighting throughout. Efficacy of all fittings should be >110 lumens/circuit Watt. ▪ PIR Presence Detection to communal circulation (Parasitic power allowance of 0.1 W/m^2).	▪ LED Lighting throughout. Efficacy of all fittings should be >110 lumens/circuit Watt. ▪ PIR Presence Detection to communal circulation (Parasitic power allowance of 0.1 W/m^2). ▪ PIR Presence Detection to flexible commercial & PBSA amenity areas (Parasitic power allowance of 0.10 W/m^2).
	Ventilation	Individual MVHR to serve each dwelling.	▪ 1 MVHR unit serving 3 studio bedrooms on north elevation, SFP 0.7 W/l/s, HR eff 88%. ▪ 1 MVHR unit serving each studio bedroom, SFP 0.6 W/l/s, HR eff 89%. ▪ HRU serving café/wharf office & PBSA amenity areas, SFP 1.60 W/l/s, HR eff 78%.
	Space Heating (Heat Generation)	Proposed ambient loop community heating network serving individual Water Source Heat Pumps within each dwelling. SCoP = 3.0.	▪ LTHW Rads via Centralised Ambient Loop, ASHP system serving PBSA areas and PBSA communal circulation, SCoP 3.26. ▪ Dedicated ASHP VRF Heating and Cooling serving flexible commercial and reception, SCoP 3.46, SEER 6.0.

Energy Hierarchy Stage	Design Measures	Domestic	Non-Domestic
Be Lean	DHW (Storage)	Served via main heating system, hot water cylinder incorporated as part of unit.	▪ Centralised Ambient Loop, ASHP system, SCoP 3.29. ▪ Assumed 4,000L storage to PBSA, 100mm factory insulation, delivery efficiency of 100%. ▪ WWHR incorporated within PBSA aspect. Improvement in SCoP of 20% via recovered heat energy.
Be Clean	Connection to District Heat Network	After an initial review of the local DHN available, it was concluded that connection to the existing DHN is not currently available. Therefore, this has not been recommended for this development.	
Be Green	Renewable Technologies	Air Source Heat Pumps serving heating and hot water. ▪ 25.42 kWp based on 62Nr 410Wp panels to serve the PBSA aspect (Optimising available roof area for PV technology). ▪ 13.12 kWp based on 32Nr 410Wp panels to serve the PBSA aspect (Optimising available roof area for PV technology).	

Table 5.0.1 - Energy Strategy Summary

Domestic	Regulated Carbon Dioxide Emissions		
	(Tonnes CO_2 per annum)	CO_2 Savings (Tonnes CO_2.yr)	%
Part L 2021 Compliance baseline	27.6		
Be lean: Savings from energy demand reduction	21.6	5.9	21.5%
Be clean: Savings from heat network	21.6	0.0	0.0%
Be green: Savings from renewable energy	6.6	15.0	54.4%
Total Savings	-	20.9	**76.0%**

Table 5.0.2 - Domestic regulated CO_2 Emissions savings from each stage of the Energy Hierarchy

Non-Domestic	Regulated Carbon Dioxide Emissions		
	(Tonnes CO_2 per annum)	CO_2 Savings (Tonnes CO_2.yr)	%
Part L 2021 Compliance baseline	23.5		
Be lean: Savings from energy demand reduction	19.8	3.7	15.8%
Be clean: Savings from heat network	19.8	0.0	0.0%
Be green: Savings from renewable energy	15.0	4.8	20.4%
Total Savings	-	8.5	**36.2%**

Table 5.0.3 - Non-Domestic regulated CO_2 Emissions savings from each stage of the Energy Hierarchy

5.1 Jamestown Road Development Site Wide Results

Sitewide	Regulated Carbon Dioxide Emissions		
	(Tonnes CO_2 per annum)	CO_2 Savings (Tonnes CO_2.yr)	%
Part L 2021 Compliance baseline	51.1		
Be lean: Savings from energy demand reduction	41.4	9.7	19%
Be clean: Savings from heat network	41.4	0.0	0.0%
Be green: Savings from renewable energy	21.6	19.8	39%
Total Savings	-	29.5	**58%**
Cumulative savings for offset payment	649 Tonnes CO_2		
Cash-in-lieu contribution	£61,612		

Table 5.1 - Site Wide regulated CO_2 Emissions savings from each stage of the Energy Hierarchy

5.2 Zero Carbon Standard

The London Plan 2021 requires residential schemes received by the mayor to meet the 'zero carbon' standard.

This document demonstrates how the proposed scheme conforms to GLA Energy Guidance 2021. The payment is calculated by multiplying the cumulative carbon shortfall for a development by the offset price to confirm the required cash-in-lieu contribution. The carbon offset price (for regulated energy) introduced in the London Plan 2021 has now risen to £95 over 30 years, so effectively £2,850 per tonne of CO_2.

The cost of the off-set contribution is a flat fee based on the development type as follows:

- After minimising CO_2 emissions on-site (regulated emissions for minor new build residential developments, regulated and unregulated emissions for major developments), all remaining emissions will incur a charge, which is calculated as below.
- For all major developments (10 residential units / 1000 sqm of commercial floorspace and above) it is based on an established price per tonne of CO_2 for the LBTH (currently set at £95 per CO_2 ton x 30 Years); the amount of CO_2 to be offset and the resulting financial contribution shall be specified in the submitted Energy Statement.

The carbon shortfall for the proposed development was estimated to be tonnes. Therefore, the cash-in-lieu contribution is estimated to be £61,612 (This is reported in the GLA Spreadsheet supporting this document).

6.0 Conclusions

This Energy Statement has outlined the measures to reduce the carbon emissions for the proposed Jamestown Road development resulting in savings at each stage of the Energy Hierarchy, calculated in accordance with current Building Regulations ADL and the GLA's CO_2 emission reporting tool:

1. be lean: use less energy and manage demand during operation – 19% CO_2 saving.
2. be clean: exploit district heating networks and supply energy efficiently and cleanly – 0% CO_2 saving.
3. be green: maximise opportunities for renewable energy – 39% CO_2 saving.
4. Total cumulative CO_2 saving 58%.

A number of passive measures including improved U-Values and air permeability, low g-value, energy efficient lighting, mixed mode ventilation incorporating MVHR, Waste Water Heat Recovery (WWHR) and a solar PV array provides a means to reduce energy consumption and on-site CO_2 emissions.

In accordance with the GLA Energy Assessment Guidance, all results and calculations have been carried out using the appended GLA Carbon Emission Reporting Spreadsheets.

The table below indicates the predicted residential and non-residential CO_2 savings for the site wide assessment (regulated emissions) using SAP 10 based on the proposed energy strategy:

	Regulated Carbon Dioxide Emissions		
	(Tonnes CO_2 per annum)	**CO_2 Savings (Tonnes CO_2.yr)**	**%**
Part L 2021 Compliance baseline	51.1		
Be lean: Savings from energy demand reduction	41.4	9.7	19%
Be clean: Savings from heat network	41.4	0.0	0.0%
Be green: Savings from renewable energy	21.6	19.8	39%
Total Savings	-	29.5	**58%**
Cumulative savings for offset payment	648.6 Tonnes CO_2		

Table 6.0.1 - Summary of Domestic and Non-Domestic CO_2 Emissions Reductions (as calculated with SAP 10 and IES)

The cumulative off-set payment leads to a total cash in-lieu contribution of £61,612 under SAP 10 and DSM calculations (All these values are summarised and are broken down in the GLA Spreadsheet supporting this statement).

The results presented above conclude that by incorporating measures outlined within this report, the proposed development complies with national, regional, and local planning policy in relation to carbon emissions, and energy consumption and conforms with the requirements set under the Site Wide Energy Strategy.

This energy statement has also identified the developments risk of overheating using dynamic simulation modelling. The results showed that without any acoustic restrictions which would limit how much or how long the windows could open the proposed development satisfied both TM59 and Part O criteria for all sample dwellings assessed utilising a natural ventilation solution.

7.0 Appendices

Appendix A - Energy Assessment Results

Residential				Be Lean		Be Green		Baseline	Be Lean	Be Clean	Be Green	Be Green Fabric Energy Efficiency				Be Green Primary Energy Rate			
Spaces	Total	Floor Area (m^2)	Total Area (m^2)	DER	TER	DER	TER					DFEE	TFEE	DFEE	TFEE	DPER	TPER	DPER	TPER
Plot 00.01	1	70.4	70.4	11.94	13.80	3.30	13.51	971.52	840.58	840.58	232.32	30.49	34.93	2146.50	2459.07	35.22	72.03	2479.49	5070.91
Plot 00.02	2	96.6	193.2	13.61	15.53	3.70	15.28	3000.40	2629.45	2629.45	714.84	45.64	50.32	8817.65	9721.82	39.01	81.33	7536.73	15712.96
Plot 00.03	1	96.6	96.6	12.23	13.92	3.37	13.68	1344.67	1181.42	1181.42	325.54	39.85	43.06	3849.51	4159.60	35.71	72.70	3449.59	7022.82
Plot 01.02	1	88.7	88.7	11.13	13.63	3.08	13.34	1208.98	987.23	987.23	273.20	30.97	38.12	2747.04	3381.24	32.75	70.99	2904.93	6296.81
Plot 01.03	1	65	65	13.57	15.80	3.64	15.48	1027.00	882.05	882.05	236.60	34.00	41.78	2210.00	2715.70	38.67	82.66	2513.55	5372.90
Plot 02.01	4	70.4	281.6	10.85	11.87	3.00	11.62	3342.59	3055.36	3055.36	844.80	23.47	26.36	6609.15	7422.98	32.23	61.86	9075.97	17419.78
Plot 02.02	3	88.7	266.1	9.53	10.79	2.71	10.53	2871.22	2535.93	2535.93	721.13	22.81	25.22	6069.74	6711.04	29.04	55.89	7727.54	14872.33
Plot 02.03	3	65	195	12.05	13.11	3.28	12.83	2556.45	2349.75	2349.75	639.60	26.66	29.58	5198.70	5768.10	35.11	68.41	6846.45	13339.95
Plot 02.04	3	60.5	181.5	13.29	14.63	3.57	14.30	2655.35	2412.14	2412.14	647.96	31.76	35.32	5764.44	6410.58	38.04	76.43	6904.26	13872.05
Plot 02.05	3	74.2	222.6	11.98	13.29	3.27	13.02	2958.35	2666.75	2666.75	727.90	31.08	34.15	6918.41	7601.79	34.85	69.33	7757.61	15432.86
Plot 05.01	1	70.4	70.4	12.25	14.51	3.33	14.22	1021.50	862.40	862.40	234.43	30.98	38.09	2180.99	2681.54	35.46	75.80	2496.38	5336.32
Plot 05.02	1	88.7	88.7	11.17	13.46	3.09	13.17	1193.90	990.78	990.78	274.08	31.16	37.34	2763.89	3312.06	32.84	70.08	2912.91	6216.10
Plot 05.03	1	65	65	13.72	16.36	3.67	16.03	1063.40	891.80	891.80	238.55	34.68	44.34	2254.20	2882.10	39.03	85.65	2536.95	5567.25
Plot 05.04	1	60.5	60.5	15.22	18.40	4.02	18.04	1113.20	920.81	920.81	243.21	40.36	52.33	2441.78	3165.97	42.60	96.52	2577.30	5839.46
Plot 05.05	1	74.2	74.2	13.78	16.80	3.70	16.50	1246.56	1022.48	1022.48	274.54	39.16	49.96	2905.67	3707.03	39.14	88.05	2904.19	6533.31
Total	27							27575.10	24228.92	24228.92	6628.70			62877.67	72100.62			70623.84	143905.80
								A	B	C	D				12.8%				50.9%

	Be Lean	Be Clean	Be Green	Cumulative
	A-B	B-C	C-D	A-D
	3346.18	0.00	17600.22	20946.39
Domestic	12.1%	0.0%	63.8%	76.0%

Non-Domestic		Be Lean Carbon Emissions		Be Green Carbon Emissions		Baseline	Be Lean	Be Clean	Be Green	Be Green Primary Energy Rate			
Spaces	Floor Area (m^2)	BER	TER	BER	TER					BPER	TPER	BPER	TPER
PBSA	6752.1	2.93	3.48	2.22	3.48	23497.308	19783.653	19783.65	14989.662	23.42	37.20	158134.18	251178.12
						A	B	C	D				37.04%

	Be Lean	Be Clean	Be Green	Cumulative
	A-B	B-C	C-D	A-D
	3713.66	0.00	4793.99	8507.65
Non-Domestic	15.8%	0.0%	20.4%	36.2%

Appendix B - Sample SAP 10.2 Calcs

Full SAP Calculation Printout

Property Reference	Plot 00.01	**Issued on Date**	24/09/2024
Assessment Reference	0001	**Prop Type Ref**	2B4P GF
Property	Plot 00.01, 33-35, Jamestown Road, London, NW1 7DB		

SAP Rating	84 B	**DER**	11.94	**TER**	13.80
Environmental	91 B	**% DER < TER**			13.48
CO_2 Emissions (t/year)	0.77	**DFEE**	30.49	**TFEE**	34.93
Compliance Check	See BREL	**% DFEE < TFEE**			12.71
% DPER < TPER	3.33	**DPER**	71.12	**TPER**	73.57

Assessor Details	Mr. Gary Ormiston	**Assessor ID**	AW68-0001
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	70.4000 (1b)	x	2.8000 (2b)	=	197.1200	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.4000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	197.1200	(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) =	81.0000 (23c)

Effective ac	0.2576	0.2544	0.2512	0.2352	0.2321	0.2161	0.2161	0.2129	0.2225	0.2321	0.2384	0.2448	(25)

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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 = 1.20)			16.8800	1.1450	19.3282			(27)
Ground Floor			70.4000	0.1000	7.0400			(28a)
External Wall	40.6000	16.8800	23.7200	0.1500	3.5580			(29a)
Wall to stairs/lifts	1.9600		1.9600	0.1400	0.2744			(29a)
Total net area of external elements Aum(A, m2)			112.9600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.2006			(33)
Corridor			52.0800	0.0000	0.0000			(32)
Party Ceiling			70.4000					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	200.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	15.2000	0.0500	0.7600
E16 Corner (normal)	2.8000	0.0900	0.2520
E18 Party wall between dwellings	11.2000	0.0900	1.0080

P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	18.6000	0.0000	0.0000		
E2 Other lintels (including other steel lintels)	6.9800	0.0300	0.2094		
E3 Sill	6.9800	0.0300	0.2094		
E4 Jamb	19.2000	0.0300	0.5760		
E5 Ground floor (normal)	15.2000	0.1000	1.5200		
P1 Party wall - Ground floor	18.6000	0.1200	2.2320		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				6.7668	(36)
Point Thermal bridges			(36a) =	0.0000	
Total fabric heat loss			(33) + (36) + (36a) =	36.9674	(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	16.7543	16.5470	16.3396	15.3029	15.0956	14.0588	14.0588	13.8515	14.4735	15.0956	15.5103	15.9250	(38)
Heat transfer coeff	53.7218	53.5144	53.3071	52.2704	52.0630	51.0263	51.0263	50.8189	51.4410	52.0630	52.4777	52.8924	(39)
Average = Sum(39)m / 12 =												52.2185	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7631	0.7601	0.7572	0.7425	0.7395	0.7248	0.7248	0.7219	0.7307	0.7395	0.7454	0.7513	(40)
HLP (average)												0.7417	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2558 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
85.3077	84.0257	82.1575	78.5832	75.9454	73.0038	71.3318	73.1858	75.2181	78.3765	82.0276	84.9808	(42a)

Hot water usage for baths

26.8033	26.4052	25.8447	24.8111	24.0372	23.1790	22.7155	23.2721	23.8782	24.7964	25.8513	26.7127	(42b)

Hot water usage for other uses

37.7316	36.3596	34.9875	33.6154	32.2434	30.8713	30.8713	32.2434	33.6154	34.9875	36.3596	37.7316	(42c)

Average daily hot water use (litres/day) 137.8032 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	149.8426	146.7904	142.9897	137.0097	132.2259	127.0541	124.9185	128.7012	132.7117	138.1604	144.2385	149.4251	(44)
Energy conte	237.3140	209.0276	219.7698	187.5594	178.0015	156.2278	151.0782	159.3590	163.6468	187.4824	205.4942	233.9636	(45)
Energy content (annual)										Total = Sum(45)m =		2288.9245	
Distribution loss (46)m = 0.15 x (45)m	35.5971	31.3541	32.9655	28.1339	26.7002	23.4342	22.6617	23.9039	24.5470	28.1224	30.8241	35.0945	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	288.2729	255.0550	270.7287	236.8745	228.9604	205.5429	202.0371	210.3179	212.9619	238.4413	254.8092	284.9225	(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	288.2729	255.0550	270.7287	236.8745	228.9604	205.5429	202.0371	210.3179	212.9619	238.4413	254.8092	284.9225	(64)
										Total per year (kWh/year) = Sum(64)m =		2888.9245	(64)
12Total per year (kWh/year)												2889	(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	91.6466	81.0085	85.8132	74.6923	71.9252	64.2745	62.9732	65.7266	66.7413	75.0776	80.6556	90.5326	(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	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	99.9837	110.6962	99.9837	103.3165	99.9837	103.3165	99.9837	99.9837	103.3165	99.9837	103.3165	99.9837	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	198.2288	200.2858	195.1023	184.0671	170.1371	157.0450	148.2986	146.2416	151.4251	162.4603	176.3903	189.4825	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	(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)	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	(71)
Water heating gains (Table 5)	123.1810	120.5484	115.3403	103.7393	96.6737	89.2702	84.6414	88.3422	92.6963	100.9108	112.0216	121.6836	(72)
Total internal gains	481.2304	491.3674	470.2632	450.9598	426.6315	406.4685	389.7606	391.4044	404.2749	423.1918	451.5653	470.9867	(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	11.0600	19.6403	0.4000	0.0000	0.7700	66.9042	(76)
Southeast	5.8200	36.7938	0.4000	0.0000	0.7700	65.9552	(77)

Solar gains	132.8593	243.2248	369.2554	504.8127	598.5819	606.1611	579.6455	509.6376	417.1231	279.4649	162.4207	111.4626	(83)
Total gains	614.0897	734.5922	839.5186	955.7725	1025.2134	1012.6296	969.4061	901.0420	821.3979	702.6567	613.9860	582.4493	(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	72.8031	73.0852	73.3694	74.8246	75.1226	76.6489	76.6489	76.9617	76.0310	75.1226	74.5290	73.9447	
alpha	5.8535	5.8723	5.8913	5.9883	6.0082	6.1099	6.1099	6.1308	6.0687	6.0082	5.9686	5.9296	
util living area	0.9629	0.9132	0.8173	0.6417	0.4695	0.3223	0.2316	0.2594	0.4306	0.7266	0.9190	0.9703	(86)
MIT	20.3963	20.6232	20.8285	20.9621	20.9944	20.9996	21.0000	20.9999	20.9975	20.9386	20.6726	20.3597	(87)
Th 2	20.2854	20.2880	20.2906	20.3035	20.3060	20.3190	20.3190	20.3216	20.3138	20.3060	20.3009	20.2957	(88)
util rest of house	0.9555	0.8985	0.7926	0.6092	0.4353	0.2881	0.1957	0.2212	0.3884	0.6882	0.9027	0.9642	(89)
MIT 2	19.5965	19.8738	20.1137	20.2684	20.3016	20.3187	20.3190	20.3215	20.3122	20.2507	19.9487	19.5597	(90)
Living area fraction										fLA = Living area / (4) =		0.5327	(91)
MIT	20.0226	20.2730	20.4944	20.6379	20.6706	20.6814	20.6817	20.6829	20.6772	20.6171	20.3343	19.9859	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.8726	20.1230	20.3444	20.4879	20.5206	20.5314	20.5317	20.5329	20.5272	20.4671	20.1843	19.8359	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9505	0.8948	0.7946	0.6180	0.4459	0.2988	0.2069	0.2331	0.4016	0.6974	0.8997	0.9594	(94)
Useful gains	583.7069	657.3022	667.0467	590.6336	457.1860	302.5238	200.6097	210.0073	329.8332	490.0346	552.4162	558.8249	(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	836.5860	814.6490	738.0061	605.7036	459.2278	302.6563	200.6202	210.0287	330.6236	513.7118	686.6335	827.0188	(97)
Space heating kWh	188.1420	105.7370	52.7938	10.8504	1.5191	0.0000	0.0000	0.0000	0.0000	17.6159	96.6364	199.5362	(98a)
Space heating requirement - total per year (kWh/year)												672.8309	
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	188.1420	105.7370	52.7938	10.8504	1.5191	0.0000	0.0000	0.0000	0.0000	17.6159	96.6364	199.5362	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												672.8309	
Space heating per m2											(98c) / (4) =	9.5573	(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 %)	88.9000	(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	188.1420	105.7370	52.7938	10.8504	1.5191	0.0000	0.0000	0.0000	0.0000	17.6159	96.6364	199.5362	(98)
Space heating efficiency (main heating system 1)	88.9000	88.9000	88.9000	88.9000	88.9000	0.0000	0.0000	0.0000	0.0000	88.9000	88.9000	88.9000	(210)
Space heating fuel (main heating system)	211.6333	118.9393	59.3856	12.2052	1.7088	0.0000	0.0000	0.0000	0.0000	19.8154	108.7024	224.4502	(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	288.2729	255.0550	270.7287	236.8745	228.9604	205.5429	202.0371	210.3179	212.9619	238.4413	254.8092	284.9225	(64)
Efficiency of water heater												80.3000	(216)
(217)m	83.4895	82.6430	81.5880	80.6417	80.3512	80.3000	80.3000	80.3000	80.3000	80.8380	82.4943	83.6322	(217)
Fuel for water heating, kWh/month	284.2440	252.9284	269.3655	232.5837	221.5293	194.5552	188.1422	198.4546	203.7943	231.9236	249.1009	279.7529	(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	72.0882	65.1119	72.0882	69.7628	72.0882	69.7628	72.0882	72.0882	69.7628	72.0882	69.7628	72.0882	(231)
Lighting	19.0559	15.2874	13.7646	10.0845	7.7896	6.3641	7.1059	9.2365	11.9973	15.7412	17.7796	19.5855	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-12.3768	-19.5258	-31.5997	-39.8946	-46.8481	-45.2956	-44.7788	-40.2776	-32.9372	-24.0873	-14.2982	-10.4473	(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	756.8401	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	2806.3747	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.6000, SFP = 0.8640)		
mechanical ventilation fans (SFP = 0.8640)	207.7802	(230a)
central heating pump	41.0000	(230c)
maintaining electric keep-hot facility for gas combi boiler	600.0000	(230f)
Total electricity for the above, kWh/year	848.7802	(231)
Electricity for lighting (calculated in Appendix L)	153.7922	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-362.3669	(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	4203.4203	(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	756.8401	0.2100	158.9364	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2806.3747	0.2100	589.3387	(264)
Space and water heating			748.2751	(265)
Pumps, fans and electric keep-hot	848.7802	0.1387	117.7363	(267)
Energy for lighting	153.7922	0.1443	22.1970	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-362.3669	0.1323	-47.9383	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-47.9383	(269)
Total CO2, kg/year			840.2700	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.9400	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	756.8401	1.1300	855.2293	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2806.3747	1.1300	3171.2034	(278)
Space and water heating			4026.4327	(279)
Pumps, fans and electric keep-hot	848.7802	1.5128	1284.0348	(281)
Energy for lighting	153.7922	1.5338	235.8916	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-362.3669	1.4888	-539.4909	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-539.4909	(283)
Total Primary energy kWh/year			5006.8682	(286)
Dwelling Primary energy Rate (DPER)			71.1200	(287)

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

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Ground floor		70.4000 (1b)	x	2.8000 (2b)	=	197.1200	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.4000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	197.1200	(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) =	0.1522	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4022	(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) =	0.3419	(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	0.4359	0.4273	0.4188	0.3760	0.3675	0.3248	0.3248	0.3162	0.3419	0.3675	0.3846	0.4017	(22b)
Effective ac	0.5950	0.5913	0.5877	0.5707	0.5675	0.5527	0.5527	0.5500	0.5584	0.5675	0.5740	0.5807	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opening Type (Uw = 1.20)			16.8800	1.1450	19.3282			(27)
Ground Floor			70.4000	0.1300	9.1520			(28a)
External Wall	40.6000	16.8800	23.7200	0.1800	4.2696			(29a)
Wall to stairs/lifts	1.9600		1.9600	0.1800	0.3528			(29a)
Total net area of external elements Aum(A, m2)			112.9600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		33.1026			(33)
Corridor			52.0800	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 200.0000 (35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
	E7 Party floor between dwellings (in blocks of flats)	15.2000	0.0700	1.0640
	E16 Corner (normal)	2.8000	0.0900	0.2520
	E18 Party wall between dwellings	11.2000	0.0600	0.6720
	P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	18.6000	0.0000	0.0000
	E2 Other lintels (including other steel lintels)	6.9800	0.0500	0.3490
	E3 Sill	6.9800	0.0500	0.3490
	E4 Jamb	19.2000	0.0500	0.9600
	E5 Ground floor (normal)	15.2000	0.1600	2.4320
	P1 Party wall - Ground floor	18.6000	0.0800	1.4880

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.5660 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 40.6686 (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	38.7041	38.4641	38.2289	37.1242	36.9175	35.9554	35.9554	35.7772	36.3260	36.9175	37.3357	37.7728	(38)
Heat transfer coeff	79.3727	79.1328	78.8976	77.7929	77.5862	76.6240	76.6240	76.4458	76.9946	77.5862	78.0043	78.4414	(39)
Average = Sum(39)m / 12 =												77.7919	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1275	1.1240	1.1207	1.1050	1.1021	1.0884	1.0884	1.0859	1.0937	1.1021	1.1080	1.1142	(40)
HLP (average)												1.1050	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2558 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	62.0419	61.1096	59.7509	57.1514	55.2330	53.0937	51.8776	53.2260	54.7041	57.0011	59.6564	61.8042	(42a)
Hot water usage for baths	26.8033	26.4052	25.8447	24.8111	24.0372	23.1790	22.7155	23.2721	23.8782	24.7964	25.8513	26.7127	(42b)
Hot water usage for other uses	37.7316	36.3596	34.9875	33.6154	32.2434	30.8713	30.8713	32.2434	33.6154	34.9875	36.3596	37.7316	(42c)
Average daily hot water use (litres/day)												116.3529	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	126.5768	123.8744	120.5831	115.5779	111.5136	107.1440	105.4644	108.7415	112.1977	116.7850	121.8673	126.2485	(44)
Energy conte	200.4668	176.3954	185.3317	158.2204	150.1187	131.7460	127.5501	134.6447	138.3510	158.4762	173.6223	197.6747	(45)
Energy content (annual)										Total = Sum(45)m =		1932.5980	
Distribution loss (46)m = 0.15 x (45)m	30.0700	26.4593	27.7998	23.7331	22.5178	19.7619	19.1325	20.1967	20.7526	23.7714	26.0433	29.6512	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	251.4257	222.4228	236.2906	207.5355	201.0776	181.0611	178.5090	185.6036	187.6660	209.4351	222.9374	248.6336	(62)
WWHRS	-28.3630	-25.0845	-26.2670	-21.7501	-20.2703	-17.3455	-16.2586	-17.2894	-17.9463	-21.1567	-23.9680	-27.8377	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	223.0627	197.3384	210.0236	185.7854	180.8073	163.7156	162.2504	168.3142	169.7198	188.2784	198.9694	220.7958	(64)
									Total per year (kWh/year) = Sum(64)m =			2269.0610	(64)
12Total per year (kWh/year)												2269	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	79.3949	70.1583	74.3625	64.9371	62.6542	56.1343	55.1501	57.5091	58.3305	65.4331	70.0582	78.4666	(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	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	99.9837	110.6962	99.9837	103.3165	99.9837	103.3165	99.9837	99.9837	103.3165	99.9837	103.3165	99.9837	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	198.2288	200.2858	195.1023	184.0671	170.1371	157.0450	148.2986	146.2416	151.4251	162.4603	176.3903	189.4825	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	(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)	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	(71)
Water heating gains (Table 5)	106.7136	104.4023	99.9496	90.1904	84.2126	77.9643	74.1265	77.2972	81.0145	87.9477	97.3030	105.4658	(72)
Total internal gains	464.7631	475.2213	454.8725	437.4109	414.1704	395.1627	379.2457	380.3594	392.5931	410.2286	436.8467	454.7689	(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	11.0600	19.6403	0.6300	0.7000	0.7700	66.3857	(76)
Southeast	5.8200	36.7938	0.6300	0.7000	0.7700	65.4440	(77)

Solar gains	131.8297	241.3398	366.3936	500.9004	593.9429	601.4633	575.1533	505.6879	413.8904	277.2991	161.1619	110.5988	(83)
Total gains	596.5927	716.5610	821.2662	938.3113	1008.1133	996.6260	954.3990	886.0472	806.4835	687.5277	598.0087	565.3677	(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	49.2752	49.4247	49.5720	50.2760	50.4099	51.0429	51.0429	51.1619	50.7972	50.4099	50.1397	49.8603	
alpha	4.2850	4.2950	4.3048	4.3517	4.3607	4.4029	4.4029	4.4108	4.3865	4.3607	4.3426	4.3240	
util living area	0.9818	0.9612	0.9182	0.8144	0.6590	0.4808	0.3509	0.3928	0.6185	0.8722	0.9647	0.9851	(86)
MIT	19.6554	19.9355	20.2902	20.6765	20.8954	20.9794	20.9959	20.9934	20.9405	20.6213	20.0739	19.6131	(87)
Th 2	19.9785	19.9812	19.9840	19.9967	19.9991	20.0103	20.0103	20.0124	20.0060	19.9991	19.9943	19.9892	(88)
util rest of house	0.9772	0.9521	0.8998	0.7778	0.6028	0.4108	0.2731	0.3104	0.5430	0.8366	0.9548	0.9814	(89)
MIT 2	18.4359	18.7882	19.2251	19.6839	19.9142	19.9982	20.0088	20.0098	19.9665	19.6378	18.9759	18.3902	(90)
Living area fraction									fLA = Living area / (4) =			0.5327	(91)
MIT	19.0855	19.3993	19.7925	20.2127	20.4369	20.5209	20.5346	20.5337	20.4853	20.1617	19.5608	19.0416	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0855	19.3993	19.7925	20.2127	20.4369	20.5209	20.5346	20.5337	20.4853	20.1617	19.5608	19.0416	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9721	0.9458	0.8958	0.7862	0.6281	0.4474	0.3145	0.3542	0.5804	0.8430	0.9496	0.9769	(94)
Useful gains	579.9740	677.7275	735.6969	737.6887	633.1996	445.8411	300.1916	313.8419	468.1083	579.5938	567.8455	552.2889	(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	1173.5631	1147.3709	1048.7425	880.0448	677.8593	453.6824	301.4852	316.0035	491.6349	741.8561	971.9941	1164.1977	(97)
Space heating kWh	441.6303	315.6004	232.9059	102.4964	33.2268	0.0000	0.0000	0.0000	0.0000	120.7232	290.9870	455.2601	(98a)
Space heating requirement - total per year (kWh/year)												1992.8300	
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	441.6303	315.6004	232.9059	102.4964	33.2268	0.0000	0.0000	0.0000	0.0000	120.7232	290.9870	455.2601	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1992.8300	
Space heating per m2											(98c) / (4) =	28.3072	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	92.4000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	441.6303	315.6004	232.9059	102.4964	33.2268	0.0000	0.0000	0.0000	0.0000	120.7232	290.9870	455.2601	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	477.9548	341.5588	252.0627	110.9268	35.9597	0.0000	0.0000	0.0000	0.0000	130.6528	314.9210	492.7057	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	223.0627	197.3384	210.0236	185.7854	180.8073	163.7156	162.2504	168.3142	169.7198	188.2784	198.9694	220.7958	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.8157	85.3820	84.6036	83.1602	81.5243	80.3000	80.3000	80.3000	80.3000	83.4541	85.1947	85.8956	(217)
Fuel for water heating, kWh/month	259.9323	231.1241	248.2443	223.4065	221.7833	203.8800	202.0553	209.6067	211.3571	225.6072	233.5468	257.0515	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	20.7746	16.6662	15.0060	10.9941	8.4921	6.9382	7.7468	10.0696	13.0794	17.1609	19.3832	21.3520	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-15.6059	-23.4071	-35.7700	-42.8430	-48.5309	-46.1598	-45.5988	-41.8809	-35.7497	-27.8935	-17.6489	-13.3335	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-5.0100	-10.8220	-22.0479	-33.9216	-45.6550	-46.1675	-45.6240	-38.2594	-27.5622	-15.7359	-6.7708	-3.9410	(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												2156.7424	(211)

Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	2727.5949	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	167.6632	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-695.9393	(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	4442.0612	(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	2156.7424	0.2100	452.9159	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2727.5949	0.2100	572.7949	(264)
Space and water heating			1025.7108	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	167.6632	0.1443	24.1990	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-394.4219	0.1333	-52.5790	
PV Unit electricity exported	-301.5173	0.1252	-37.7494	
Total			-90.3283	(269)
Total CO2, kg/year			971.5108	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.8000	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2156.7424	1.1300	2437.1189	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2727.5949	1.1300	3082.1822	(278)
Space and water heating			5519.3011	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	167.6632	1.5338	257.1674	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-394.4219	1.4926	-588.7160	
PV Unit electricity exported	-301.5173	0.4595	-138.5559	
Total			-727.2720	(283)
Total Primary energy kWh/year			5179.2974	(286)
Target Primary Energy Rate (TPER)			73.5700	(287)

Full SAP Calculation Printout

Property Reference	Plot 00.02	**Issued on Date**	24/09/2024
Assessment Reference	0001	**Prop Type Ref**	3B5P GF ET
Property	Plot 00.02, 33-35 , Jamestown Road, London, NW1 7DB		

SAP Rating	82 B	**DER**	13.61	**TER**	15.53
Environmental	88 B	**% DER < TER**			12.36
CO_2 Emissions (t/year)	1.14	**DFEE**	45.64	**TFEE**	50.32
Compliance Check	See BREL	**% DFEE < TFEE**			9.30
% DPER < TPER	2.50	**DPER**	80.55	**TPER**	82.62

Assessor Details	Mr. Gary Ormiston	**Assessor ID**	AW68-0001
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	46.8000 (1b)	x	3.4000 (2b)	=	159.1200	(1b) - (3b)
First floor	49.8000 (1c)	x	3.7000 (2c)	=	184.2600	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	96.6000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	343.3800	(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) =	81.0000 (23c)

Effective ac	0.2576	0.2544	0.2512	0.2352	0.2321	0.2161	0.2161	0.2129	0.2225	0.2321	0.2384	0.2448	(25)

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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 = 1.20)			27.5000	1.1450	31.4885			(27)
Ground Floor			46.8000	0.1000	4.6800			(28a)
Exposed Floor			3.0000	0.1000	0.3000			(28b)
External Wall	145.0600	27.5000	117.5600	0.1500	17.6340			(29a)
Terrace Roof	4.2000		4.2000	0.1000	0.4200			(30)
Total net area of external elements Aum(A, m2)			199.0600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		54.5225			(33)
Party to dwelling			60.4700	0.0000	0.0000			(32)
Party Ceiling			45.6000					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	200.0000 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	17.9000	0.0500	0.8950

E16 Corner (normal)	21.0000	0.0900	1.8900	
E18 Party wall between dwellings	10.8000	0.0900	0.9720	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.9000	0.0000	0.0000	
E5 Ground floor (normal)	20.9000	0.1000	2.0900	
P1 Party wall - Ground floor	8.1000	0.1200	0.9720	
E2 Other lintels (including other steel lintels)	12.1000	0.0300	0.3630	
E3 Sill	12.1000	0.0300	0.3630	
E4 Jamb	35.6000	0.0300	1.0680	
E6 Intermediate floor within a dwelling	17.2600	0.0700	1.2082	
E20 Exposed floor (normal)	2.7400	0.1100	0.3014	
E21 Exposed floor (inverted)	2.7400	0.1600	0.4384	
E24 Eaves (insulation at ceiling level - inverted)	2.7000	0.0700	0.1890	
E14 Flat roof	2.0000	0.0800	0.1600	
E25 Staggered party wall between dwellings	3.4000	0.2400	0.8160	
P2 Party wall - Intermediate floor within a dwelling	8.1000	0.0000	0.0000	
P7 Party Wall - Exposed floor (normal)	0.8000	0.0800	0.0640	
P5 Party wall - Roof (insulation at rafter level)	2.0000	0.0800	0.1600	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.9500 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 66.4725 (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	29.1858	28.8246	28.4634	26.6574	26.2963	24.4903	24.4903	24.1291	25.2127	26.2963	27.0186	27.7410	(38)
Heat transfer coeff	95.6583	95.2972	94.9360	93.1300	92.7688	90.9628	90.9628	90.6016	91.6852	92.7688	93.4912	94.2136	(39)
Average = Sum(39)m / 12 =												93.0397	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9903	0.9865	0.9828	0.9641	0.9603	0.9416	0.9416	0.9379	0.9491	0.9603	0.9678	0.9753	(40)
HLP (average)												0.9631	
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 2.7057 (42)
Hot water usage for mixer showers

95.6810	94.2431	92.1478	88.1388	85.1803	81.8810	80.0056	82.0851	84.3645	87.9070	92.0021	95.3144	(42a)

Hot water usage for baths

30.0476	29.6013	28.9729	27.8142	26.9466	25.9846	25.4649	26.0890	26.7684	27.7978	28.9803	29.9460	(42b)

Hot water usage for other uses

42.3395	40.7999	39.2603	37.7207	36.1810	34.6414	34.6414	36.1810	37.7207	39.2603	40.7999	42.3395	(42c)

Average daily hot water use (litres/day) 154.5640 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	168.0681	164.6443	160.3810	153.6737	148.3080	142.5070	140.1120	144.3551	148.8536	154.9651	161.7824	167.5999	(44)
Energy conte	266.1788	234.4513	246.4996	210.3716	199.6510	175.2290	169.4533	178.7418	183.5514	210.2862	230.4886	262.4210	(45)
Energy content (annual)										Total = Sum(45)m =		2567.3236	
Distribution loss (46)m = 0.15 x (45)m	39.9268	35.1677	36.9749	31.5557	29.9477	26.2843	25.4180	26.8113	27.5327	31.5429	34.5733	39.3631	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	317.1377	280.4787	297.4585	259.6867	250.6099	224.5440	220.4122	229.7007	232.8664	261.2451	279.8037	313.3799	(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	317.1377	280.4787	297.4585	259.6867	250.6099	224.5440	220.4122	229.7007	232.8664	261.2451	279.8037	313.3799	(64)
										Total per year (kWh/year) = Sum(64)m =		3167.3236	(64)
12Total per year (kWh/year)												3167	(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	101.2442	89.4619	94.7008	82.2773	79.1237	70.5924	69.0830	72.1714	73.3596	82.6599	88.9662	99.9947	(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	135.2872	135.2872	135.2872	135.2872	135.2872	135.2872	135.2872	135.2872	135.2872	135.2872	135.2872	135.2872	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	126.4550	140.0037	126.4550	130.6701	126.4550	130.6701	126.4550	126.4550	130.6701	126.4550	130.6701	126.4550	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	250.7111	253.3127	246.7568	232.7999	215.1820	198.6235	187.5615	184.9599	191.5159	205.4727	223.0906	239.6491	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.5287	36.5287	36.5287	36.5287	36.5287	36.5287	36.5287	36.5287	36.5287	36.5287	36.5287	36.5287	(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)	-108.2297	-108.2297	-108.2297	-108.2297	-108.2297	-108.2297	-108.2297	-108.2297	-108.2297	-108.2297	-108.2297	-108.2297	(71)
Water heating gains (Table 5)	136.0809	133.1278	127.2861	114.2741	106.3490	98.0450	92.8534	97.0045	101.8883	111.1020	123.5642	134.4015	(72)
Total internal gains	579.8331	593.0304	567.0839	544.3303	514.5721	490.9248	470.4561	472.0055	487.6605	509.6158	543.9111	567.0916	(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	12.4600	19.6403	0.4000	0.0000	0.7700	75.3730	(76)
West	15.0400	19.6403	0.4000	0.0000	0.7700	90.9800	(80)

Solar gains	166.3530	325.4218	535.9234	781.6123	957.8952	980.5762	933.5485	801.9044	623.3011	386.1404	207.4227	136.8006	(83)
Total gains	746.1861	918.4522	1103.0073	1325.9426	1472.4674	1471.5010	1404.0046	1273.9099	1110.9615	895.7562	751.3338	703.8923	(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	56.1024	56.3151	56.5293	57.6255	57.8499	58.9985	58.9985	59.2337	58.5336	57.8499	57.4029	56.9628	
alpha	4.7402	4.7543	4.7686	4.8417	4.8567	4.9332	4.9332	4.9489	4.9022	4.8567	4.8269	4.7975	
util living area	0.9854	0.9631	0.9042	0.7552	0.5670	0.3931	0.2847	0.3263	0.5534	0.8585	0.9688	0.9885	(86)
MIT	19.8228	20.1122	20.4814	20.8277	20.9617	20.9950	20.9992	20.9985	20.9754	20.7309	20.2156	19.7849	(87)
Th 2	20.0915	20.0946	20.0977	20.1134	20.1165	20.1322	20.1322	20.1354	20.1259	20.1165	20.1102	20.1040	(88)
util rest of house	0.9818	0.9547	0.8847	0.7176	0.5185	0.3409	0.2287	0.2654	0.4890	0.8232	0.9602	0.9857	(89)
MIT 2	18.7285	19.0932	19.5449	19.9498	20.0861	20.1293	20.1319	20.1348	20.1097	19.8599	19.2389	18.6897	(90)
Living area fraction									fLA = Living area / (4) =			0.3292	(91)
MIT	19.0888	19.4286	19.8532	20.2388	20.3743	20.4143	20.4174	20.4191	20.3947	20.1467	19.5604	19.0503	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0888	19.4286	19.8532	20.2388	20.3743	20.4143	20.4174	20.4191	20.3947	20.1467	19.5604	19.0503	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9766	0.9472	0.8788	0.7232	0.5329	0.3579	0.2471	0.2854	0.5092	0.8245	0.9537	0.9812	(94)
Useful gains	728.7433	869.9500	969.2994	958.8943	784.7274	526.7017	346.9791	363.6073	565.7030	738.5571	716.5119	690.6902	(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	1414.6676	1384.5345	1267.6960	1055.9821	804.7072	528.8824	347.2447	364.1366	577.1277	885.6315	1164.9355	1399.0959	(97)
Space heating kWh	510.3277	345.8008	222.0071	69.9032	14.8650	0.0000	0.0000	0.0000	0.0000	109.4234	322.8650	527.0538	(98a)
Space heating requirement - total per year (kWh/year)												2122.2460	
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	510.3277	345.8008	222.0071	69.9032	14.8650	0.0000	0.0000	0.0000	0.0000	109.4234	322.8650	527.0538	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2122.2460	
Space heating per m2											(98c) / (4) =	21.9694	(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 %)												83.9000	(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	510.3277	345.8008	222.0071	69.9032	14.8650	0.0000	0.0000	0.0000	0.0000	109.4234	322.8650	527.0538	(98)
Space heating efficiency (main heating system 1)	83.9000	83.9000	83.9000	83.9000	0.0000	0.0000	0.0000	0.0000	83.9000	83.9000	83.9000	83.9000	(210)
Space heating fuel (main heating system)	608.2571	412.1583	264.6092	83.3173	17.7175	0.0000	0.0000	0.0000	0.0000	130.4212	384.8212	628.1929	(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	317.1377	280.4787	297.4585	259.6867	250.6099	224.5440	220.4122	229.7007	232.8664	261.2451	279.8037	313.3799	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.3948	84.8312	83.7631	81.9820	80.7373	80.3000	80.3000	80.3000	80.3000	82.6606	84.6890	85.4861	(217)
Fuel for water heating, kWh/month	311.7037	276.3740	294.2820	256.6069	247.2846	218.2179	211.0253	222.5925	228.5820	254.3972	272.1588	306.9749	(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	85.7513	77.4528	85.7513	82.9852	85.7513	82.9852	85.7513	85.7513	82.9852	85.7513	82.9852	85.7513	(231)
Lighting	24.1011	19.3348	17.4088	12.7545	9.8519	8.0491	8.9872	11.6820	15.1737	19.9087	22.4869	24.7709	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-8.7456	-14.1114	-23.3687	-30.2062	-36.0933	-35.0907	-34.6477	-30.8353	-24.7773	-17.6333	-10.1960	-7.3486	(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	2529.4946	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	3100.2000	(219)
Space cooling fuel	0.0000	(221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.6000, SFP = 0.8800)		
mechanical ventilation fans (SFP = 0.8800)	368.6528	(230a)
central heating pump	41.0000	(230c)
maintaining electric keep-hot facility for gas combi boiler	600.0000	(230f)
Total electricity for the above, kWh/year	1009.6528	(231)
Electricity for lighting (calculated in Appendix L)	194.5096	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-273.0542	(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	6560.8027	(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	2529.4946	0.2100	531.1939	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3100.2000	0.2100	651.0420	(264)
Space and water heating			1182.2359	(265)
Pumps, fans and electric keep-hot	1009.6528	0.1387	140.0513	(267)
Energy for lighting	194.5096	0.1443	28.0737	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-273.0542	0.1319	-36.0113	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-36.0113	(269)
Total CO2, kg/year			1314.3496	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			13.6100	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2529.4946	1.1300	2858.3289	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3100.2000	1.1300	3503.2260	(278)
Space and water heating			6361.5549	(279)
Pumps, fans and electric keep-hot	1009.6528	1.5128	1527.4027	(281)
Energy for lighting	194.5096	1.5338	298.3453	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-273.0542	1.4873	-406.1030	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-406.1030	(283)
Total Primary energy kWh/year			7781.1999	(286)
Dwelling Primary energy Rate (DPER)			80.5500	(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	46.8000 (1b)	x	3.4000 (2b)	=	159.1200	(1b) - (3b)
First floor	49.8000 (1c)	x	3.7000 (2c)	=	184.2600	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 96.6000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	343.3800	(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) =	0.0874	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3374	(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) =		0.2868	(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													
	0.3656	0.3585	0.3513	0.3154	0.3083	0.2724	0.2724	0.2653	0.2868	0.3083	0.3226	0.3369	(22b)
Effective ac	0.5668	0.5642	0.5617	0.5498	0.5475	0.5371	0.5371	0.5352	0.5411	0.5475	0.5520	0.5568	(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)			24.1400	1.1450	27.6412			(27)
Ground Floor			46.8000	0.1300	6.0840			(28a)
Exposed Floor			3.0000	0.1300	0.3900			(28b)
External Wall	145.0600	24.1400	120.9200	0.1800	21.7656			(29a)
Terrace Roof	4.2000		4.2000	0.1100	0.4620			(30)
Total net area of external elements Aum(A, m2)			199.0600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		56.3428			(33)
Party to dwelling			60.4700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 200.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	17.9000	0.0700	1.2530
E16 Corner (normal)	21.0000	0.0900	1.8900
E18 Party wall between dwellings	10.8000	0.0600	0.6480
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.9000	0.0000	0.0000
E5 Ground floor (normal)	20.9000	0.1600	3.3440
P1 Party wall - Ground floor	8.1000	0.0800	0.6480
E2 Other lintels (including other steel lintels)	12.1000	0.0500	0.6050
E3 Sill	12.1000	0.0500	0.6050
E4 Jamb	35.6000	0.0500	1.7800
E6 Intermediate floor within a dwelling	17.2600	0.0000	0.0000
E20 Exposed floor (normal)	2.7400	0.3200	0.8768
E21 Exposed floor (inverted)	2.7400	0.3200	0.8768
E24 Eaves (insulation at ceiling level - inverted)	2.7000	0.2400	0.6480
E14 Flat roof	2.0000	0.0800	0.1600
E25 Staggered party wall between dwellings	3.4000	0.0600	0.2040
P2 Party wall - Intermediate floor within a dwelling	8.1000	0.0000	0.0000
P7 Party Wall - Exposed floor (normal)	0.8000	0.1600	0.1280
P5 Party wall - Roof (insulation at rafter level)	2.0000	0.0800	0.1600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.8266 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 70.1694 (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	64.2316	63.9375	63.6493	62.2952	62.0419	60.8625	60.8625	60.6441	61.3168	62.0419	62.5544	63.0902	(38)
Heat transfer coeff	134.4011	134.1070	133.8187	132.4646	132.2113	131.0320	131.0320	130.8136	131.4862	132.2113	132.7238	133.2596	(39)
Average = Sum(39)m / 12 =												132.4634	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3913	1.3883	1.3853	1.3713	1.3686	1.3564	1.3564	1.3542	1.3611	1.3686	1.3740	1.3795	(40)
HLP (average)												1.3713	
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 2.7057 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	69.5862	68.5404	67.0166	64.1010	61.9493	59.5498	58.1859	59.6982	61.3560	63.9324	66.9106	69.3196	(42a)
Hot water usage for baths	30.0476	29.6013	28.9729	27.8142	26.9466	25.9846	25.4649	26.0890	26.7684	27.7978	28.9803	29.9460	(42b)
Hot water usage for other uses	42.3395	40.7999	39.2603	37.7207	36.1810	34.6414	34.6414	36.1810	37.7207	39.2603	40.7999	42.3395	(42c)
Average daily hot water use (litres/day)												130.5054	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	141.9733	138.9417	135.2498	129.6359	125.0770	120.1758	118.2923	121.9682	125.8451	130.9905	136.6909	141.6051	(44)
Energy conte	224.8510	197.8511	207.8739	177.4650	168.3776	147.7702	143.0643	151.0222	155.1796	177.7528	194.7412	221.7193	(45)
Energy content (annual)										Total = Sum(45)m =		2167.6681	
Distribution loss (46)m = 0.15 x (45)m	33.7276	29.6777	31.1811	26.6198	25.2566	22.1655	21.4596	22.6533	23.2769	26.6629	29.2112	33.2579	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	275.8099	243.8785	258.8328	226.7801	219.3366	197.0852	194.0232	201.9811	204.4946	228.7117	244.0563	272.6782	(62)
WWHRS	-31.8119	-28.1347	-29.4610	-24.3949	-22.7352	-19.4547	-18.2356	-19.3918	-20.1285	-23.7293	-26.8824	-31.2228	(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	243.9980	215.7438	229.3717	202.3852	196.6014	177.6306	175.7875	182.5893	184.3661	204.9824	217.1738	241.4554	(64)
									Total per year (kWh/year) = Sum(64)m =			2472.0852	(64)
12Total per year (kWh/year)												2472	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =			0.0000	(64a)
Heat gains from water heating, kWh/month	87.5027	77.2923	81.8578	71.3359	68.7253	61.4624	60.3086	62.9546	63.9260	71.8425	77.0802	86.4614	(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	135.2872	135.2872	135.2872	135.2872	135.2872	135.2872	135.2872	135.2872	135.2872	135.2872	135.2872	135.2872	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	126.4550	140.0037	126.4550	130.6701	126.4550	130.6701	126.4550	126.4550	130.6701	126.4550	130.6701	126.4550	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	250.7111	253.3127	246.7568	232.7999	215.1820	198.6235	187.5615	184.9599	191.5159	205.4727	223.0906	239.6491	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.5287	36.5287	36.5287	36.5287	36.5287	36.5287	36.5287	36.5287	36.5287	36.5287	36.5287	36.5287	(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)													
	-108.2297	-108.2297	-108.2297	-108.2297	-108.2297	-108.2297	-108.2297	-108.2297	-108.2297	-108.2297	-108.2297	-108.2297	(71)
Water heating gains (Table 5)													
	117.6111	115.0183	110.0239	99.0776	92.3727	85.3644	81.0599	84.6164	88.7861	96.5626	107.0559	116.2116	(72)
Total internal gains													
	561.3633	574.9209	549.8218	529.1338	500.5958	478.2442	458.6626	459.6174	474.5582	495.0763	527.4028	548.9017	(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	10.9400	19.6403	0.6300	0.7000	0.7700	65.6654	(76)
West	13.2000	19.6403	0.6300	0.7000	0.7700	79.2306	(80)

Solar gains	144.8960	283.4473	466.7974	680.7961	834.3412	854.0967	813.1349	698.4708	542.9046	336.3341	180.6683	119.1554	(83)
Total gains	706.2593	858.3682	1016.6191	1209.9299	1334.9370	1332.3409	1271.7974	1158.0882	1017.4629	831.4105	708.0711	668.0572	(84)

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7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	39.9302	40.0178	40.1040	40.5140	40.5916	40.9569	40.9569	41.0253	40.8154	40.5916	40.4349	40.2723	
alpha	3.6620	3.6679	3.6736	3.7009	3.7061	3.7305	3.7305	3.7350	3.7210	3.7061	3.6957	3.6848	
util living area													
	0.9900	0.9793	0.9534	0.8819	0.7540	0.5827	0.4401	0.4969	0.7409	0.9324	0.9819	0.9918	(86)
MIT	19.0642	19.3472	19.7820	20.3261	20.7193	20.9215	20.9787	20.9669	20.8066	20.2451	19.5547	19.0207	(87)
Th 2	19.7700	19.7723	19.7746	19.7854	19.7875	19.7969	19.7969	19.7986	19.7933	19.7875	19.7834	19.7791	(88)
util rest of house													
	0.9873	0.9736	0.9406	0.8503	0.6929	0.4898	0.3258	0.3772	0.6546	0.9070	0.9760	0.9896	(89)
MIT 2	17.5486	17.9085	18.4546	19.1186	19.5545	19.7509	19.7896	19.7861	19.6598	19.0435	18.1825	17.4990	(90)
Living area fraction									fLA = Living area / (4) =			0.3292	(91)
MIT	18.0475	18.3821	18.8916	19.5161	19.9379	20.1362	20.1811	20.1748	20.0373	19.4391	18.6343	18.0000	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.0475	18.3821	18.8916	19.5161	19.9379	20.1362	20.1811	20.1748	20.0373	19.4391	18.6343	18.0000	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9815	0.9647	0.9286	0.8421	0.7012	0.5173	0.3633	0.4161	0.6739	0.8977	0.9680	0.9846	(94)
Useful gains	693.2209	828.1003	944.0531	1018.8855	936.0592	689.1691	461.9904	481.8479	685.6751	746.3446	685.4412	657.7742	(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													
	1847.6845	1808.0487	1658.2223	1406.2615	1089.1477	725.4249	469.2340	493.7937	780.6703	1168.6278	1530.8703	1838.9771	(97)
Space heating kWh													
	858.9209	658.5253	531.3419	278.9107	113.8978	0.0000	0.0000	0.0000	0.0000	314.1788	608.7090	878.8149	(98a)
Space heating requirement - total per year (kWh/year)												4243.2992	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	858.9209	658.5253	531.3419	278.9107	113.8978	0.0000	0.0000	0.0000	0.0000	314.1788	608.7090	878.8149	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4243.2992	
Space heating per m2											(98c) / (4) =	43.9265	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.4000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	858.9209	658.5253	531.3419	278.9107	113.8978	0.0000	0.0000	0.0000	0.0000	314.1788	608.7090	878.8149	(98)
Space heating efficiency (main heating system 1)													
	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)													
	929.5681	712.6897	575.0453	301.8514	123.2660	0.0000	0.0000	0.0000	0.0000	340.0203	658.7759	951.0984	(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													
	243.9980	215.7438	229.3717	202.3852	196.6014	177.6306	175.7875	182.5893	184.3661	204.9824	217.1738	241.4554	(64)
Efficiency of water heater												80.3000	(216)
(217)m	86.8424	86.6110	86.1190	85.0689	83.2543	80.3000	80.3000	80.3000	80.3000	85.2933	86.4649	86.8942	(217)
Fuel for water heating, kWh/month													
	280.9663	249.0952	266.3428	237.9073	236.1455	221.2087	218.9135	227.3839	229.5967	240.3265	251.1698	277.8729	(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	26.2748	21.0787	18.9790	13.9048	10.7405	8.7751	9.7978	12.7356	16.5423	21.7044	24.5150	27.0051	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-21.1108	-31.4995	-47.8832	-57.0277	-64.2964	-61.0231	-60.2587	-55.4794	-47.5712	-37.3791	-23.8109	-18.0533	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-7.1775	-15.4683	-31.4523	-48.3055	-64.9417	-65.6646	-64.9134	-54.4858	-39.3028	-22.4873	-9.6969	-5.6501	(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	4592.3152	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	2936.9291	(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)	212.0530	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-954.9394	(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	6872.3579	(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	4592.3152	0.2100	964.3862	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2936.9291	0.2100	616.7551	(264)
Space and water heating			1581.1413	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	212.0530	0.1443	30.6058	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-525.3932	0.1334	-70.0997	
PV Unit electricity exported	-429.5462	0.1252	-53.7962	
Total			-123.8959	(269)
Total CO2, kg/year			1499.7804	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.5300	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	4592.3152	1.1300	5189.3161	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2936.9291	1.1300	3318.7299	(278)
Space and water heating			8508.0461	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	212.0530	1.5338	325.2540	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-525.3932	1.4930	-784.4352	
PV Unit electricity exported	-429.5462	0.4597	-197.4551	
Total			-981.8903	(283)
Total Primary energy kWh/year			7981.5106	(286)
Target Primary Energy Rate (TPER)			82.6200	(287)

Full SAP Calculation Printout

Property Reference	Plot 01.02	**Issued on Date**	24/09/2024
Assessment Reference	0001	**Prop Type Ref**	3B5P EF
Property	Plot 01.02, 33-35, Jamestown Road, London, NW1 7DB		

SAP Rating	85 B	**DER**	11.13	**TER**	13.63
Environmental	90 B	**% DER < TER**			18.34
CO_2 Emissions (t/year)	0.88	**DFEE**	30.97	**TFEE**	38.12
Compliance Check	See BREL	**% DFEE < TFEE**			18.76
% DPER < TPER	9.83	**DPER**	65.43	**TPER**	72.56

Assessor Details	Mr. Gary Ormiston	**Assessor ID**	AW68-0001
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	88.7000 (1b)	x	2.8000 (2b)	=	248.3600	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	248.3600	(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) =	81.0000 (23c)

Effective ac	0.2576	0.2544	0.2512	0.2352	0.2321	0.2161	0.2161	0.2129	0.2225	0.2321	0.2384	0.2448	(25)

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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 = 1.20)			14.0000	1.1450	16.0305			(27)
Exposed Floor			88.7000	0.1000	8.8700			(28b)
External Wall	43.1200	14.0000	29.1200	0.1500	4.3680			(29a)
Wall to stairs/lifts	11.2000		11.2000	0.1400	1.5680			(29a)
Total net area of external elements Aum(A, m2)			143.0200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.8365			(33)
Corridor			35.8400	0.0000	0.0000			(32)
Dwellings			42.0000	0.0000	0.0000			(32)
Party Ceiling			88.7000					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	200.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	19.4000	0.0500	0.9700
E16 Corner (normal)	2.8000	0.0900	0.2520

E18 Party wall between dwellings	5.6000	0.0900	0.5040	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	27.8000	0.0000	0.0000	
E2 Other lintels (including other steel lintels)	8.8000	0.0300	0.2640	
E3 Sill	8.8000	0.0300	0.2640	
E4 Jamb	19.6000	0.0300	0.5880	
E20 Exposed floor (normal)	19.4000	0.1600	3.1040	
E25 Staggered party wall between dwellings	8.4000	0.2400	2.0160	
P7 Party Wall - Exposed floor (normal)	27.8000	0.0800	2.2240	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.1860 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.0225 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	21.1095	20.8483	20.5870	19.2808	19.0196	17.7133	17.7133	17.4521	18.2358	19.0196	19.5421	20.0645	(38)
Heat transfer coeff	62.1320	61.8708	61.6096	60.3033	60.0421	58.7359	58.7359	58.4746	59.2584	60.0421	60.5646	61.0871	(39)
Average = Sum(39)m / 12 =												60.2380	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7005	0.6975	0.6946	0.6799	0.6769	0.6622	0.6622	0.6592	0.6681	0.6769	0.6828	0.6887	(40)
HLP (average)												0.6791	
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 2.6075 (42)
Hot water usage for mixer showers

93.4162	92.0123	89.9666	86.0525	83.1640	79.9428	78.1119	80.1421	82.3676	85.8262	89.8244	93.0583	(42a)

Hot water usage for baths

29.3392	28.9035	28.2899	27.1585	26.3114	25.3720	24.8646	25.4739	26.1374	27.1425	28.2972	29.2400	(42b)

Hot water usage for other uses

41.3335	39.8304	38.3274	36.8244	35.3213	33.8183	33.8183	35.3213	36.8244	38.3274	39.8304	41.3335	(42c)

Average daily hot water use (litres/day) 150.9045 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	164.0889	160.7462	156.5839	150.0354	144.7967	139.1331	136.7948	140.9373	145.3293	151.2961	157.9520	163.6318	(44)
Energy conte	259.8767	228.9005	240.6636	205.3910	194.9242	171.0804	165.4414	174.5099	179.2056	205.3074	225.0315	256.2078	(45)
Energy content (annual)										Total = Sum(45)m =		2506.5400	
Distribution loss (46)m = 0.15 x (45)m	38.9815	34.3351	36.0995	30.8086	29.2386	25.6621	24.8162	26.1765	26.8808	30.7961	33.7547	38.4312	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	310.8356	274.9279	291.6225	254.7061	245.8831	220.3955	216.4003	225.4688	228.5206	256.2663	274.3466	307.1667	(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	310.8356	274.9279	291.6225	254.7061	245.8831	220.3955	216.4003	225.4688	228.5206	256.2663	274.3466	307.1667	(64)
										Total per year (kWh/year) = Sum(64)m =		3106.5400	(64)
12Total per year (kWh/year)												3107	(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	99.1487	87.6163	92.7604	80.6213	77.5520	69.2130	67.7490	70.7643	71.9146	81.0044	87.1517	97.9288	(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	130.3753	130.3753	130.3753	130.3753	130.3753	130.3753	130.3753	130.3753	130.3753	130.3753	130.3753	130.3753	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	124.8747	138.2542	124.8747	129.0372	124.8747	129.0372	124.8747	124.8747	129.0372	124.8747	129.0372	124.8747	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	236.6656	239.1215	232.9328	219.7579	203.1269	187.4962	177.0538	174.5980	180.7867	193.9616	210.5926	226.2233	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0375	36.0375	36.0375	36.0375	36.0375	36.0375	36.0375	36.0375	36.0375	36.0375	36.0375	36.0375	(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)	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	(71)
Water heating gains (Table 5)	133.2644	130.3813	124.6779	111.9740	104.2366	96.1292	91.0605	95.1132	99.8814	108.8769	121.0441	131.6248	(72)
Total internal gains	559.9173	572.8696	547.5981	525.8817	497.3508	474.7751	455.1016	456.6985	471.8179	492.8258	525.7864	547.8354	(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	9.8400	10.6334	0.4000	0.0000	0.7700	32.2268	(74)
South	4.1600	46.7521	0.4000	0.0000	0.7700	59.9025	(78)

Solar gains	92.1293	159.6920	229.6197	309.3384	373.6244	384.0560	364.7173	313.9583	256.3691	179.1267	110.7608	78.6271	(83)
Total gains	652.0467	732.5615	777.2178	835.2201	870.9753	858.8311	819.8190	770.6569	728.1870	671.9525	636.5473	626.4625	(84)

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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, nil,m (see Table 9a)													
tau	79.3114	79.6463	79.9840	81.7165	82.0720	83.8972	83.8972	84.2721	83.1575	82.0720	81.3640	80.6681	
alpha	6.2874	6.3098	6.3323	6.4478	6.4715	6.5931	6.5931	6.6181	6.5438	6.4715	6.4243	6.3779	
util living area	0.9793	0.9574	0.9159	0.8008	0.6277	0.4366	0.3151	0.3488	0.5558	0.8324	0.9537	0.9828	(86)
MIT	20.3654	20.5310	20.7110	20.9028	20.9813	20.9985	20.9999	20.9997	20.9933	20.8959	20.6251	20.3453	(87)
Th 2	20.3404	20.3430	20.3456	20.3587	20.3613	20.3744	20.3744	20.3770	20.3691	20.3613	20.3560	20.3508	(88)
util rest of house	0.9749	0.9490	0.9003	0.7717	0.5883	0.3944	0.2704	0.3017	0.5071	0.8003	0.9432	0.9791	(89)
MIT 2	19.6039	19.8116	20.0324	20.2634	20.3457	20.3734	20.3743	20.3769	20.3645	20.2621	19.9412	19.5871	(90)
Living area fraction										fLA = Living area / (4) =		0.3709	(91)
MIT	19.8863	20.0785	20.2841	20.5005	20.5814	20.6053	20.6063	20.6079	20.5978	20.4972	20.1949	19.8683	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8863	20.0785	20.2841	20.5005	20.5814	20.6053	20.6063	20.6079	20.5978	20.4972	20.1949	19.8683	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9712	0.9452	0.8987	0.7784	0.6021	0.4100	0.2870	0.3192	0.5249	0.8075	0.9403	0.9758	(94)
Useful gains	633.2806	692.4147	698.5154	650.1097	524.3900	352.1369	235.2703	245.9672	382.2185	542.6076	598.5167	611.3001	(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	968.4109	939.1036	849.2333	699.5511	533.2592	352.7260	235.3150	246.0548	385.0461	594.2483	793.0867	957.1331	(97)
Space heating kWh	249.3369	165.7749	112.1341	35.5978	6.5987	0.0000	0.0000	0.0000	0.0000	38.4207	140.0904	257.2997	(98a)
Space heating requirement - total per year (kWh/year)												1005.2533	
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	249.3369	165.7749	112.1341	35.5978	6.5987	0.0000	0.0000	0.0000	0.0000	38.4207	140.0904	257.2997	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1005.2533	
Space heating per m2											(98c) / (4) =	11.3332	(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 %)	83.9000	(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	249.3369	165.7749	112.1341	35.5978	6.5987	0.0000	0.0000	0.0000	0.0000	38.4207	140.0904	257.2997	(98)
Space heating efficiency (main heating system 1)	83.9000	83.9000	83.9000	83.9000	83.9000	0.0000	0.0000	0.0000	0.0000	83.9000	83.9000	83.9000	(210)
Space heating fuel (main heating system)	297.1835	197.5863	133.6521	42.4288	7.8649	0.0000	0.0000	0.0000	0.0000	45.7934	166.9731	306.6743	(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	310.8356	274.9279	291.6225	254.7061	245.8831	220.3955	216.4003	225.4688	228.5206	256.2663	274.3466	307.1667	(64)
Efficiency of water heater												80.3000	(216)
(217)m	83.9132	83.3324	82.5170	81.2640	80.5035	80.3000	80.3000	80.3000	80.3000	81.3257	83.0146	84.0042	(217)
Fuel for water heating, kWh/month	309.6970	274.6838	291.6535	252.7454	242.1313	213.0516	206.0292	217.3224	223.1701	252.4507	271.0747	304.9939	(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	76.6754	69.2552	76.6754	74.2020	76.6754	74.2020	76.6754	76.6754	74.2020	76.6754	74.2020	76.6754	(231)
Lighting	23.7999	19.0932	17.1913	12.5951	9.7288	7.9485	8.8749	11.5360	14.9841	19.6599	22.2059	24.4614	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-15.4998	-24.3611	-39.2650	-49.3494	-57.7337	-55.7256	-55.0804	-49.6460	-40.7484	-29.9612	-17.8728	-13.0921	(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	1198.1564	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	3059.0035	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.6000, SFP = 0.8640)		
mechanical ventilation fans (SFP = 0.8640)	261.7913	(230a)
central heating pump	41.0000	(230c)
maintaining electric keep-hot facility for gas combi boiler	600.0000	(230f)
Total electricity for the above, kWh/year	902.7913	(231)
Electricity for lighting (calculated in Appendix L)	192.0789	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-448.3357	(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	4903.6945	(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	1198.1564	0.2100	251.6129	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3059.0035	0.2100	642.3907	(264)
Space and water heating			894.0036	(265)
Pumps, fans and electric keep-hot	902.7913	0.1387	125.2283	(267)
Energy for lighting	192.0789	0.1443	27.7229	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-448.3357	0.1324	-59.3498	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-59.3498	(269)
Total CO2, kg/year			987.6050	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.1300	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1198.1564	1.1300	1353.9168	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3059.0035	1.1300	3456.6740	(278)
Space and water heating			4810.5908	(279)
Pumps, fans and electric keep-hot	902.7913	1.5128	1365.7427	(281)
Energy for lighting	192.0789	1.5338	294.6171	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-448.3357	1.4891	-667.6257	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-667.6257	(283)
Total Primary energy kWh/year			5803.3248	(286)
Dwelling Primary energy Rate (DPER)			65.4300	(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		88.7000 (1b)	x	2.8000 (2b)	=	248.3600	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.7000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	248.3600	(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) =	0.1208	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3708	(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) =	0.3152	(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	0.4018	0.3940	0.3861	0.3467	0.3388	0.2994	0.2994	0.2915	0.3152	0.3388	0.3546	0.3703	(22b)
Effective ac	0.5807	0.5776	0.5745	0.5601	0.5574	0.5448	0.5448	0.5425	0.5497	0.5574	0.5629	0.5686	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opening Type (Uw = 1.20)			14.0000	1.1450	16.0305			(27)
Exposed Floor			88.7000	0.1300	11.5310			(28b)
External Wall	43.1200	14.0000	29.1200	0.1800	5.2416			(29a)
Wall to stairs/lifts	11.2000		11.2000	0.1800	2.0160			(29a)
Total net area of external elements Aum(A, m2)			143.0200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.8191			(33)
Corridor			35.8400	0.0000	0.0000			(32)
Dwellings			42.0000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 200.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	19.4000	0.0700	1.3580
E16 Corner (normal)	2.8000	0.0900	0.2520
E18 Party wall between dwellings	5.6000	0.0600	0.3360
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	27.8000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	8.8000	0.0500	0.4400
E3 Sill	8.8000	0.0500	0.4400
E4 Jamb	19.6000	0.0500	0.9800
E20 Exposed floor (normal)	19.4000	0.3200	6.2080
E25 Staggered party wall between dwellings	8.4000	0.0600	0.5040
P7 Party Wall - Exposed floor (normal)	27.8000	0.1600	4.4480

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 14.9660 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 49.7851 (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	47.5968	47.3398	47.0879	45.9049	45.6836	44.6532	44.6532	44.4624	45.0501	45.6836	46.1313	46.5995	(38)
Heat transfer coeff	97.3819	97.1249	96.8731	95.6900	95.4687	94.4383	94.4383	94.2475	94.8352	95.4687	95.9165	96.3846	(39)
Average = Sum(39)m / 12 =												95.6890	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0979	1.0950	1.0921	1.0788	1.0763	1.0647	1.0647	1.0625	1.0692	1.0763	1.0814	1.0866	(40)
HLP (average)												1.0788	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6075 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	67.9390	66.9180	65.4303	62.5837	60.4829	58.1402	56.8086	58.2851	59.9037	62.4191	65.3268	67.6787	(42a)
Hot water usage for baths	29.3392	28.9035	28.2899	27.1585	26.3114	25.3720	24.8646	25.4739	26.1374	27.1425	28.2972	29.2400	(42b)
Hot water usage for other uses	41.3335	39.8304	38.3274	36.8244	35.3213	33.8183	33.8183	35.3213	36.8244	38.3274	39.8304	41.3335	(42c)
Average daily hot water use (litres/day)												127.4155	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	138.6117	135.6520	132.0476	126.5666	122.1156	117.3305	115.4915	119.0804	122.8654	127.8890	133.4544	138.2522	(44)
Energy conte	219.5271	193.1666	202.9522	173.2633	164.3911	144.2716	139.6770	147.4464	151.5053	173.5441	190.1303	216.4696	(45)
Energy content (annual)										Total = Sum(45)m =		2116.3446	
Distribution loss (46)m = 0.15 x (45)m	32.9291	28.9750	30.4428	25.9895	24.6587	21.6407	20.9516	22.1170	22.7258	26.0316	28.5195	32.4704	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	270.4860	239.1940	253.9111	222.5783	215.3500	193.5867	190.6359	198.4053	200.8204	224.5030	239.4453	267.4285	(62)
WWHRS	-31.0589	-27.4687	-28.7637	-23.8175	-22.1970	-18.9941	-17.8040	-18.9328	-19.6521	-23.1676	-26.2461	-30.4837	(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	239.4271	211.7253	225.1474	198.7609	193.1530	174.5925	172.8319	179.4726	181.1683	201.3354	213.1992	236.9448	(64)
										Total per year (kWh/year) = Sum(64)m =		2427.7584	(64)
12Total per year (kWh/year)												2428	(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	85.7325	75.7347	80.2213	69.9388	67.3998	60.2991	59.1823	61.7657	62.7043	70.4431	75.5471	84.7159	(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	130.3753	130.3753	130.3753	130.3753	130.3753	130.3753	130.3753	130.3753	130.3753	130.3753	130.3753	130.3753	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	124.8747	138.2542	124.8747	129.0372	124.8747	129.0372	124.8747	124.8747	129.0372	124.8747	129.0372	124.8747	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	236.6656	239.1215	232.9328	219.7579	203.1269	187.4962	177.0538	174.5980	180.7867	193.9616	210.5926	226.2233	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0375	36.0375	36.0375	36.0375	36.0375	36.0375	36.0375	36.0375	36.0375	36.0375	36.0375	36.0375	(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)	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	(71)
Water heating gains (Table 5)	115.2318	112.7005	107.8244	97.1372	90.5911	83.7487	79.5461	83.0184	87.0893	94.6816	104.9265	113.8654	(72)
Total internal gains	541.8848	555.1887	530.7445	511.0449	483.7053	462.3947	443.5873	444.6037	459.0257	478.6305	509.6688	530.0760	(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	9.8400	10.6334	0.6300	0.7000	0.7700	31.9771	(74)
South	4.1600	46.7521	0.6300	0.7000	0.7700	59.4382	(78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	91.4153	158.4544	227.8402	306.9411	370.7289	381.0796	361.8908	311.5252	254.3823	177.7385	109.9024	78.0178	(83)
Total gains	633.3001	713.6431	758.5847	817.9860	854.4342	843.4742	805.4781	756.1288	713.4080	656.3690	619.5713	608.0938	(84)

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7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	50.6026	50.7365	50.8684	51.4973	51.6167	52.1799	52.1799	52.2855	51.9615	51.6167	51.3757	51.1262	
alpha	4.3735	4.3824	4.3912	4.4332	4.4411	4.4787	4.4787	4.4857	4.4641	4.4411	4.4250	4.4084	
util living area	0.9901	0.9823	0.9681	0.9259	0.8315	0.6622	0.5026	0.5522	0.7800	0.9397	0.9817	0.9916	(86)
MIT	19.5492	19.7466	20.0256	20.4161	20.7412	20.9329	20.9844	20.9766	20.8570	20.4514	19.9436	19.5209	(87)
Th 2	20.0026	20.0049	20.0073	20.0182	20.0202	20.0298	20.0298	20.0315	20.0261	20.0202	20.0161	20.0118	(88)
util rest of house	0.9875	0.9777	0.9595	0.9052	0.7853	0.5805	0.3980	0.4455	0.7086	0.9186	0.9762	0.9895	(89)
MIT 2	18.3188	18.5707	18.9242	19.4130	19.7893	19.9863	20.0236	20.0214	19.9203	19.4654	18.8305	18.2892	(90)
Living area fraction									fLA = Living area / (4) =			0.3709	(91)
MIT	18.7752	19.0069	19.3327	19.7851	20.1424	20.3374	20.3800	20.3757	20.2677	19.8312	19.2434	18.7461	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7752	19.0069	19.3327	19.7851	20.1424	20.3374	20.3800	20.3757	20.2677	19.8312	19.2434	18.7461	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9831	0.9717	0.9521	0.8994	0.7916	0.6077	0.4367	0.4846	0.7280	0.9137	0.9704	0.9856	(94)
Useful gains	622.6164	693.4289	722.2576	735.6943	676.3913	512.5426	351.7186	366.4153	519.3487	599.7045	601.2190	599.3346	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1409.6212	1370.1323	1243.1452	1041.5935	805.9839	541.8310	356.9736	374.6960	584.9156	881.2863	1164.7479	1402.0159	(97)
Space heating kWh	585.5316	454.7446	387.5404	220.2474	96.4169	0.0000	0.0000	0.0000	0.0000	209.4969	405.7408	597.1949	(98a)
Space heating requirement - total per year (kWh/year)												2956.9135	
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	585.5316	454.7446	387.5404	220.2474	96.4169	0.0000	0.0000	0.0000	0.0000	209.4969	405.7408	597.1949	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2956.9135	
Space heating per m2										(98c) / (4) =		33.3361	(99)

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

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

Fraction of space heat from main system(s) 1.0000 (202)

Efficiency of main space heating system 1 (in %) 92.4000 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	585.5316	454.7446	387.5404	220.2474	96.4169	0.0000	0.0000	0.0000	0.0000	209.4969	405.7408	597.1949	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	633.6922	492.1479	419.4160	238.3630	104.3473	0.0000	0.0000	0.0000	0.0000	226.7282	439.1135	646.3149	(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	239.4271	211.7253	225.1474	198.7609	193.1530	174.5925	172.8319	179.4726	181.1683	201.3354	213.1992	236.9448	(64)
Efficiency of water heater												80.3000	(216)
(217)m	86.2200	85.9749	85.5337	84.6019	82.9726	80.3000	80.3000	80.3000	80.3000	84.4667	85.7371	86.2753	(217)
Fuel for water heating, kWh/month	277.6932	246.2642	263.2264	234.9365	232.7914	217.4253	215.2328	223.5026	225.6144	238.3606	248.6663	274.6380	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	25.9465	20.8152	18.7418	13.7311	10.6063	8.6654	9.6754	12.5764	16.3356	21.4331	24.2087	26.6676	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.4856	-29.1274	-44.3554	-52.9220	-59.7532	-56.7469	-56.0459	-51.5679	-44.1586	-34.6170	-21.9994	-16.6582	(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	-6.4893	-13.9994	-28.4920	-43.7970	-58.9158	-59.5802	-58.8896	-49.4043	-35.6109	-20.3535	-8.7681	-5.1066	(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	3200.1228	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	2898.3515	(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)	209.4031	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-876.8439	(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	5517.0335	(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	3200.1228	0.2100	672.0258	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2898.3515	0.2100	608.6538	(264)
Space and water heating			1280.6796	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	209.4031	0.1443	30.2233	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-487.4373	0.1334	-65.0169	
PV Unit electricity exported	-389.4066	0.1252	-48.7607	
Total			-113.7776	(269)
Total CO2, kg/year			1209.0546	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.6300	(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	3200.1228	1.1300	3616.1388	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2898.3515	1.1300	3275.1372	(278)
Space and water heating			6891.2760	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	209.4031	1.5338	321.1895	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-487.4373	1.4929	-727.6956	
PV Unit electricity exported	-389.4066	0.4596	-178.9723	
Total			-906.6679	(283)
Total Primary energy kWh/year			6435.8984	(286)
Target Primary Energy Rate (TPER)			72.5600	(287)

Full SAP Calculation Printout

Property Reference	Plot 02.02	**Issued on Date**	24/09/2024
Assessment Reference	0001	**Prop Type Ref**	3B5P MF
Property	Plot 02.02, 33-35, Jamestown Road, London, NW1 7DB		

SAP Rating	86 B	**DER**	9.53	**TER**	10.79
Environmental	92 A	**% DER < TER**			11.68
CO_2 Emissions (t/year)	0.78	**DFEE**	22.81	**TFEE**	25.22
Compliance Check	See BREL	**% DFEE < TFEE**			9.54
% DPER < TPER	0.78	**DPER**	56.82	**TPER**	57.26

Assessor Details	Mr. Gary Ormiston	**Assessor ID**	AW68-0001
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	88.7000 (1b)	x	2.8000 (2b)	=	248.3600	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	248.3600	(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) =		81.0000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2576	0.2544	0.2512	0.2352	0.2321	0.2161	0.2161	0.2129	0.2225	0.2321	0.2384	0.2448	(25)

3. Heat losses and heat loss parameter

Element	Gross 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 = 1.20)			14.0000	1.1450	16.0305			(27)
External Wall	43.1200	14.0000	29.1200	0.1500	4.3680			(29a)
Wall to stairs/lifts	11.2000		11.2000	0.1400	1.5680			(29a)
Total net area of external elements Aum(A, m2)			54.3200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.9665			(33)
Corridor			35.8400	0.0000	0.0000			(32)
Dwellings			42.0000	0.0000	0.0000			(32)
Party Floor 1			88.7000					(32d)
Party Ceiling			88.7000					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	200.0000	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	38.8000	0.0500	1.9400
E16 Corner (normal)	2.8000	0.0900	0.2520

E18 Party wall between dwellings	5.6000	0.0900	0.5040	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	55.6000	0.0000	0.0000	
E2 Other lintels (including other steel lintels)	8.8000	0.0300	0.2640	
E3 Sill	8.8000	0.0300	0.2640	
E4 Jamb	19.6000	0.0300	0.5880	
E25 Staggered party wall between dwellings	8.4000	0.2400	2.0160	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.8280 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 27.7945 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	21.1095	20.8483	20.5870	19.2808	19.0196	17.7133	17.7133	17.4521	18.2358	19.0196	19.5421	20.0645	(38)
Heat transfer coeff	48.9040	48.6428	48.3816	47.0753	46.8141	45.5079	45.5079	45.2466	46.0304	46.8141	47.3366	47.8591	(39)
Average = Sum(39)m / 12 =												47.0100	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.5513	0.5484	0.5455	0.5307	0.5278	0.5131	0.5131	0.5101	0.5189	0.5278	0.5337	0.5396	(40)
HLP (average)												0.5300	
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 2.6075 (42)

Hot water usage for mixer showers

93.4162	92.0123	89.9666	86.0525	83.1640	79.9428	78.1119	80.1421	82.3676	85.8262	89.8244	93.0583	(42a)

Hot water usage for baths

29.3392	28.9035	28.2899	27.1585	26.3114	25.3720	24.8646	25.4739	26.1374	27.1425	28.2972	29.2400	(42b)

Hot water usage for other uses

41.3335	39.8304	38.3274	36.8244	35.3213	33.8183	33.8183	35.3213	36.8244	38.3274	39.8304	41.3335	(42c)

Average daily hot water use (litres/day) 150.9045 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	164.0889	160.7462	156.5839	150.0354	144.7967	139.1331	136.7948	140.9373	145.3293	151.2961	157.9520	163.6318	(44)
Energy conte	259.8767	228.9005	240.6636	205.3910	194.9242	171.0804	165.4414	174.5099	179.2056	205.3074	225.0315	256.2078	(45)
Energy content (annual)										Total = Sum(45)m =		2506.5400	
Distribution loss (46)m = 0.15 x (45)m	38.9815	34.3351	36.0995	30.8086	29.2386	25.6621	24.8162	26.1765	26.8808	30.7961	33.7547	38.4312	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	310.8356	274.9279	291.6225	254.7061	245.8831	220.3955	216.4003	225.4688	228.5206	256.2663	274.3466	307.1667	(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	310.8356	274.9279	291.6225	254.7061	245.8831	220.3955	216.4003	225.4688	228.5206	256.2663	274.3466	307.1667	(64)
										Total per year (kWh/year) = Sum(64)m =		3106.5400	(64)
12Total per year (kWh/year)												3107	(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	99.1487	87.6163	92.7604	80.6213	77.5520	69.2130	67.7490	70.7643	71.9146	81.0044	87.1517	97.9288	(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	130.3753	130.3753	130.3753	130.3753	130.3753	130.3753	130.3753	130.3753	130.3753	130.3753	130.3753	130.3753	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	124.8747	138.2542	124.8747	129.0372	124.8747	129.0372	124.8747	124.8747	129.0372	124.8747	129.0372	124.8747	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	236.6656	239.1215	232.9328	219.7579	203.1269	187.4962	177.0538	174.5980	180.7867	193.9616	210.5926	226.2233	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0375	36.0375	36.0375	36.0375	36.0375	36.0375	36.0375	36.0375	36.0375	36.0375	36.0375	36.0375	(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)	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	(71)
Water heating gains (Table 5)	133.2644	130.3813	124.6779	111.9740	104.2366	96.1292	91.0605	95.1132	99.8814	108.8769	121.0441	131.6248	(72)
Total internal gains	559.9173	572.8696	547.5981	525.8817	497.3508	474.7751	455.1016	456.6985	471.8179	492.8258	525.7864	547.8354	(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	9.8400	10.6334	0.4000	0.0000	0.7700	32.2268	(74)
South	4.1600	46.7521	0.4000	0.0000	0.7700	59.9025	(78)

Solar gains	92.1293	159.6920	229.6197	309.3384	373.6244	384.0560	364.7173	313.9583	256.3691	179.1267	110.7608	78.6271	(83)
Total gains	652.0467	732.5615	777.2178	835.2201	870.9753	858.8311	819.8190	770.6569	728.1870	671.9525	636.5473	626.4625	(84)

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7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	100.7642	101.3054	101.8524	104.6785	105.2627	108.2841	108.2841	108.9093	107.0549	105.2627	104.1008	102.9643	
alpha	7.7176	7.7537	7.7902	7.9786	8.0175	8.2189	8.2189	8.2606	8.1370	8.0175	7.9401	7.8643	
util living area	0.9587	0.9130	0.8360	0.6714	0.4989	0.3391	0.2442	0.2701	0.4359	0.7086	0.9023	0.9652	(86)
MIT	20.6841	20.8114	20.9144	20.9854	20.9986	21.0000	21.0000	21.0000	20.9997	20.9822	20.8615	20.6702	(87)
Th 2	20.4740	20.4767	20.4793	20.4927	20.4954	20.5089	20.5089	20.5116	20.5035	20.4954	20.4901	20.4847	(88)
util rest of house	0.9514	0.9001	0.8160	0.6456	0.4721	0.3131	0.2170	0.2414	0.4046	0.6782	0.8862	0.9588	(89)
MIT 2	20.1130	20.2685	20.3900	20.4790	20.4943	20.5089	20.5089	20.5116	20.5033	20.4793	20.3419	20.1055	(90)
Living area fraction										fLA = Living area / (4) =		0.3709	(91)
MIT	20.3248	20.4699	20.5846	20.6668	20.6813	20.6910	20.6910	20.6927	20.6874	20.6659	20.5346	20.3149	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3248	20.4699	20.5846	20.6668	20.6813	20.6910	20.6910	20.6927	20.6874	20.6659	20.5346	20.3149	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9491	0.8999	0.8202	0.6546	0.4820	0.3227	0.2271	0.2520	0.4162	0.6886	0.8877	0.9565	(94)
Useful gains	618.8734	659.2657	637.4451	546.7004	419.8196	277.1717	186.1739	194.2302	303.0775	462.6938	565.0795	599.2259	(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	783.6785	757.3622	681.4327	553.9256	420.4538	277.1889	186.1747	194.2318	303.2194	471.2246	635.9491	771.2459	(97)
Space heating kWh	122.6150	65.9209	32.7268	5.2022	0.4718	0.0000	0.0000	0.0000	0.0000	6.3469	51.0261	127.9829	(98a)
Space heating requirement - total per year (kWh/year)												412.2926	
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	122.6150	65.9209	32.7268	5.2022	0.4718	0.0000	0.0000	0.0000	0.0000	6.3469	51.0261	127.9829	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												412.2926	
Space heating per m2										(98c) / (4) =		4.6482	(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 %)	83.9000	(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	122.6150	65.9209	32.7268	5.2022	0.4718	0.0000	0.0000	0.0000	0.0000	6.3469	51.0261	127.9829	(98)
Space heating efficiency (main heating system 1)	83.9000	83.9000	83.9000	83.9000	83.9000	0.0000	0.0000	0.0000	0.0000	83.9000	83.9000	83.9000	(210)
Space heating fuel (main heating system)	146.1442	78.5708	39.0069	6.2004	0.5624	0.0000	0.0000	0.0000	0.0000	7.5648	60.8178	152.5422	(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	310.8356	274.9279	291.6225	254.7061	245.8831	220.3955	216.4003	225.4688	228.5206	256.2663	274.3466	307.1667	(64)
Efficiency of water heater												80.3000	(216)
(217)m	82.5593	81.8310	81.0915	80.4558	80.3149	80.3000	80.3000	80.3000	80.3000	80.4882	81.5370	82.6516	(217)
Fuel for water heating, kWh/month	314.7759	279.7235	296.7803	255.2843	242.7000	213.0516	206.0292	217.3224	223.1701	255.0777	275.9871	309.9853	(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	76.6754	69.2552	76.6754	74.2020	76.6754	74.2020	76.6754	76.6754	74.2020	76.6754	74.2020	76.6754	(231)
Lighting	23.7999	19.0932	17.1913	12.5951	9.7288	7.9485	8.8749	11.5360	14.9841	19.6599	22.2059	24.4614	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-15.4998	-24.3611	-39.2650	-49.3494	-57.7337	-55.7256	-55.0804	-49.6460	-40.7484	-29.9612	-17.8728	-13.0921	(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	491.4095	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	3089.8872	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.6000, SFP = 0.8640)		
mechanical ventilation fans (SFP = 0.8640)	261.7913	(230a)
central heating pump	41.0000	(230c)
maintaining electric keep-hot facility for gas combi boiler	600.0000	(230f)
Total electricity for the above, kWh/year	902.7913	(231)
Electricity for lighting (calculated in Appendix L)	192.0789	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-448.3357	(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	4227.8312	(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	491.4095	0.2100	103.1960	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3089.8872	0.2100	648.8763	(264)
Space and water heating			752.0723	(265)
Pumps, fans and electric keep-hot	902.7913	0.1387	125.2283	(267)
Energy for lighting	192.0789	0.1443	27.7229	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-448.3357	0.1324	-59.3498	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-59.3498	(269)
Total CO2, kg/year			845.6737	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			9.5300	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	491.4095	1.1300	555.2927	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3089.8872	1.1300	3491.5725	(278)
Space and water heating			4046.8653	(279)
Pumps, fans and electric keep-hot	902.7913	1.5128	1365.7427	(281)
Energy for lighting	192.0789	1.5338	294.6171	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-448.3357	1.4891	-667.6257	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-667.6257	(283)
Total Primary energy kWh/year			5039.5993	(286)
Dwelling Primary energy Rate (DPER)			56.8200	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	88.7000 (1b)	x	2.8000 (2b)	=	248.3600	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 88.7000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	248.3600	(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) =	0.1208 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3708 (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) =	0.3152 (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	0.4018	0.3940	0.3861	0.3467	0.3388	0.2994	0.2994	0.2915	0.3152	0.3388	0.3546	0.3703	(22b)
Effective ac	0.5807	0.5776	0.5745	0.5601	0.5574	0.5448	0.5448	0.5425	0.5497	0.5574	0.5629	0.5686	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opening Type (Uw = 1.20)			14.0000	1.1450	16.0305			(27)
External Wall	43.1200	14.0000	29.1200	0.1800	5.2416			(29a)
Wall to stairs/lifts	11.2000		11.2000	0.1800	2.0160			(29a)
Total net area of external elements Aum(A, m2)			54.3200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	23.2881			(33)
Corridor			35.8400	0.0000	0.0000			(32)
Dwellings			42.0000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 200.0000 (35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E7	Party floor between dwellings (in blocks of flats)	38.8000	0.0700	2.7160
E16	Corner (normal)	2.8000	0.0900	0.2520
E18	Party wall between dwellings	5.6000	0.0600	0.3360
P3	Party wall - Intermediate floor between dwellings (in blocks of flats)	55.6000	0.0000	0.0000
E2	Other lintels (including other steel lintels)	8.8000	0.0500	0.4400
E3	Sill	8.8000	0.0500	0.4400
E4	Jamb	19.6000	0.0500	0.9800
E25	Staggered party wall between dwellings	8.4000	0.0600	0.5040

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.6680 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 28.9561 (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	47.5968	47.3398	47.0879	45.9049	45.6836	44.6532	44.6532	44.4624	45.0501	45.6836	46.1313	46.5995	(38)
Heat transfer coeff	76.5529	76.2959	76.0441	74.8610	74.6397	73.6093	73.6093	73.4185	74.0062	74.6397	75.0875	75.5556	(39)

Average = Sum(39)m / 12 = 74.8600

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8631	0.8602	0.8573	0.8440	0.8415	0.8299	0.8299	0.8277	0.8343	0.8415	0.8465	0.8518	(40)
HLP (average)												0.8440	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6075 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
67.9390	66.9180	65.4303	62.5837	60.4829	58.1402	56.8086	58.2851	59.9037	62.4191	65.3268	67.6787	(42a)

Hot water usage for baths

29.3392	28.9035	28.2899	27.1585	26.3114	25.3720	24.8646	25.4739	26.1374	27.1425	28.2972	29.2400	(42b)

Hot water usage for other uses

41.3335	39.8304	38.3274	36.8244	35.3213	33.8183	33.8183	35.3213	36.8244	38.3274	39.8304	41.3335	(42c)

Average daily hot water use (litres/day) 127.4155 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	138.6117	135.6520	132.0476	126.5666	122.1156	117.3305	115.4915	119.0804	122.8654	127.8890	133.4544	138.2522	(44)
Energy conte	219.5271	193.1666	202.9522	173.2633	164.3911	144.2716	139.6770	147.4464	151.5053	173.5441	190.1303	216.4696	(45)
Energy content (annual)										Total = Sum(45)m =		2116.3446	
Distribution loss (46)m = 0.15 x (45)m	32.9291	28.9750	30.4428	25.9895	24.6587	21.6407	20.9516	22.1170	22.7258	26.0316	28.5195	32.4704	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	270.4860	239.1940	253.9111	222.5783	215.3500	193.5867	190.6359	198.4053	200.8204	224.5030	239.4453	267.4285	(62)
WWHRS	-31.0589	-27.4687	-28.7637	-23.8175	-22.1970	-18.9941	-17.8040	-18.9328	-19.6521	-23.1676	-26.2461	-30.4837	(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	239.4271	211.7253	225.1474	198.7609	193.1530	174.5925	172.8319	179.4726	181.1683	201.3354	213.1992	236.9448	(64)
									Total per year (kWh/year) = Sum(64)m =			2427.7584	(64)
12Total per year (kWh/year)												2428	(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	85.7325	75.7347	80.2213	69.9388	67.3998	60.2991	59.1823	61.7657	62.7043	70.4431	75.5471	84.7159	(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	130.3753	130.3753	130.3753	130.3753	130.3753	130.3753	130.3753	130.3753	130.3753	130.3753	130.3753	130.3753	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	124.8747	138.2542	124.8747	129.0372	124.8747	129.0372	124.8747	124.8747	129.0372	124.8747	129.0372	124.8747	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	236.6656	239.1215	232.9328	219.7579	203.1269	187.4962	177.0538	174.5980	180.7867	193.9616	210.5926	226.2233	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0375	36.0375	36.0375	36.0375	36.0375	36.0375	36.0375	36.0375	36.0375	36.0375	36.0375	36.0375	(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)	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	(71)
Water heating gains (Table 5)	115.2318	112.7005	107.8244	97.1372	90.5911	83.7487	79.5461	83.0184	87.0893	94.6816	104.9265	113.8654	(72)
Total internal gains	541.8848	555.1887	530.7445	511.0449	483.7053	462.3947	443.5873	444.6037	459.0257	478.6305	509.6688	530.0760	(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	9.8400	10.6334	0.6300	0.7000	0.7700	31.9771	(74)
South	4.1600	46.7521	0.6300	0.7000	0.7700	59.4382	(78)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	91.4153	158.4544	227.8402	306.9411	370.7289	381.0796	361.8908	311.5252	254.3823	177.7385	109.9024	78.0178	(83)
Total gains	633.3001	713.6431	758.5847	817.9860	854.4342	843.4742	805.4781	756.1288	713.4080	656.3690	619.5713	608.0938	(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	64.3709	64.5877	64.8016	65.8257	66.0209	66.9450	66.9450	67.1190	66.5860	66.0209	65.6272	65.2206	
alpha	5.2914	5.3058	5.3201	5.3884	5.4014	5.4630	5.4630	5.4746	5.4391	5.4014	5.3751	5.3480	
util living area	0.9876	0.9757	0.9529	0.8831	0.7449	0.5480	0.4004	0.4436	0.6784	0.9052	0.9744	0.9897	(86)
MIT	20.0006	20.1851	20.4180	20.7180	20.9113	20.9864	20.9979	20.9965	20.9590	20.7199	20.3240	19.9757	(87)
Th 2	20.1990	20.2015	20.2039	20.2154	20.2175	20.2275	20.2275	20.2294	20.2237	20.2175	20.2132	20.2087	(88)
util rest of house	0.9846	0.9701	0.9420	0.8578	0.6986	0.4859	0.3310	0.3708	0.6145	0.8790	0.9676	0.9873	(89)
MIT 2	19.0333	19.2678	19.5598	19.9286	20.1409	20.2189	20.2267	20.2278	20.1944	19.9394	19.4539	19.0091	(90)
Living area fraction									fLA = Living area / (4) =			0.3709	(91)
MIT	19.3921	19.6080	19.8781	20.2214	20.4267	20.5035	20.5127	20.5129	20.4780	20.2289	19.7766	19.3677	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3921	19.6080	19.8781	20.2214	20.4267	20.5035	20.5127	20.5129	20.4780	20.2289	19.7766	19.3677	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9808	0.9650	0.9367	0.8580	0.7116	0.5084	0.3567	0.3978	0.6362	0.8794	0.9629	0.9839	(94)
Useful gains	621.1378	688.6737	710.5854	701.8589	607.9789	428.8520	287.3417	300.7701	453.8484	577.2033	596.5706	598.2881	(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	1155.3433	1122.1632	1017.3263	847.5298	651.3574	434.5555	288.0144	301.9649	472.0100	718.6963	951.8556	1146.0017	(97)
Space heating kWh	397.4489	291.3049	228.2153	104.8831	32.2736	0.0000	0.0000	0.0000	0.0000	105.2708	255.8052	407.4989	(98a)
Space heating requirement - total per year (kWh/year)												1822.7008	
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	397.4489	291.3049	228.2153	104.8831	32.2736	0.0000	0.0000	0.0000	0.0000	105.2708	255.8052	407.4989	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1822.7008	
Space heating per m2											(98c) / (4) =	20.5491	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.4000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	397.4489	291.3049	228.2153	104.8831	32.2736	0.0000	0.0000	0.0000	0.0000	105.2708	255.8052	407.4989	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	430.1395	315.2651	246.9862	113.5098	34.9282	0.0000	0.0000	0.0000	0.0000	113.9294	276.8455	441.0162	(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	239.4271	211.7253	225.1474	198.7609	193.1530	174.5925	172.8319	179.4726	181.1683	201.3354	213.1992	236.9448	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.4592	85.0654	84.4105	83.0760	81.4277	80.3000	80.3000	80.3000	80.3000	83.0587	84.7729	85.5320	(217)
Fuel for water heating, kWh/month	280.1654	248.8969	266.7292	239.2520	237.2078	217.4253	215.2328	223.5026	225.6144	242.4012	251.4946	277.0247	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	25.9465	20.8152	18.7418	13.7311	10.6063	8.6654	9.6754	12.5764	16.3356	21.4331	24.2087	26.6676	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.4856	-29.1274	-44.3554	-52.9220	-59.7532	-56.7469	-56.0459	-51.5679	-44.1586	-34.6170	-21.9994	-16.6582	(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	-6.4893	-13.9994	-28.4920	-43.7970	-58.9158	-59.5802	-58.8896	-49.4043	-35.6109	-20.3535	-8.7681	-5.1066	(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												1972.6199	(211)
Space heating fuel - main system 2												0.0000	(213)

Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	2924.9470	(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)	209.4031	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-876.8439	(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	4316.1261	(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	1972.6199	0.2100	414.2502	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2924.9470	0.2100	614.2389	(264)
Space and water heating			1028.4890	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	209.4031	0.1443	30.2233	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-487.4373	0.1334	-65.0169	
PV Unit electricity exported	-389.4066	0.1252	-48.7607	
Total			-113.7776	(269)
Total CO2, kg/year			956.8640	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.7900	(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	1972.6199	1.1300	2229.0605	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2924.9470	1.1300	3305.1901	(278)
Space and water heating			5534.2506	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	209.4031	1.5338	321.1895	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-487.4373	1.4929	-727.6956	
PV Unit electricity exported	-389.4066	0.4596	-178.9723	
Total			-906.6679	(283)
Total Primary energy kWh/year			5078.8729	(286)
Target Primary Energy Rate (TPER)			57.2600	(287)

Full SAP Calculation Printout

Property Reference	Plot 05.03	**Issued on Date**	24/09/2024
Assessment Reference	0001	**Prop Type Ref**	2B3P TF
Property	Plot 05.03, 33-35, Jamestown Road, London, NW1 7DB		

SAP Rating	82 B	**DER**	13.72	**TER**	16.36
Environmental	89 B	**% DER < TER**			16.14
CO_2 Emissions (t/year)	0.8	**DFEE**	34.68	**TFEE**	44.34
Compliance Check	See BREL	**% DFEE < TFEE**			21.78
% DPER < TPER	7.00	**DPER**	81.32	**TPER**	87.44

Assessor Details	Mr. Gary Ormiston	**Assessor ID**	AW68-0001
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	65.0000	(1b)	x 2.8000	(2b) =	182.0000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	182.0000	(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) =		81.0000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2576	0.2544	0.2512	0.2352	0.2321	0.2161	0.2161	0.2129	0.2225	0.2321	0.2384	0.2448	(25)

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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 = 1.20)			18.5200	1.1450	21.2061			(27)
External Wall	63.2800	18.5200	44.7600	0.1500	6.7140			(29a)
External Roof 1	65.0000		65.0000	0.1000	6.5000			(30)
Total net area of external elements Aum(A, m2)			128.2800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.4201			(33)
Dwellings			29.1200	0.0000	0.0000			(32)
Party Floor 1			65.0000					(32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	200.0000 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	22.6000	0.0500	1.1300
E16 Corner (normal)	5.6000	0.0900	0.5040
E18 Party wall between dwellings	5.6000	0.0900	0.5040
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.4000	0.0000	0.0000

E2 Other lintels (including other steel lintels)	10.8000	0.0300	0.3240	
E3 Sill	10.8000	0.0300	0.3240	
E4 Jamb	24.0000	0.0300	0.7200	
E15 Flat roof with parapet	22.6000	0.2000	4.5200	
P5 Party wall - Roof (insulation at rafter level)	10.4000	0.0800	0.8320	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.8580 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 43.2781 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	15.4692	15.2778	15.0863	14.1291	13.9377	12.9805	12.9805	12.7890	13.3633	13.9377	14.3206	14.7034	(38)
Heat transfer coeff	58.7473	58.5559	58.3644	57.4072	57.2158	56.2586	56.2586	56.0671	56.6415	57.2158	57.5987	57.9815	(39)
Average = Sum(39)m / 12 =												57.3594	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9038	0.9009	0.8979	0.8832	0.8802	0.8655	0.8655	0.8626	0.8714	0.8802	0.8861	0.8920	(40)
HLP (average)												0.8825	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.1189 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
82.1519	80.9174	79.1183	75.6762	73.1360	70.3032	68.6930	70.4785	72.4356	75.4772	78.9932	81.8372	(42a)

Hot water usage for baths

25.8163	25.4329	24.8930	23.8975	23.1521	22.3255	21.8790	22.4152	22.9989	23.8834	24.8994	25.7291	(42b)

Hot water usage for other uses

36.3298	35.0087	33.6877	32.3666	31.0455	29.7244	29.7244	31.0455	32.3666	33.6877	35.0087	36.3298	(42c)

Average daily hot water use (litres/day) 132.7043 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	144.2981	141.3590	137.6990	131.9403	127.3336	122.3531	120.2965	123.9391	127.8011	133.0482	138.9014	143.8961	(44)
Energy conte	228.5329	201.2934	211.6382	180.6196	171.4154	150.4474	145.4882	153.4625	157.5915	180.5452	197.8905	225.3065	(45)
Energy content (annual)										Total = Sum(45)m =		2204.2314	
Distribution loss (46)m = 0.15 x (45)m	34.2799	30.1940	31.7457	27.0929	25.7123	22.5671	21.8232	23.0194	23.6387	27.0818	29.6836	33.7960	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	279.4918	247.3208	262.5971	229.9347	222.3744	199.7625	196.4471	204.4214	206.9066	231.5041	247.2055	276.2654	(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	279.4918	247.3208	262.5971	229.9347	222.3744	199.7625	196.4471	204.4214	206.9066	231.5041	247.2055	276.2654	(64)
										Total per year (kWh/year) = Sum(64)m =		2804.2314	(64)
12Total per year (kWh/year)												2804	(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	88.7269	78.4369	83.1094	72.3848	69.7354	62.3525	61.1145	63.7660	64.7280	72.7710	78.1273	87.6541	(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	105.9458	105.9458	105.9458	105.9458	105.9458	105.9458	105.9458	105.9458	105.9458	105.9458	105.9458	105.9458	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	93.4922	103.5092	93.4922	96.6086	93.4922	96.6086	93.4922	93.4922	96.6086	93.4922	96.6086	93.4922	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	185.3587	187.2821	182.4351	172.1164	159.0908	146.8487	138.6702	136.7467	141.5937	151.9125	164.9380	177.1801	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.5946	33.5946	33.5946	33.5946	33.5946	33.5946	33.5946	33.5946	33.5946	33.5946	33.5946	33.5946	(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)	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	(71)
Water heating gains (Table 5)	119.2566	116.7216	111.7062	100.5344	93.7303	86.6007	82.1432	85.7070	89.8999	97.8105	108.5102	117.8147	(72)
Total internal gains	455.8912	465.2966	445.4172	427.0431	404.0971	384.8417	369.0893	370.7296	382.8860	400.9988	427.8405	446.2707	(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	7.7200	10.6334	0.4000	0.0000	0.7700	25.2837	(74)
East	4.0000	19.6403	0.4000	0.0000	0.7700	24.1968	(76)
South	6.8000	46.7521	0.4000	0.0000	0.7700	97.9175	(78)

Solar gains	147.3980	256.0161	364.3321	476.4452	557.5722	564.3466	539.5720	477.2053	402.7677	286.6498	177.4269	125.5857	(83)
Total gains	603.2892	721.3127	809.7493	903.4883	961.6693	949.1883	908.6613	847.9350	785.6536	687.6487	605.2674	571.8565	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.4685	61.6695	61.8718	62.9034	63.1139	64.1877	64.1877	64.4069	63.7539	63.1139	62.6944	62.2804	
alpha	5.0979	5.1113	5.1248	5.1936	5.2076	5.2792	5.2792	5.2938	5.2503	5.2076	5.1796	5.1520	
util living area													
	0.9660	0.9258	0.8546	0.7124	0.5417	0.3779	0.2722	0.3038	0.4910	0.7727	0.9303	0.9724	(86)
MIT	20.1758	20.4306	20.6804	20.8940	20.9767	20.9972	20.9996	20.9993	20.9894	20.8675	20.5065	20.1327	(87)
Th 2	20.1643	20.1668	20.1693	20.1818	20.1843	20.1969	20.1969	20.1994	20.1919	20.1843	20.1793	20.1743	(88)
util rest of house													
	0.9587	0.9117	0.8304	0.6756	0.4976	0.3311	0.2226	0.2511	0.4359	0.7316	0.9147	0.9664	(89)
MIT 2	19.2254	19.5389	19.8360	20.0823	20.1658	20.1952	20.1968	20.1991	20.1849	20.0634	19.6468	19.1797	(90)
Living area fraction										fLA = Living area / (4) =		0.3477	(91)
MIT	19.5558	19.8490	20.1296	20.3645	20.4478	20.4741	20.4759	20.4774	20.4646	20.3430	19.9458	19.5111	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5558	19.8490	20.1296	20.3645	20.4478	20.4741	20.4759	20.4774	20.4646	20.3430	19.9458	19.5111	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9523	0.9057	0.8292	0.6841	0.5120	0.3473	0.2399	0.2694	0.4547	0.7400	0.9096	0.9604	(94)
Useful gains	574.4960	653.2645	671.4467	618.0318	492.3648	329.6454	217.9642	228.4439	357.2122	508.8772	550.5288	549.2360	(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													
	896.2393	875.3491	795.4840	658.1469	500.5100	330.4672	218.0528	228.6057	360.5029	557.4540	739.8984	887.7596	(97)
Space heating kWh													
	239.3770	149.2408	92.2838	28.8829	6.0600	0.0000	0.0000	0.0000	0.0000	36.1411	136.3461	251.8616	(98a)
Space heating requirement - total per year (kWh/year)												940.1933	
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													
	239.3770	149.2408	92.2838	28.8829	6.0600	0.0000	0.0000	0.0000	0.0000	36.1411	136.3461	251.8616	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												940.1933	
Space heating per m2											(98c) / (4) =	14.4645	(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 %)	83.9000	(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													
	239.3770	149.2408	92.2838	28.8829	6.0600	0.0000	0.0000	0.0000	0.0000	36.1411	136.3461	251.8616	(98)
Space heating efficiency (main heating system 1)													
	83.9000	83.9000	83.9000	83.9000	83.9000	0.0000	0.0000	0.0000	0.0000	83.9000	83.9000	83.9000	(210)
Space heating fuel (main heating system)													
	285.3123	177.8794	109.9926	34.4253	7.2229	0.0000	0.0000	0.0000	0.0000	43.0765	162.5103	300.1926	(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													
	279.4918	247.3208	262.5971	229.9347	222.3744	199.7625	196.4471	204.4214	206.9066	231.5041	247.2055	276.2654	(64)
Efficiency of water heater												80.3000	(216)
(217)m	84.0512	83.3339	82.3721	81.1763	80.5066	80.3000	80.3000	80.3000	80.3000	81.3628	83.1598	84.1837	(217)
Fuel for water heating, kWh/month													
	271.8974	241.5505	256.9294	222.5028	212.9210	187.3567	181.1808	191.1115	196.2535	221.9013	237.9642	267.6366	(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	70.7346	63.8893	70.7346	68.4528	70.7346	68.4528	70.7346	70.7346	68.4528	70.7346	68.4528	70.7346	(231)
Lighting	17.8187	14.2948	12.8709	9.4298	7.2838	5.9510	6.6446	8.6368	11.2184	14.7192	16.6252	18.3139	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-11.4182	-18.0364	-29.2293	-36.9580	-43.4550	-42.0401	-41.5643	-37.3613	-30.5145	-22.2743	-13.1995	-9.6361	(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	1120.6118	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	2689.2057	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.6000, SFP = 0.8640)		
mechanical ventilation fans (SFP = 0.8640)	191.8426	(230a)
central heating pump	41.0000	(230c)
maintaining electric keep-hot facility for gas combi boiler	600.0000	(230f)
Total electricity for the above, kWh/year	832.8426	(231)
Electricity for lighting (calculated in Appendix L)	143.8071	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-335.6871	(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	4450.7801	(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	1120.6118	0.2100	235.3285	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2689.2057	0.2100	564.7332	(264)
Space and water heating			800.0617	(265)
Pumps, fans and electric keep-hot	832.8426	0.1387	115.5255	(267)
Energy for lighting	143.8071	0.1443	20.7558	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-335.6871	0.1323	-44.3989	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-44.3989	(269)
Total CO2, kg/year			891.9441	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			13.7200	(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	1120.6118	1.1300	1266.2914	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2689.2057	1.1300	3038.8024	(278)
Space and water heating			4305.0938	(279)
Pumps, fans and electric keep-hot	832.8426	1.5128	1259.9242	(281)
Energy for lighting	143.8071	1.5338	220.5762	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-335.6871	1.4887	-499.7331	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-499.7331	(283)
Total Primary energy kWh/year			5285.8611	(286)
Dwelling Primary energy Rate (DPER)			81.3200	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	65.0000	(1b)	x 2.8000	(2b) =	182.0000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	182.0000	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1099 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3599 (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) =	0.3059 (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	0.3900	0.3824	0.3747	0.3365	0.3288	0.2906	0.2906	0.2830	0.3059	0.3288	0.3441	0.3594	(22b)
Effective ac	0.5761	0.5731	0.5702	0.5566	0.5541	0.5422	0.5422	0.5400	0.5468	0.5541	0.5592	0.5646	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opening Type (Uw = 1.20)			16.2600	1.1450	18.6183			(27)
External Wall	63.2800	16.2600	47.0200	0.1800	8.4636			(29a)
External Roof 1	65.0000		65.0000	0.1100	7.1500			(30)
Total net area of external elements Aum(A, m2)			128.2800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.2319			(33)
Dwellings			29.1200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 200.0000 (35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
	E7 Party floor between dwellings (in blocks of flats)	22.6000	0.0700	1.5820
	E16 Corner (normal)	5.6000	0.0900	0.5040
	E18 Party wall between dwellings	5.6000	0.0600	0.3360
	P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.4000	0.0000	0.0000
	E2 Other lintels (including other steel lintels)	10.8000	0.0500	0.5400
	E3 Sill	10.8000	0.0500	0.5400
	E4 Jamb	24.0000	0.0500	1.2000
	E15 Flat roof with parapet	22.6000	0.5600	12.6560
	P5 Party wall - Roof (insulation at rafter level)	10.4000	0.0800	0.8320

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 18.1900 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 52.4219 (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	34.5983	34.4209	34.2470	33.4303	33.2775	32.5662	32.5662	32.4345	32.8402	33.2775	33.5866	33.9098	(38)
Heat transfer coeff	87.0202	86.8428	86.6689	85.8522	85.6994	84.9881	84.9881	84.8564	85.2621	85.6994	86.0085	86.3317	(39)

Average = Sum(39)m / 12 = 85.8515

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3388	1.3360	1.3334	1.3208	1.3185	1.3075	1.3075	1.3055	1.3117	1.3185	1.3232	1.3282	(40)
HLP (average)												1.3208	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.1189 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	59.7469	58.8490	57.5406	55.0372	53.1898	51.1296	49.9586	51.2571	52.6804	54.8925	57.4496	59.5180	(42a)
Hot water usage for baths	25.8163	25.4329	24.8930	23.8975	23.1521	22.3255	21.8790	22.4152	22.9989	23.8834	24.8994	25.7291	(42b)
Hot water usage for other uses	36.3298	35.0087	33.6877	32.3666	31.0455	29.7244	29.7244	31.0455	32.3666	33.6877	35.0087	36.3298	(42c)

Average daily hot water use (litres/day) 112.0475 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	121.8930	119.2907	116.1213	111.3013	107.3874	103.1795	101.5620	104.7177	108.0459	112.4635	117.3578	121.5768	(44)
Energy conte	193.0488	169.8683	178.4741	152.3659	144.5640	126.8712	122.8304	129.6624	133.2315	152.6120	167.1977	190.3600	(45)
Energy content (annual)										Total = Sum(45)m =		1861.0862	
Distribution loss (46)m = 0.15 x (45)m	28.9573	25.4802	26.7711	22.8549	21.6846	19.0307	18.4246	19.4494	19.9847	22.8918	25.0796	28.5540	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	244.0077	215.8957	229.4330	201.6810	195.5230	176.1863	173.7893	180.6213	182.5465	203.5709	216.5127	241.3189	(62)
WWHRS	-27.3138	-24.1565	-25.2953	-20.9455	-19.5205	-16.7038	-15.6572	-16.6498	-17.2824	-20.3741	-23.0813	-26.8080	(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	216.6939	191.7392	204.1376	180.7355	176.0025	159.4825	158.1322	163.9715	165.2641	183.1968	193.4314	214.5109	(64)
										Total per year (kWh/year) = Sum(64)m =		2207.2980	(64)
12Total per year (kWh/year)												2207	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	76.9284	67.9881	72.0824	62.9904	60.8073	54.5135	53.5808	55.8525	56.6282	63.4832	67.9220	76.0344	(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	105.9458	105.9458	105.9458	105.9458	105.9458	105.9458	105.9458	105.9458	105.9458	105.9458	105.9458	105.9458	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	93.4922	103.5092	93.4922	96.6086	93.4922	96.6086	93.4922	93.4922	96.6086	93.4922	96.6086	93.4922	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	185.3587	187.2821	182.4351	172.1164	159.0908	146.8487	138.6702	136.7467	141.5937	151.9125	164.9380	177.1801	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.5946	33.5946	33.5946	33.5946	33.5946	33.5946	33.5946	33.5946	33.5946	33.5946	33.5946	33.5946	(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)	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	(71)
Water heating gains (Table 5)	103.3984	101.1727	96.8849	87.4867	81.7302	75.7131	72.0173	75.0705	78.6503	85.3269	94.3361	102.1968	(72)
Total internal gains	440.0330	449.7477	430.5959	413.9954	392.0970	373.9541	358.9633	360.0932	371.6364	388.5152	413.6664	430.6528	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	6.7800	10.6334	0.6300	0.7000	0.7700	22.0330	(74)
East	3.5100	19.6403	0.6300	0.7000	0.7700	21.0681	(76)
South	5.9700	46.7521	0.6300	0.7000	0.7700	85.2996	(78)

Solar gains	128.4007	223.0187	317.3733	415.0382	485.7133	491.6169	470.0341	415.7018	350.8553	249.7037	154.5591	109.3999 (83)
Total gains	568.4337	672.7664	747.9692	829.0336	877.8102	865.5711	828.9975	775.7949	722.4916	638.2189	568.2255	540.0527 (84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	41.4974	41.5822	41.6656	42.0619	42.1369	42.4896	42.4896	42.5556	42.3531	42.1369	41.9855	41.8283	
alpha	3.7665	3.7721	3.7777	3.8041	3.8091	3.8326	3.8326	3.8370	3.8235	3.8091	3.7990	3.7886	
util living area	0.9821	0.9661	0.9378	0.8706	0.7522	0.5844	0.4391	0.4846	0.7046	0.9005	0.9680	0.9850	(86)
MIT	19.3156	19.5911	19.9538	20.4011	20.7416	20.9278	20.9812	20.9727	20.8501	20.4017	19.7812	19.2677	(87)
Th 2	19.8106	19.8127	19.8148	19.8246	19.8264	19.8350	19.8350	19.8365	19.8317	19.8264	19.8227	19.8188	(88)
util rest of house	0.9773	0.9575	0.9218	0.8377	0.6923	0.4937	0.3284	0.3703	0.6185	0.8674	0.9583	0.9810	(89)
MIT 2	17.8926	18.2399	18.6917	19.2345	19.6112	19.7922	19.8284	19.8261	19.7301	19.2514	18.4908	17.8376	(90)
Living area fraction									fLA = Living area / (4) =			0.3477	(91)
MIT	18.3874	18.7097	19.1305	19.6401	20.0042	20.1871	20.2292	20.2247	20.1195	19.6513	18.9395	18.3348	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3874	18.7097	19.1305	19.6401	20.0042	20.1871	20.2292	20.2247	20.1195	19.6513	18.9395	18.3348	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9696	0.9470	0.9103	0.8317	0.7021	0.5223	0.3667	0.4096	0.6415	0.8615	0.9487	0.9741	(94)
Useful gains	551.1262	637.1398	680.8993	689.5257	616.3472	452.1221	304.0253	317.7893	463.4660	549.8243	539.0724	526.0491	(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	1225.8869	1199.2736	1094.6723	922.0591	711.6677	474.8343	308.4420	324.5539	513.2369	775.6927	1018.2980	1220.2826	(97)
Space heating kWh	502.0219	377.7539	307.8472	167.4240	70.9184	0.0000	0.0000	0.0000	0.0000	168.0461	345.0425	516.5097	(98a)
Space heating requirement - total per year (kWh/year)												2455.5636	
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	502.0219	377.7539	307.8472	167.4240	70.9184	0.0000	0.0000	0.0000	0.0000	168.0461	345.0425	516.5097	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2455.5636	
Space heating per m2											(98c) / (4) =	37.7779	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	92.4000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	502.0219	377.7539	307.8472	167.4240	70.9184	0.0000	0.0000	0.0000	0.0000	168.0461	345.0425	516.5097	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	543.3138	408.8245	333.1679	181.1949	76.7515	0.0000	0.0000	0.0000	0.0000	181.8681	373.4226	558.9932	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	216.6939	191.7392	204.1376	180.7355	176.0025	159.4825	158.1322	163.9715	165.2641	183.1968	193.4314	214.5109	(64)
Efficiency of water heater												80.3000	(216)
(217)m	86.1192	85.8060	85.2593	84.2178	82.5948	80.3000	80.3000	80.3000	80.3000	84.1968	85.6065	86.1913	(217)
Fuel for water heating, kWh/month	251.6209	223.4567	239.4317	214.6049	213.0914	198.6083	196.9268	204.1986	205.8084	217.5815	225.9540	248.8778	(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	19.4258	15.5841	14.0318	10.2803	7.9408	6.4877	7.2438	9.4158	12.2302	16.0467	18.1247	19.9657	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-14.4451	-21.6859	-33.1712	-39.7716	-45.0922	-42.9083	-42.3914	-38.9179	-33.1921	-25.8638	-16.3444	-12.3398	(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	-4.5894	-9.9177	-20.2119	-31.1048	-41.8693	-42.3370	-41.8341	-35.0753	-25.2635	-14.4190	-6.2022	-3.6096	(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												2657.5364	(211)

Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	2640.1609	(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)	156.7775	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-642.5576	(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	4897.9173	(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	2657.5364	0.2100	558.0826	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2640.1609	0.2100	554.4338	(264)
Space and water heating			1112.5164	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	156.7775	0.1443	22.6278	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-366.1237	0.1333	-48.7986	
PV Unit electricity exported	-276.4338	0.1252	-34.6077	
Total			-83.4062	(269)
Total CO2, kg/year			1063.6673	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.3600	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2657.5364	1.1300	3003.0161	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2640.1609	1.1300	2983.3818	(278)
Space and water heating			5986.3979	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	156.7775	1.5338	240.4706	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-366.1237	1.4925	-546.4477	
PV Unit electricity exported	-276.4338	0.4595	-127.0247	
Total			-673.4724	(283)
Total Primary energy kWh/year			5683.4970	(286)
Target Primary Energy Rate (TPER)			87.4400	(287)

Full SAP Calculation Printout

Property Reference	Plot 00.01	**Issued on Date**	24/09/2024
Assessment Reference	0001	**Prop Type Ref**	2B4P GF
Property	Plot 00.01, 33-35, Jamestown Road, London, NW1 7DB		

SAP Rating	84 B	**DER**	3.30	**TER**	13.51
Environmental	97 A	**% DER < TER**			75.57
CO_2 Emissions (t/year)	0.21	**DFEE**	30.49	**TFEE**	34.93
Compliance Check	See BREL	**% DFEE < TFEE**			12.71
% DPER < TPER	51.10	**DPER**	35.22	**TPER**	72.03

Assessor Details	Mr. Gary Ormiston	**Assessor ID**	AW68-0001
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	70.4000	(1b)	x 2.8000	(2b) =	197.1200	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.4000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	197.1200	(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) =	81.0000 (23c)

Effective ac	0.2576	0.2544	0.2512	0.2352	0.2321	0.2161	0.2161	0.2129	0.2225	0.2321	0.2384	0.2448	(25)

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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 = 1.20)			16.8800	1.1450	19.3282			(27)
Ground Floor			70.4000	0.1000	7.0400			(28a)
External Wall	40.6000	16.8800	23.7200	0.1500	3.5580			(29a)
Wall to stairs/lifts	1.9600		1.9600	0.1400	0.2744			(29a)
Total net area of external elements Aum(A, m2)			112.9600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.2006			(33)
Corridor			52.0800	0.0000	0.0000			(32)
Party Ceiling			70.4000					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	200.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	15.2000	0.0500	0.7600
E16 Corner (normal)	2.8000	0.0900	0.2520
E18 Party wall between dwellings	11.2000	0.0900	1.0080

P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	18.6000	0.0000	0.0000		
E2 Other lintels (including other steel lintels)	6.9800	0.0300	0.2094		
E3 Sill	6.9800	0.0300	0.2094		
E4 Jamb	19.2000	0.0300	0.5760		
E5 Ground floor (normal)	15.2000	0.1000	1.5200		
P1 Party wall - Ground floor	18.6000	0.1200	2.2320		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				6.7668	(36)
Point Thermal bridges			(36a) =	0.0000	
Total fabric heat loss			(33) + (36) + (36a) =	36.9674	(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	16.7543	16.5470	16.3396	15.3029	15.0956	14.0588	14.0588	13.8515	14.4735	15.0956	15.5103	15.9250	(38)
Heat transfer coeff	53.7218	53.5144	53.3071	52.2704	52.0630	51.0263	51.0263	50.8189	51.4410	52.0630	52.4777	52.8924	(39)
Average = Sum(39)m / 12 =												52.2185	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7631	0.7601	0.7572	0.7425	0.7395	0.7248	0.7248	0.7219	0.7307	0.7395	0.7454	0.7513	(40)
HLP (average)												0.7417	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2558	(42)
Hot water usage for mixer showers	85.3077	84.0257	82.1575	78.5832	75.9454	73.0038	71.3318	73.1858	75.2181	78.3765	82.0276	84.9808	(42a)
Hot water usage for baths	26.8033	26.4052	25.8447	24.8111	24.0372	23.1790	22.7155	23.2721	23.8782	24.7964	25.8513	26.7127	(42b)
Hot water usage for other uses	37.7316	36.3596	34.9875	33.6154	32.2434	30.8713	30.8713	32.2434	33.6154	34.9875	36.3596	37.7316	(42c)
Average daily hot water use (litres/day)												137.8032	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	149.8426	146.7904	142.9897	137.0097	132.2259	127.0541	124.9185	128.7012	132.7117	138.1604	144.2385	149.4251	(44)
Energy conte	237.3140	209.0276	219.7698	187.5594	178.0015	156.2278	151.0782	159.3590	163.6468	187.4824	205.4942	233.9636	(45)
Energy content (annual)										Total = Sum(45)m =		2288.9245	
Distribution loss (46)m = 0.15 x (45)m	35.5971	31.3541	32.9655	28.1339	26.7002	23.4342	22.6617	23.9039	24.5470	28.1224	30.8241	35.0945	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(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	292.5908	258.9551	275.0466	241.0531	233.2783	209.7215	206.3550	214.6358	217.1405	242.7592	258.9878	289.2404	(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	292.5908	258.9551	275.0466	241.0531	233.2783	209.7215	206.3550	214.6358	217.1405	242.7592	258.9878	289.2404	(64)
										Total per year (kWh/year) = Sum(64)m =		2939.7642	(64)
12Total per year (kWh/year)												2940	(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	123.1284	109.4436	117.2949	105.1585	103.4070	94.7407	94.4549	97.2083	97.2075	106.5593	111.1218	122.0143	(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	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	99.9837	110.6962	99.9837	103.3165	99.9837	103.3165	99.9837	99.9837	103.3165	99.9837	103.3165	99.9837	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	198.2288	200.2858	195.1023	184.0671	170.1371	157.0450	148.2986	146.2416	151.4251	162.4603	176.3903	189.4825	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	(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)	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	(71)
Water heating gains (Table 5)	165.4951	162.8626	157.6544	146.0534	138.9878	131.5843	126.9555	130.6563	135.0104	143.2249	154.3358	163.9978	(72)
Total internal gains	520.5446	530.6816	509.5773	490.2739	465.9456	448.7827	432.0748	433.7186	446.5890	462.5059	490.8795	510.3009	(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	11.0600	19.6403	0.4000	0.0000	0.7700	66.9042	(76)
Southeast	5.8200	36.7938	0.4000	0.0000	0.7700	65.9552	(77)

Solar gains	132.8593	243.2248	369.2554	504.8127	598.5819	606.1611	579.6455	509.6376	417.1231	279.4649	162.4207	111.4626	(83)
Total gains	653.4039	773.9063	878.8327	995.0867	1064.5275	1054.9437	1011.7203	943.3561	863.7121	741.9708	653.3002	621.7635	(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	72.8031	73.0852	73.3694	74.8246	75.1226	76.6489	76.6489	76.9617	76.0310	75.1226	74.5290	73.9447	
alpha	5.8535	5.8723	5.8913	5.9883	6.0082	6.1099	6.1099	6.1308	6.0687	6.0082	5.9686	5.9296	
util living area	0.9521	0.8961	0.7948	0.6196	0.4526	0.3094	0.2219	0.2478	0.4099	0.6964	0.8992	0.9605	(86)
MIT	20.4570	20.6681	20.8528	20.9684	20.9954	20.9997	21.0000	20.9999	20.9981	20.9508	20.7185	20.4233	(87)
Th 2	20.2854	20.2880	20.2906	20.3035	20.3060	20.3190	20.3190	20.3216	20.3138	20.3060	20.3009	20.2957	(88)
util rest of house	0.9429	0.8796	0.7690	0.5875	0.4195	0.2765	0.1876	0.2112	0.3695	0.6579	0.8804	0.9528	(89)
MIT 2	19.8065	20.0061	20.1733	20.2808	20.3032	20.3188	20.3190	20.3215	20.3128	20.2719	20.0677	19.7832	(90)
Living area fraction									fLA = Living area / (4) =			0.5327	(91)
MIT	20.1530	20.3587	20.5353	20.6470	20.6719	20.6815	20.6817	20.6829	20.6779	20.6336	20.4144	20.1242	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1530	20.3587	20.5353	20.6470	20.6719	20.6815	20.6817	20.6829	20.6779	20.6336	20.4144	20.1242	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9411	0.8814	0.7782	0.6035	0.4370	0.2940	0.2059	0.2307	0.3910	0.6764	0.8836	0.9507	(94)
Useful gains	614.8915	682.1040	683.8767	600.5063	465.2398	310.1910	208.2640	217.6316	337.6731	501.8482	577.2683	591.1126	(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	851.6525	827.2633	748.1803	614.0224	467.1040	310.3151	208.2746	217.6524	338.3717	522.3772	698.7089	842.2675	(97)
Space heating kWh	176.1502	97.5471	47.8419	9.7316	1.3870	0.0000	0.0000	0.0000	0.0000	15.2736	87.4372	186.8592	(98a)
Space heating requirement - total per year (kWh/year)												622.2278	
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	176.1502	97.5471	47.8419	9.7316	1.3870	0.0000	0.0000	0.0000	0.0000	15.2736	87.4372	186.8592	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												622.2278	
Space heating per m2										(98c) / (4) =		8.8385	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (301)

Fraction of space heat from community system 1.0000 (302)

Fraction of heat from community Heat pump-Space and Water 1.0000 (303a)

Factor for control and charging method (Table 4c(3)) for space heating 1.0500 (305)

Factor for charging method (Table 4c(3)) for water heating 1.0000 (305a)

Distribution loss factor (Table 12c) for community heating system 1.0200 (306)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

Space heating:

Space heating requirement

176.1502	97.5471	47.8419	9.7316	1.3870	0.0000	0.0000	0.0000	0.0000	15.2736	87.4372	186.8592	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.02												
307a 188.6568	104.4729	51.2387	10.4225	1.4855	0.0000	0.0000	0.0000	0.0000	16.3580	93.6453	200.1262	
Space heating requirement												
188.6568	104.4729	51.2387	10.4225	1.4855	0.0000	0.0000	0.0000	0.0000	16.3580	93.6453	200.1262	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000 (308)
Space heating fuel for secondary/supplementary system												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)

Water heating

Annual water heating requirement

292.5908	258.9551	275.0466	241.0531	233.2783	209.7215	206.3550	214.6358	217.1405	242.7592	258.9878	289.2404	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.02												
310a 298.4426	264.1342	280.5476	245.8742	237.9439	213.9160	210.4821	218.9285	221.4833	247.6144	264.1676	295.0252	
Water heating fuel												
298.4426	264.1342	280.5476	245.8742	237.9439	213.9160	210.4821	218.9285	221.4833	247.6144	264.1676	295.0252	(310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa 17.6471	15.9393	17.6471	17.0778	17.6471	17.0778	17.6471	17.6471	17.0778	17.6471	17.0778	17.6471	(331)
Lighting 19.0559	15.2874	13.7646	10.0845	7.7896	6.3641	7.1059	9.2365	11.9973	15.7412	17.7796	19.5855	(332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)

Annual totals kWh/year

Space heating fuel - community heating 666.4060 (307)

Space heating fuel - secondary 0.0000 (309)

Water heating fuel - community heating 2998.5595 (310)

Efficiency of water heater 0.0000 (311)

Electricity used for heat distribution 6.6641 (313)

Space cooling fuel 0.0000 (321)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.6000, SFP = 0.8640)

mechanical ventilation fans (SFP = 0.8640) 207.7802 (330a)

Total electricity for the above, kWh/year 207.7802 (331)

Electricity for lighting (calculated in Appendix L) 153.7922 (332)

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

PV generation 0.0000 (333)

Wind generation 0.0000 (334)

Hydro-electric generation (Appendix N) 0.0000 (335a)

Electricity generated - Micro CHP (Appendix N) 0.0000 (335)

Appendix Q - special features

Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4026.5379	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			300.0000	(367)
Space and Water heating from Heat pump	1221.6552	0.1590	35.3262	(367)
Electrical energy for heat distribution (space & water)	6.6641	0.0000	5.2861	(372)
Overall CO2 factor for heat network			0.0495	(386)
Total CO2 associated with community systems			181.4883	(373)
Space and water heating			181.4883	(376)
Pumps, fans and electric keep-hot	207.7802	0.1387	28.8217	(378)
Energy for lighting	153.7922	0.1443	22.1970	(379)
Total CO2, kg/year			232.5070	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.3000	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			300.0000	(467a)
Space and Water heating from Heat pump	1221.6552	1.5886	352.8852	(467)
Electrical energy for heat distribution (space & water)	6.6641	0.0000	56.1995	(472)
Overall CO2 factor for heat network			0.5265	(486)
Total CO2 associated with community systems			1929.5157	(473)
Space and water heating			1929.5157	(476)
Pumps, fans and electric keep-hot	207.7802	1.5128	314.3300	(478)
Energy for lighting	153.7922	1.5338	235.8916	(479)
Total Primary energy kWh/year			2479.7372	(483)
Dwelling Primary energy Rate (DPER)			35.2200	(484)

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	70.4000	(1b)	x 2.8000	(2b) =	197.1200	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.4000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		197.1200	(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) = 0.1522	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.4022	(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) = 0.3419	(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	0.4359	0.4273	0.4188	0.3760	0.3675	0.3248	0.3248	0.3162	0.3419	0.3675	0.3846	0.4017	(22b)
Effective ac	0.5950	0.5913	0.5877	0.5707	0.5675	0.5527	0.5527	0.5500	0.5584	0.5675	0.5740	0.5807	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opening Type (Uw = 1.20)			16.8800	1.1450	19.3282			(27)
Ground Floor			70.4000	0.1300	9.1520			(28a)
External Wall	40.6000	16.8800	23.7200	0.1800	4.2696			(29a)
Wall to stairs/lifts	1.9600		1.9600	0.1800	0.3528			(29a)

Total net area of external elements Aum(A, m2) 112.9600 (31)
Fabric heat loss, W/K = Sum (A x U) (26)...(30) + (32) = 33.1026 (33)
Corridor 52.0800 0.0000 0.0000 (32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 200.0000 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	15.2000	0.0700	1.0640
E16 Corner (normal)	2.8000	0.0900	0.2520
E18 Party wall between dwellings	11.2000	0.0600	0.6720
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	18.6000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	6.9800	0.0500	0.3490
E3 Sill	6.9800	0.0500	0.3490
E4 Jamb	19.2000	0.0500	0.9600
E5 Ground floor (normal)	15.2000	0.1600	2.4320
P1 Party wall - Ground floor	18.6000	0.0800	1.4880

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.5660 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 40.6686 (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	38.7041	38.4641	38.2289	37.1242	36.9175	35.9554	35.9554	35.7772	36.3260	36.9175	37.3357	37.7728	(38)
Heat transfer coeff	79.3727	79.1328	78.8976	77.7929	77.5862	76.6240	76.6240	76.4458	76.9946	77.5862	78.0043	78.4414	(39)

Average = Sum(39)m / 12 = 77.7919

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1275	1.1240	1.1207	1.1050	1.1021	1.0884	1.0884	1.0859	1.0937	1.1021	1.1080	1.1142	(40)
HLP (average)												1.1050	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2558 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	62.0419	61.1096	59.7509	57.1514	55.2330	53.0937	51.8776	53.2260	54.7041	57.0011	59.6564	61.8042	(42a)
Hot water usage for baths	26.8033	26.4052	25.8447	24.8111	24.0372	23.1790	22.7155	23.2721	23.8782	24.7964	25.8513	26.7127	(42b)
Hot water usage for other uses	37.7316	36.3596	34.9875	33.6154	32.2434	30.8713	30.8713	32.2434	33.6154	34.9875	36.3596	37.7316	(42c)

Average daily hot water use (litres/day) 116.3529 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	126.5768	123.8744	120.5831	115.5779	111.5136	107.1440	105.4644	108.7415	112.1977	116.7850	121.8673	126.2485	(44)
Energy conte	200.4668	176.3954	185.3317	158.2204	150.1187	131.7460	127.5501	134.6447	138.3510	158.4762	173.6223	197.6747	(45)
Energy content (annual)										Total = Sum(45)m =		1932.5980	
Distribution loss (46)m = 0.15 x (45)m	30.0700	26.4593	27.7998	23.7331	22.5178	19.7619	19.1325	20.1967	20.7526	23.7714	26.0433	29.6512	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7016	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9188	(55)
Total storage loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(56)
If cylinder contains dedicated solar storage	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(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	252.2134	223.1343	237.0783	208.2978	201.8653	181.8234	179.2967	186.3913	188.4283	210.2228	223.6997	249.4213	(62)
WWHRS	-28.3630	-25.0845	-26.2670	-21.7501	-20.2703	-17.3455	-16.2586	-17.2894	-17.9463	-21.1567	-23.9680	-27.8377	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	223.8504	198.0498	210.8113	186.5476	181.5950	164.4779	163.0381	169.1019	170.4820	189.0661	199.7317	221.5835	(64)
									Total per year (kWh/year) = Sum(64)m =			2278.3353	(64)
12Total per year (kWh/year)												2278	(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	108.0525	96.0426	103.0201	92.6702	91.3117	83.8674	83.8077	86.1666	86.0636	94.0906	97.7913	107.1241	(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	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	112.7898	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	99.9837	110.6962	99.9837	103.3165	99.9837	103.3165	99.9837	99.9837	103.3165	99.9837	103.3165	99.9837	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	198.2288	200.2858	195.1023	184.0671	170.1371	157.0450	148.2986	146.2416	151.4251	162.4603	176.3903	189.4825	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	34.2790	(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)	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	-90.2319	(71)
Water heating gains (Table 5)	145.2318	142.9205	138.4678	128.7086	122.7308	116.4825	112.6447	115.8154	119.5327	126.4659	135.8212	143.9840	(72)
Total internal gains	503.2813	513.7395	493.3907	475.9291	452.6886	433.6809	417.7639	418.8776	431.1113	448.7468	475.3649	493.2871	(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			11.0600		19.6403		0.6300	0.7000		0.7700		66.3857	(76)
Southeast			5.8200		36.7938		0.6300	0.7000		0.7700		65.4440	(77)
Solar gains	131.8297	241.3398	366.3936	500.9004	593.9429	601.4633	575.1533	505.6879	413.8904	277.2991	161.1619	110.5988	(83)
Total gains	635.1110	755.0793	859.7844	976.8295	1046.6315	1035.1442	992.9172	924.5654	845.0017	726.0459	636.5269	603.8859	(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	49.2752	49.4247	49.5720	50.2760	50.4099	51.0429	51.0429	51.1619	50.7972	50.4099	50.1397	49.8603	
alpha	4.2850	4.2950	4.3048	4.3517	4.3607	4.4029	4.4029	4.4108	4.3865	4.3607	4.3426	4.3240	
util living area	0.9773	0.9541	0.9069	0.7978	0.6404	0.4643	0.3376	0.3770	0.5955	0.8537	0.9566	0.9812	(86)
MIT	19.7189	19.9930	20.3369	20.7041	20.9063	20.9820	20.9965	20.9943	20.9486	20.6581	20.1324	19.6779	(87)
Th 2	19.9785	19.9812	19.9840	19.9967	19.9991	20.0103	20.0103	20.0124	20.0060	19.9991	19.9943	19.9892	(88)
util rest of house	0.9718	0.9436	0.8867	0.7597	0.5845	0.3962	0.2626	0.2977	0.5211	0.8152	0.9449	0.9765	(89)
MIT 2	18.5156	18.8587	19.2798	19.7129	19.9237	19.9998	20.0090	20.0102	19.9722	19.6770	19.0472	18.4717	(90)
Living area fraction										fLA = Living area / (4) =		0.5327	(91)
MIT	19.1566	19.4629	19.8429	20.2409	20.4471	20.5230	20.5350	20.5344	20.4923	20.1996	19.6252	19.1142	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1566	19.4629	19.8429	20.2409	20.4471	20.5230	20.5350	20.5344	20.4923	20.1996	19.6252	19.1142	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9662	0.9372	0.8835	0.7696	0.6102	0.4318	0.3026	0.3399	0.5584	0.8237	0.9397	0.9714	(94)
Useful gains	613.6227	707.6683	759.6604	751.7206	638.6562	447.0111	300.4106	314.2254	471.8772	598.0276	598.1282	586.6335	(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	1179.2064	1152.4045	1052.7230	882.2395	678.6559	453.8463	301.5170	316.0586	492.1746	744.7991	977.0231	1169.8936	(97)
Space heating kWh	420.7943	298.8627	218.0386	93.9737	29.7598	0.0000	0.0000	0.0000	0.0000	109.1980	272.8043	433.9456	(98a)
Space heating requirement - total per year (kWh/year)												1877.3770	
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	420.7943	298.8627	218.0386	93.9737	29.7598	0.0000	0.0000	0.0000	0.0000	109.1980	272.8043	433.9456	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1877.3770	
Space heating per m2											(98c) / (4) =	26.6673	(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	420.7943	298.8627	218.0386	93.9737	29.7598	0.0000	0.0000	0.0000	0.0000	109.1980	272.8043	433.9456	(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)	455.8984	323.7950	236.2282	101.8133	32.2425	0.0000	0.0000	0.0000	0.0000	118.3077	295.5627	470.1469	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	223.8504	198.0498	210.8113	186.5476	181.5950	164.4779	163.0381	169.1019	170.4820	189.0661	199.7317	221.5835	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.4534	84.9801	84.1355	82.6046	80.9553	79.8000	79.8000	79.8000	79.8000	82.8752	84.7595	85.5390	(217)
Fuel for water heating, kWh/month	261.9562	233.0543	250.5617	225.8320	224.3151	206.1127	204.3084	211.9071	213.6366	228.1336	235.6453	259.0438	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	20.7746	16.6662	15.0060	10.9941	8.4921	6.9382	7.7468	10.0696	13.0794	17.1609	19.3832	21.3520	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-15.6059	-23.4071	-35.7700	-42.8430	-48.5309	-46.1598	-45.5988	-41.8809	-35.7497	-27.8935	-17.6489	-13.3335	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-5.0100	-10.8220	-22.0479	-33.9216	-45.6550	-46.1675	-45.6240	-38.2594	-27.5622	-15.7359	-6.7708	-3.9410	(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												2033.9946	(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												2754.5069	(219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	167.6632	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-695.9393	(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	4346.2254	(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	2033.9946	0.2100	427.1389	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2754.5069	0.2100	578.4464	(264)
Space and water heating			1005.5853	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	167.6632	0.1443	24.1990	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-394.4219	0.1333	-52.5790	
PV Unit electricity exported	-301.5173	0.1252	-37.7494	
Total			-90.3283	(269)
Total CO2, kg/year			951.3852	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.5100	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2033.9946	1.1300	2298.4139	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2754.5069	1.1300	3112.5928	(278)
Space and water heating			5411.0066	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	167.6632	1.5338	257.1674	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-394.4219	1.4926	-588.7160	
PV Unit electricity exported	-301.5173	0.4595	-138.5559	
Total			-727.2720	(283)
Total Primary energy kWh/year			5071.0029	(286)
Target Primary Energy Rate (TPER)			72.0300	(287)

Full SAP Calculation Printout

Property Reference	Plot 00.02	**Issued on Date**	24/09/2024
Assessment Reference	0001	**Prop Type Ref**	3B5P GF ET
Property	Plot 00.02, 33-35 , Jamestown Road, London, NW1 7DB		

SAP Rating	83 B	**DER**	3.70	**TER**	15.28
Environmental	97 A	**% DER < TER**			75.79
CO_2 Emissions (t/year)	0.32	**DFEE**	45.64	**TFEE**	50.32
Compliance Check	See BREL	**% DFEE < TFEE**			9.30
% DPER < TPER	52.03	**DPER**	39.01	**TPER**	81.33

Assessor Details	Mr. Gary Ormiston	**Assessor ID**	AW68-0001
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	46.8000 (1b)	x	3.4000 (2b)	=	159.1200	(1b) - (3b)
First floor	49.8000 (1c)	x	3.7000 (2c)	=	184.2600	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	96.6000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	343.3800	(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) =	81.0000	(23c)

Effective ac	0.2576	0.2544	0.2512	0.2352	0.2321	0.2161	0.2161	0.2129	0.2225	0.2321	0.2384	0.2448	(25)

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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 = 1.20)			27.5000	1.1450	31.4885			(27)
Ground Floor			46.8000	0.1000	4.6800			(28a)
Exposed Floor			3.0000	0.1000	0.3000			(28b)
External Wall	145.0600	27.5000	117.5600	0.1500	17.6340			(29a)
Terrace Roof	4.2000		4.2000	0.1000	0.4200			(30)
Total net area of external elements Aum(A, m2)			199.0600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		54.5225			(33)
Party to dwelling			60.4700	0.0000	0.0000			(32)
Party Ceiling			45.6000					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	200.0000 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	17.9000	0.0500	0.8950

E16 Corner (normal)	21.0000	0.0900	1.8900	
E18 Party wall between dwellings	10.8000	0.0900	0.9720	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.9000	0.0000	0.0000	
E5 Ground floor (normal)	20.9000	0.1000	2.0900	
P1 Party wall - Ground floor	8.1000	0.1200	0.9720	
E2 Other lintels (including other steel lintels)	12.1000	0.0300	0.3630	
E3 Sill	12.1000	0.0300	0.3630	
E4 Jamb	35.6000	0.0300	1.0680	
E6 Intermediate floor within a dwelling	17.2600	0.0700	1.2082	
E20 Exposed floor (normal)	2.7400	0.1100	0.3014	
E21 Exposed floor (inverted)	2.7400	0.1600	0.4384	
E24 Eaves (insulation at ceiling level - inverted)	2.7000	0.0700	0.1890	
E14 Flat roof	2.0000	0.0800	0.1600	
E25 Staggered party wall between dwellings	3.4000	0.2400	0.8160	
P2 Party wall - Intermediate floor within a dwelling	8.1000	0.0000	0.0000	
P7 Party Wall - Exposed floor (normal)	0.8000	0.0800	0.0640	
P5 Party wall - Roof (insulation at rafter level)	2.0000	0.0800	0.1600	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.9500 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 66.4725 (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	29.1858	28.8246	28.4634	26.6574	26.2963	24.4903	24.4903	24.1291	25.2127	26.2963	27.0186	27.7410	(38)
Heat transfer coeff	95.6583	95.2972	94.9360	93.1300	92.7688	90.9628	90.9628	90.6016	91.6852	92.7688	93.4912	94.2136	(39)
Average = Sum(39)m / 12 =												93.0397	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9903	0.9865	0.9828	0.9641	0.9603	0.9416	0.9416	0.9379	0.9491	0.9603	0.9678	0.9753	(40)
HLP (average)												0.9631	
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 2.7057 (42)

Hot water usage for mixer showers

95.6810	94.2431	92.1478	88.1388	85.1803	81.8810	80.0056	82.0851	84.3645	87.9070	92.0021	95.3144	(42a)

Hot water usage for baths

30.0476	29.6013	28.9729	27.8142	26.9466	25.9846	25.4649	26.0890	26.7684	27.7978	28.9803	29.9460	(42b)

Hot water usage for other uses

42.3395	40.7999	39.2603	37.7207	36.1810	34.6414	34.6414	36.1810	37.7207	39.2603	40.7999	42.3395	(42c)

Average daily hot water use (litres/day) 154.5640 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	168.0681	164.6443	160.3810	153.6737	148.3080	142.5070	140.1120	144.3551	148.8536	154.9651	161.7824	167.5999	(44)
Energy conte	266.1788	234.4513	246.4996	210.3716	199.6510	175.2290	169.4533	178.7418	183.5514	210.2862	230.4886	262.4210	(45)
Energy content (annual)										Total = Sum(45)m =		2567.3236	

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

39.9268	35.1677	36.9749	31.5557	29.9477	26.2843	25.4180	26.8113	27.5327	31.5429	34.5733	39.3631	(46)

Water storage loss:

Store volume 110.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)

Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(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

321.4556	284.3788	301.7764	263.8653	254.9278	228.7226	224.7301	234.0186	237.0451	265.5630	283.9823	317.6978	(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

321.4556	284.3788	301.7764	263.8653	254.9278	228.7226	224.7301	234.0186	237.0451	265.5630	283.9823	317.6978	(64)

Total per year (kWh/year) = Sum(64)m = 3218.1633 (64)

12Total per year (kWh/year) 3218 (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

132.7259	117.8970	126.1826	112.7435	110.6054	101.0586	100.5647	103.6531	103.8258	114.1416	119.4324	131.4764	(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	135.2872	135.2872	135.2872	135.2872	135.2872	135.2872	135.2872	135.2872	135.2872	135.2872	135.2872	135.2872	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	126.4550	140.0037	126.4550	130.6701	126.4550	130.6701	126.4550	126.4550	130.6701	126.4550	130.6701	126.4550	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	250.7111	253.3127	246.7568	232.7999	215.1820	198.6235	187.5615	184.9599	191.5159	205.4727	223.0906	239.6491	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.5287	36.5287	36.5287	36.5287	36.5287	36.5287	36.5287	36.5287	36.5287	36.5287	36.5287	36.5287	(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)	-108.2297	-108.2297	-108.2297	-108.2297	-108.2297	-108.2297	-108.2297	-108.2297	-108.2297	-108.2297	-108.2297	-108.2297	(71)
Water heating gains (Table 5)	178.3950	175.4420	169.6002	156.5882	148.6632	140.3591	135.1676	139.3186	144.2025	153.4161	165.8783	176.7156	(72)
Total internal gains	619.1472	632.3445	606.3981	583.6444	553.8863	533.2390	512.7702	514.3197	529.9746	548.9299	583.2253	606.4058	(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	12.4600	19.6403	0.4000	0.0000	0.7700	75.3730	(76)
West	15.0400	19.6403	0.4000	0.0000	0.7700	90.9800	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	166.3530	325.4218	535.9234	781.6123	957.8952	980.5762	933.5485	801.9044	623.3011	386.1404	207.4227	136.8006	(83)
Total gains	785.5002	957.7664	1142.3215	1365.2567	1511.7815	1513.8152	1446.3187	1316.2241	1153.2757	935.0703	790.6479	743.2064	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	56.1024	56.3151	56.5293	57.6255	57.8499	58.9985	58.9985	59.2337	58.5336	57.8499	57.4029	56.9628	
alpha	4.7402	4.7543	4.7686	4.8417	4.8567	4.9332	4.9332	4.9489	4.9022	4.8567	4.8269	4.7975	
util living area	0.9821	0.9572	0.8939	0.7410	0.5540	0.3824	0.2764	0.3159	0.5351	0.8420	0.9623	0.9857	(86)
MIT	19.8722	20.1562	20.5139	20.8417	20.9653	20.9956	20.9993	20.9987	20.9787	20.7560	20.2609	19.8353	(87)
Th 2	20.0915	20.0946	20.0977	20.1134	20.1165	20.1322	20.1322	20.1354	20.1259	20.1165	20.1102	20.1040	(88)
util rest of house	0.9779	0.9477	0.8731	0.7028	0.5062	0.3315	0.2220	0.2569	0.4722	0.8046	0.9524	0.9823	(89)
MIT 2	19.0778	19.3563	19.6962	19.9969	20.0951	20.1302	20.1320	20.1350	20.1151	19.9371	19.4744	19.0514	(90)
Living area fraction									fLA = Living area / (4) =			0.3292	(91)
MIT	19.3393	19.6196	19.9654	20.2750	20.3816	20.4151	20.4175	20.4193	20.3993	20.2067	19.7333	19.3095	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3393	19.6196	19.9654	20.2750	20.3816	20.4151	20.4175	20.4193	20.3993	20.2067	19.7333	19.3095	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9734	0.9418	0.8697	0.7101	0.5207	0.3481	0.2399	0.2763	0.4922	0.8087	0.9473	0.9784	(94)
Useful gains	764.6004	902.0507	993.4369	969.4227	787.2517	527.0295	347.0221	363.6992	567.6727	756.2251	748.9635	727.1189	(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	1438.6340	1402.7357	1278.3490	1059.3552	805.3787	528.9561	347.2537	364.1554	577.5567	891.2030	1181.1040	1423.5180	(97)
Space heating kWh	501.4810	336.4603	211.9746	64.7514	13.4864	0.0000	0.0000	0.0000	0.0000	100.4236	311.1412	518.1209	(98a)
Space heating requirement - total per year (kWh/year)												2057.8394	
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	501.4810	336.4603	211.9746	64.7514	13.4864	0.0000	0.0000	0.0000	0.0000	100.4236	311.1412	518.1209	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2057.8394	
Space heating per m2										(98c) / (4) =		21.3027	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0500	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.0200	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	501.4810	336.4603	211.9746	64.7514	13.4864	0.0000	0.0000	0.0000	0.0000	100.4236	311.1412	518.1209	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.02													
307a	537.0861	360.3490	227.0248	69.3488	14.4440	0.0000	0.0000	0.0000	0.0000	107.5537	333.2322	554.9075	
Space heating requirement	537.0861	360.3490	227.0248	69.3488	14.4440	0.0000	0.0000	0.0000	0.0000	107.5537	333.2322	554.9075	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement	321.4556	284.3788	301.7764	263.8653	254.9278	228.7226	224.7301	234.0186	237.0451	265.5630	283.9823	317.6978	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.02													
310a	327.8847	290.0663	307.8119	269.1426	260.0264	233.2971	229.2247	238.6989	241.7860	270.8742	289.6619	324.0517	
Water heating fuel	327.8847	290.0663	307.8119	269.1426	260.0264	233.2971	229.2247	238.6989	241.7860	270.8742	289.6619	324.0517	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	31.3102	28.2802	31.3102	30.3002	31.3102	30.3002	31.3102	31.3102	30.3002	31.3102	30.3002	31.3102	(331)
Lighting	24.1011	19.3348	17.4088	12.7545	9.8519	8.0491	8.9872	11.6820	15.1737	19.9087	22.4869	24.7709	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												2203.9460	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3282.5266	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												22.0395	(313)
Space cooling fuel												0.0000	(321)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.6000, SFP = 0.8800)		
mechanical ventilation fans (SFP = 0.8800)	368.6528	(330a)
Total electricity for the above, kWh/year	368.6528	(331)
Electricity for lighting (calculated in Appendix L)	194.5096	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	6049.6350	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			300.0000	(367)
Space and Water heating from Heat pump	1828.8242	0.1575	115.7181	(367)
Electrical energy for heat distribution (space & water)	22.0395	0.0000	8.0999	(372)
Overall CO2 factor for heat network			0.0507	(386)
Total CO2 associated with community systems			278.0953	(373)
Space and water heating			278.0953	(376)
Pumps, fans and electric keep-hot	368.6528	0.1387	51.1367	(378)
Energy for lighting	194.5096	0.1443	28.0737	(379)
Total CO2, kg/year			357.3058	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.7000	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			300.0000	(467a)
Space and Water heating from Heat pump	1828.8242	1.5831	1163.0042	(467)
Electrical energy for heat distribution (space & water)	22.0395	0.0000	84.8294	(472)
Overall CO2 factor for heat network			0.5308	(486)
Total CO2 associated with community systems			2912.4763	(473)
Space and water heating			2912.4763	(476)
Pumps, fans and electric keep-hot	368.6528	1.5128	557.6979	(478)
Energy for lighting	194.5096	1.5338	298.3453	(479)
Total Primary energy kWh/year			3768.5196	(483)
Dwelling Primary energy Rate (DPER)			39.0100	(484)

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	46.8000 (1b)	x	3.4000 (2b)	=	159.1200	(1b) - (3b)
First floor	49.8000 (1c)	x	3.7000 (2c)	=	184.2600	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	96.6000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	343.3800	(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) =	0.0874 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3374 (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) =	0.2868 (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	0.3656	0.3585	0.3513	0.3154	0.3083	0.2724	0.2724	0.2653	0.2868	0.3083	0.3226	0.3369	(22b)
Effective ac	0.5668	0.5642	0.5617	0.5498	0.5475	0.5371	0.5371	0.5352	0.5411	0.5475	0.5520	0.5568	(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)			24.1400	1.1450	27.6412			(27)
Ground Floor			46.8000	0.1300	6.0840			(28a)
Exposed Floor			3.0000	0.1300	0.3900			(28b)
External Wall	145.0600	24.1400	120.9200	0.1800	21.7656			(29a)
Terrace Roof	4.2000		4.2000	0.1100	0.4620			(30)
Total net area of external elements Aum(A, m2)			199.0600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		56.3428			(33)
Party to dwelling			60.4700	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 200.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	17.9000	0.0700	1.2530
E16 Corner (normal)	21.0000	0.0900	1.8900
E18 Party wall between dwellings	10.8000	0.0600	0.6480
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	6.9000	0.0000	0.0000
E5 Ground floor (normal)	20.9000	0.1600	3.3440
P1 Party wall - Ground floor	8.1000	0.0800	0.6480
E2 Other lintels (including other steel lintels)	12.1000	0.0500	0.6050
E3 Sill	12.1000	0.0500	0.6050
E4 Jamb	35.6000	0.0500	1.7800
E6 Intermediate floor within a dwelling	17.2600	0.0000	0.0000
E20 Exposed floor (normal)	2.7400	0.3200	0.8768
E21 Exposed floor (inverted)	2.7400	0.3200	0.8768
E24 Eaves (insulation at ceiling level - inverted)	2.7000	0.2400	0.6480
E14 Flat roof	2.0000	0.0800	0.1600
E25 Staggered party wall between dwellings	3.4000	0.0600	0.2040
P2 Party wall - Intermediate floor within a dwelling	8.1000	0.0000	0.0000
P7 Party Wall - Exposed floor (normal)	0.8000	0.1600	0.1280
P5 Party wall - Roof (insulation at rafter level)	2.0000	0.0800	0.1600

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 13.8266 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 70.1694 (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	64.2316	63.9375	63.6493	62.2952	62.0419	60.8625	60.8625	60.6441	61.3168	62.0419	62.5544	63.0902	(38)
Heat transfer coeff	134.4011	134.1070	133.8187	132.4646	132.2113	131.0320	131.0320	130.8136	131.4862	132.2113	132.7238	133.2596	(39)
Average = Sum(39)m / 12 =												132.4634	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3913	1.3883	1.3853	1.3713	1.3686	1.3564	1.3564	1.3542	1.3611	1.3686	1.3740	1.3795	(40)
HLP (average)												1.3713	
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 2.7057 (42)

Hot water usage for mixer showers

69.5862	68.5404	67.0166	64.1010	61.9493	59.5498	58.1859	59.6982	61.3560	63.9324	66.9106	69.3196	(42a)

Hot water usage for baths

30.0476	29.6013	28.9729	27.8142	26.9466	25.9846	25.4649	26.0890	26.7684	27.7978	28.9803	29.9460	(42b)

Hot water usage for other uses

42.3395	40.7999	39.2603	37.7207	36.1810	34.6414	34.6414	36.1810	37.7207	39.2603	40.7999	42.3395	(42c)

Average daily hot water use (litres/day) 130.5054 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	141.9733	138.9417	135.2498	129.6359	125.0770	120.1758	118.2923	121.9682	125.8451	130.9905	136.6909	141.6051	(44)
Energy conte	224.8510	197.8511	207.8739	177.4650	168.3776	147.7702	143.0643	151.0222	155.1796	177.7528	194.7412	221.7193	(45)
Energy content (annual)										Total = Sum(45)m =		2167.6681	
Distribution loss (46)m = 0.15 x (45)m													
	33.7276	29.6777	31.1811	26.6198	25.2566	22.1655	21.4596	22.6533	23.2769	26.6629	29.2112	33.2579	(46)

Water storage loss:

Store volume 210.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.7016 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.9188 (55)

Total storage loss

28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(56)

If cylinder contains dedicated solar storage

28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(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

276.5975	244.5899	259.6205	227.5423	220.1242	197.8475	194.8109	202.7688	205.2569	229.4994	244.8185	273.4659	(62)

WWHRS	-31.8119	-28.1347	-29.4610	-24.3949	-22.7352	-19.4547	-18.2356	-19.3918	-20.1285	-23.7293	-26.8824	-31.2228	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

244.7856	216.4552	230.1594	203.1474	197.3891	178.3929	176.5752	183.3770	185.1284	205.7701	217.9361	242.2431	(64)

Total per year (kWh/year) = Sum(64)m = 2481.3595 (64)

12Total per year (kWh/year) 2481 (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

116.1602	103.1766	110.5153	99.0690	97.3828	89.1955	88.9661	91.6121	91.6591	100.5001	104.8133	115.1189	(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	135.2872	135.2872	135.2872	135.2872	135.2872	135.2872	135.2872	135.2872	135.2872	135.2872	135.2872	135.2872	(66)

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

	126.4550	140.0037	126.4550	130.6701	126.4550	130.6701	126.4550	126.4550	130.6701	126.4550	130.6701	126.4550	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	250.7111	253.3127	246.7568	232.7999	215.1820	198.6235	187.5615	184.9599	191.5159	205.4727	223.0906	239.6491	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.5287	36.5287	36.5287	36.5287	36.5287	36.5287	36.5287	36.5287	36.5287	36.5287	36.5287	36.5287	(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)													
	-108.2297	-108.2297	-108.2297	-108.2297	-108.2297	-108.2297	-108.2297	-108.2297	-108.2297	-108.2297	-108.2297	-108.2297	(71)
Water heating gains (Table 5)													
	156.1293	153.5366	148.5421	137.5958	130.8909	123.8826	119.5781	123.1346	127.3043	135.0808	145.5741	154.7298	(72)
Total internal gains													
	599.8815	613.4391	588.3400	567.6520	539.1140	516.7624	497.1808	498.1356	513.0764	533.5945	565.9210	587.4199	(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	10.9400	19.6403	0.6300	0.7000	0.7700	65.6654	(76)
West	13.2000	19.6403	0.6300	0.7000	0.7700	79.2306	(80)

Solar gains	144.8960	283.4473	466.7974	680.7961	834.3412	854.0967	813.1349	698.4708	542.9046	336.3341	180.6683	119.1554	(83)
Total gains	744.7775	896.8864	1055.1373	1248.4482	1373.4552	1370.8591	1310.3156	1196.6065	1055.9811	869.9287	746.5893	706.5754	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	39.9302	40.0178	40.1040	40.5140	40.5916	40.9569	40.9569	41.0253	40.8154	40.5916	40.4349	40.2723	
alpha	3.6620	3.6679	3.6736	3.7009	3.7061	3.7305	3.7305	3.7350	3.7210	3.7061	3.6957	3.6848	
util living area													
	0.9882	0.9763	0.9483	0.8731	0.7419	0.5696	0.4282	0.4829	0.7247	0.9238	0.9787	0.9902	(86)
MIT	19.1103	19.3912	19.8213	20.3550	20.7350	20.9272	20.9805	20.9699	20.8210	20.2809	19.5992	19.0672	(87)
Th 2	19.7700	19.7723	19.7746	19.7854	19.7875	19.7969	19.7969	19.7986	19.7933	19.7875	19.7834	19.7791	(88)
util rest of house													
	0.9849	0.9699	0.9343	0.8400	0.6800	0.4777	0.3166	0.3657	0.6375	0.8960	0.9718	0.9875	(89)
MIT 2	17.6070	17.9635	18.5023	19.1507	19.5690	19.7545	19.7903	19.7873	19.6712	19.0846	18.2382	17.5581	(90)
Living area fraction									fLA = Living area / (4) =			0.3292	(91)
MIT	18.1018	18.4335	18.9365	19.5471	19.9528	20.1406	20.1821	20.1766	20.0497	19.4784	18.6862	18.0549	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1018	18.4335	18.9365	19.5471	19.9528	20.1406	20.1821	20.1766	20.0497	19.4784	18.6862	18.0549	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9785	0.9604	0.9221	0.8324	0.6892	0.5051	0.3532	0.4038	0.6578	0.8872	0.9631	0.9819	(94)
Useful gains	728.7820	861.3717	972.9675	1039.2679	946.5909	692.4499	462.7804	483.2133	694.6325	771.7709	719.0734	693.7694	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1854.9811	1814.9357	1664.2380	1410.3680	1091.1174	725.9925	469.3728	494.0314	782.3081	1173.8291	1537.7664	1846.2980	(97)
Space heating kWh													
	837.8921	640.7950	514.3052	267.1921	107.5277	0.0000	0.0000	0.0000	0.0000	299.1313	589.4590	857.4812	(98a)
Space heating requirement - total per year (kWh/year)												4113.7837	
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													
	837.8921	640.7950	514.3052	267.1921	107.5277	0.0000	0.0000	0.0000	0.0000	299.1313	589.4590	857.4812	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4113.7837	
Space heating per m2											(98c) / (4) =	42.5858	(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													
	837.8921	640.7950	514.3052	267.1921	107.5277	0.0000	0.0000	0.0000	0.0000	299.1313	589.4590	857.4812	(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)													
	907.7921	694.2525	557.2104	289.4822	116.4980	0.0000	0.0000	0.0000	0.0000	324.0859	638.6338	929.0154	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	244.7856	216.4552	230.1594	203.1474	197.3891	178.3929	176.5752	183.3770	185.1284	205.7701	217.9361	242.2431	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.5920	86.3412	85.8081	84.6753	82.7579	79.8000	79.8000	79.8000	79.8000	84.8978	86.1766	86.6474	(217)
Fuel for water heating, kWh/month													
	282.6886	250.6974	268.2259	239.9136	238.5140	223.5500	221.2722	229.7957	231.9905	242.3739	252.8949	279.5734	(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	26.2748	21.0787	18.9790	13.9048	10.7405	8.7751	9.7978	12.7356	16.5423	21.7044	24.5150	27.0051	(232)

Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-21.1108	-31.4995	-47.8832	-57.0277	-64.2964	-61.0231	-60.2587	-55.4794	-47.5712	-37.3791	-23.8109	-18.0533 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-7.1775	-15.4683	-31.4523	-48.3055	-64.9417	-65.6646	-64.9134	-54.4858	-39.3028	-22.4873	-9.6969	-5.6501 (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	4456.9704	(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	2961.4900	(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)	212.0530	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-954.9394	(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	6761.5740	(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	4456.9704	0.2100	935.9638	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2961.4900	0.2100	621.9129	(264)
Space and water heating			1557.8767	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	212.0530	0.1443	30.6058	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-525.3932	0.1334	-70.0997	
PV Unit electricity exported	-429.5462	0.1252	-53.7962	
Total			-123.8959	(269)
Total CO2, kg/year			1476.5158	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.2800	(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	4456.9704	1.1300	5036.3765	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2961.4900	1.1300	3346.4837	(278)
Space and water heating			8382.8602	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	212.0530	1.5338	325.2540	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-525.3932	1.4930	-784.4352	
PV Unit electricity exported	-429.5462	0.4597	-197.4551	
Total			-981.8903	(283)
Total Primary energy kWh/year			7856.3248	(286)
Target Primary Energy Rate (TPER)			81.3300	(287)

Full SAP Calculation Printout

Property Reference	Plot 01.02	**Issued on Date**	24/09/2024
Assessment Reference	0001	**Prop Type Ref**	3B5P EF
Property	Plot 01.02, 33-35, Jamestown Road, London, NW1 7DB		

SAP Rating	85 B	**DER**	3.08	**TER**	13.34
Environmental	97 A	**% DER < TER**			76.91
CO_2 Emissions (t/year)	0.25	**DFEE**	30.97	**TFEE**	38.12
Compliance Check	See BREL	**% DFEE < TFEE**			18.76
% DPER < TPER	53.87	**DPER**	32.75	**TPER**	70.99

Assessor Details	Mr. Gary Ormiston	**Assessor ID**	AW68-0001
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	88.7000	(1b)	x 2.8000	(2b) =	248.3600	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	248.3600	(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) =	81.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2576	0.2544	0.2512	0.2352	0.2321	0.2161	0.2161	0.2129	0.2225	0.2321	0.2384	0.2448	(25)

3. Heat losses and heat loss parameter

Element	Gross 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 = 1.20)			14.0000	1.1450	16.0305			(27)
Exposed Floor			88.7000	0.1000	8.8700			(28b)
External Wall	43.1200	14.0000	29.1200	0.1500	4.3680			(29a)
Wall to stairs/lifts	11.2000		11.2000	0.1400	1.5680			(29a)
Total net area of external elements Aum(A, m2)			143.0200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.8365			(33)
Corridor			35.8400	0.0000	0.0000			(32)
Dwellings			42.0000	0.0000	0.0000			(32)
Party Ceiling			88.7000					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	200.0000	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	19.4000	0.0500	0.9700
E16 Corner (normal)	2.8000	0.0900	0.2520

E18 Party wall between dwellings	5.6000	0.0900	0.5040	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	27.8000	0.0000	0.0000	
E2 Other lintels (including other steel lintels)	8.8000	0.0300	0.2640	
E3 Sill	8.8000	0.0300	0.2640	
E4 Jamb	19.6000	0.0300	0.5880	
E20 Exposed floor (normal)	19.4000	0.1600	3.1040	
E25 Staggered party wall between dwellings	8.4000	0.2400	2.0160	
P7 Party Wall - Exposed floor (normal)	27.8000	0.0800	2.2240	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 10.1860 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 41.0225 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	21.1095	20.8483	20.5870	19.2808	19.0196	17.7133	17.7133	17.4521	18.2358	19.0196	19.5421	20.0645	(38)
Heat transfer coeff	62.1320	61.8708	61.6096	60.3033	60.0421	58.7359	58.7359	58.4746	59.2584	60.0421	60.5646	61.0871	(39)
Average = Sum(39)m / 12 =												60.2380	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7005	0.6975	0.6946	0.6799	0.6769	0.6622	0.6622	0.6592	0.6681	0.6769	0.6828	0.6887	(40)
HLP (average)												0.6791	
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 2.6075 (42)
Hot water usage for mixer showers

93.4162	92.0123	89.9666	86.0525	83.1640	79.9428	78.1119	80.1421	82.3676	85.8262	89.8244	93.0583	(42a)

Hot water usage for baths

29.3392	28.9035	28.2899	27.1585	26.3114	25.3720	24.8646	25.4739	26.1374	27.1425	28.2972	29.2400	(42b)

Hot water usage for other uses

41.3335	39.8304	38.3274	36.8244	35.3213	33.8183	33.8183	35.3213	36.8244	38.3274	39.8304	41.3335	(42c)

Average daily hot water use (litres/day) 150.9045 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	164.0889	160.7462	156.5839	150.0354	144.7967	139.1331	136.7948	140.9373	145.3293	151.2961	157.9520	163.6318	(44)
Energy conte	259.8767	228.9005	240.6636	205.3910	194.9242	171.0804	165.4414	174.5099	179.2056	205.3074	225.0315	256.2078	(45)
Energy content (annual)										Total = Sum(45)m =		2506.5400	
Distribution loss (46)m = 0.15 x (45)m	38.9815	34.3351	36.0995	30.8086	29.2386	25.6621	24.8162	26.1765	26.8808	30.7961	33.7547	38.4312	(46)

Water storage loss:
Store volume 110.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0152 (51)
Volume factor from Table 2a 1.0294 (52)
Temperature factor from Table 2b 0.6000 (53)
Enter (49) or (54) in (55) 1.0327 (55)
Total storage loss

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)

If cylinder contains dedicated solar storage

32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(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

315.1535	278.8279	295.9404	258.8847	250.2010	224.5741	220.7182	229.7867	232.6992	260.5842	278.5252	311.4846	(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

315.1535	278.8279	295.9404	258.8847	250.2010	224.5741	220.7182	229.7867	232.6992	260.5842	278.5252	311.4846	(64)

Total per year (kWh/year) = Sum(64)m = 3157.3797 (64)
12Total per year (kWh/year) 3157 (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

130.6304	116.0514	124.2421	111.0874	109.0338	99.6792	99.2307	102.2460	102.3808	112.4861	117.6179	129.4105	(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	130.3753	130.3753	130.3753	130.3753	130.3753	130.3753	130.3753	130.3753	130.3753	130.3753	130.3753	130.3753	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	124.8747	138.2542	124.8747	129.0372	124.8747	129.0372	124.8747	124.8747	129.0372	124.8747	129.0372	124.8747	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	236.6656	239.1215	232.9328	219.7579	203.1269	187.4962	177.0538	174.5980	180.7867	193.9616	210.5926	226.2233	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0375	36.0375	36.0375	36.0375	36.0375	36.0375	36.0375	36.0375	36.0375	36.0375	36.0375	36.0375	(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)	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	(71)
Water heating gains (Table 5)	175.5785	172.6955	166.9921	154.2881	146.5507	138.4433	133.3746	137.4274	142.1955	151.1911	163.3582	173.9389	(72)
Total internal gains	599.2315	612.1837	586.9122	565.1958	536.6650	517.0892	497.4158	499.0127	514.1320	532.1399	565.1006	587.1495	(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	9.8400	10.6334	0.4000	0.0000	0.7700	32.2268	(74)
South	4.1600	46.7521	0.4000	0.0000	0.7700	59.9025	(78)

Solar gains 92.1293	159.6920	229.6197	309.3384	373.6244	384.0560	364.7173	313.9583	256.3691	179.1267	110.7608	78.6271	(83)

Total gains	691.3608	771.8757	816.5319	874.5342	910.2894	901.1452	862.1331	812.9710	770.5011	711.2666	675.8614	665.7767	(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	79.3114	79.6463	79.9840	81.7165	82.0720	83.8972	83.8972	84.2721	83.1575	82.0720	81.3640	80.6681	
alpha	6.2874	6.3098	6.3323	6.4478	6.4715	6.5931	6.5931	6.6181	6.5438	6.4715	6.4243	6.3779	
util living area													
	0.9726	0.9467	0.8992	0.7763	0.6031	0.4164	0.2997	0.3307	0.5267	0.8037	0.9402	0.9768	(86)
MIT	20.4193	20.5777	20.7466	20.9188	20.9850	20.9989	20.9999	20.9998	20.9951	20.9156	20.6704	20.4005	(87)
Th 2	20.3404	20.3430	20.3456	20.3587	20.3613	20.3744	20.3744	20.3770	20.3691	20.3613	20.3560	20.3508	(88)
util rest of house													
	0.9670	0.9367	0.8817	0.7462	0.5647	0.3760	0.2571	0.2860	0.4800	0.7698	0.9275	0.9720	(89)
MIT 2	19.8187	19.9731	20.1338	20.2973	20.3516	20.3738	20.3743	20.3769	20.3665	20.2996	20.0750	19.8095	(90)
Living area fraction										fLA = Living area / (4) =		0.3709	(91)
MIT	20.0415	20.1974	20.3611	20.5278	20.5865	20.6057	20.6064	20.6080	20.5997	20.5281	20.2958	20.0287	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0415	20.1974	20.3611	20.5278	20.5865	20.6057	20.6064	20.6080	20.5997	20.5281	20.2958	20.0287	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9640	0.9342	0.8822	0.7544	0.5784	0.3910	0.2729	0.3026	0.4972	0.7790	0.9262	0.9692	(94)
Useful gains	666.4927	721.1142	720.3338	659.7510	526.4739	352.3049	235.2841	245.9953	383.0865	554.1092	625.9494	645.2803	(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													
	978.0494	946.4606	853.9748	701.1976	533.5666	352.7480	235.3168	246.0584	385.1589	596.1040	799.1997	966.9299	(97)
Space heating kWh													
	231.7982	151.4328	99.4290	29.8415	5.2769	0.0000	0.0000	0.0000	0.0000	31.2441	124.7402	239.3073	(98a)
Space heating requirement - total per year (kWh/year)												913.0700	
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													
	231.7982	151.4328	99.4290	29.8415	5.2769	0.0000	0.0000	0.0000	0.0000	31.2441	124.7402	239.3073	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												913.0700	
Space heating per m2											(98c) / (4) =	10.2939	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0500	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.0200	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	231.7982	151.4328	99.4290	29.8415	5.2769	0.0000	0.0000	0.0000	0.0000	31.2441	124.7402	239.3073	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.02													
307a	248.2558	162.1845	106.4884	31.9603	5.6516	0.0000	0.0000	0.0000	0.0000	33.4625	133.5967	256.2982	
Space heating requirement													
	248.2558	162.1845	106.4884	31.9603	5.6516	0.0000	0.0000	0.0000	0.0000	33.4625	133.5967	256.2982	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	315.1535	278.8279	295.9404	258.8847	250.2010	224.5741	220.7182	229.7867	232.6992	260.5842	278.5252	311.4846	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.02													
310a	321.4565	284.4045	301.8592	264.0624	255.2051	229.0656	225.1326	234.3824	237.3532	265.7959	284.0957	317.7143	
Water heating fuel													
	321.4565	284.4045	301.8592	264.0624	255.2051	229.0656	225.1326	234.3824	237.3532	265.7959	284.0957	317.7143	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	22.2343	20.0826	22.2343	21.5171	22.2343	21.5171	22.2343	22.2343	21.5171	22.2343	21.5171	22.2343	(331)
Lighting	23.7999	19.0932	17.1913	12.5951	9.7288	7.9485	8.8749	11.5360	14.9841	19.6599	22.2059	24.4614	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												977.8980	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3220.5273	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												9.7790	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.6000, SFP = 0.8640)													
mechanical ventilation fans (SFP = 0.8640)												261.7913	(330a)
Total electricity for the above, kWh/year												261.7913	(331)
Electricity for lighting (calculated in Appendix L)												192.0789	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)

Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4652.2956	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			300.0000	(367)
Space and Water heating from Heat pump	1399.4751	0.1580	51.5083	(367)
Electrical energy for heat distribution (space & water)	9.7790	0.0000	6.0858	(372)
Overall CO2 factor for heat network			0.0498	(386)
Total CO2 associated with community systems			208.9455	(373)
Space and water heating			208.9455	(376)
Pumps, fans and electric keep-hot	261.7913	0.1387	36.3137	(378)
Energy for lighting	192.0789	0.1443	27.7229	(379)
Total CO2, kg/year			272.9821	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.0800	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			300.0000	(467a)
Space and Water heating from Heat pump	1399.4751	1.5849	516.6388	(467)
Electrical energy for heat distribution (space & water)	9.7790	0.0000	64.4939	(472)
Overall CO2 factor for heat network			0.5274	(486)
Total CO2 associated with community systems			2214.2892	(473)
Space and water heating			2214.2892	(476)
Pumps, fans and electric keep-hot	261.7913	1.5128	396.0379	(478)
Energy for lighting	192.0789	1.5338	294.6171	(479)
Total Primary energy kWh/year			2904.9442	(483)
Dwelling Primary energy Rate (DPER)			32.7500	(484)

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	88.7000	(1b)	x 2.8000	(2b) =	248.3600	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		248.3600	(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) =	0.1208	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3708	(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) =	0.3152	(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	0.4018	0.3940	0.3861	0.3467	0.3388	0.2994	0.2994	0.2915	0.3152	0.3388	0.3546	0.3703	(22b)
Effective ac	0.5807	0.5776	0.5745	0.5601	0.5574	0.5448	0.5448	0.5425	0.5497	0.5574	0.5629	0.5686	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opening Type (Uw = 1.20)			14.0000	1.1450	16.0305			(27)
Exposed Floor			88.7000	0.1300	11.5310			(28b)

External Wall	43.1200	14.0000	29.1200	0.1800	5.2416	(29a)
Wall to stairs/lifts	11.2000		11.2000	0.1800	2.0160	(29a)
Total net area of external elements Aum(A, m2)			143.0200			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.8191	(33)
Corridor			35.8400	0.0000	0.0000	(32)
Dwellings			42.0000	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 200.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	19.4000	0.0700	1.3580
E16 Corner (normal)	2.8000	0.0900	0.2520
E18 Party wall between dwellings	5.6000	0.0600	0.3360
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	27.8000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	8.8000	0.0500	0.4400
E3 Sill	8.8000	0.0500	0.4400
E4 Jamb	19.6000	0.0500	0.9800
E20 Exposed floor (normal)	19.4000	0.3200	6.2080
E25 Staggered party wall between dwellings	8.4000	0.0600	0.5040
P7 Party Wall - Exposed floor (normal)	27.8000	0.1600	4.4480

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 14.9660 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 49.7851 (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	47.5968	47.3398	47.0879	45.9049	45.6836	44.6532	44.6532	44.4624	45.0501	45.6836	46.1313	46.5995	(38)
Heat transfer coeff	97.3819	97.1249	96.8731	95.6900	95.4687	94.4383	94.4383	94.2475	94.8352	95.4687	95.9165	96.3846	(39)
Average = Sum(39)m / 12 =												95.6890	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0979	1.0950	1.0921	1.0788	1.0763	1.0647	1.0647	1.0625	1.0692	1.0763	1.0814	1.0866	(40)
HLP (average)												1.0788	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6075 (42)

Hot water usage for mixer showers

67.9390	66.9180	65.4303	62.5837	60.4829	58.1402	56.8086	58.2851	59.9037	62.4191	65.3268	67.6787	(42a)

Hot water usage for baths

29.3392	28.9035	28.2899	27.1585	26.3114	25.3720	24.8646	25.4739	26.1374	27.1425	28.2972	29.2400	(42b)

Hot water usage for other uses

41.3335	39.8304	38.3274	36.8244	35.3213	33.8183	33.8183	35.3213	36.8244	38.3274	39.8304	41.3335	(42c)

Average daily hot water use (litres/day) 127.4155 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	138.6117	135.6520	132.0476	126.5666	122.1156	117.3305	115.4915	119.0804	122.8654	127.8890	133.4544	138.2522	(44)
Energy conte	219.5271	193.1666	202.9522	173.2633	164.3911	144.2716	139.6770	147.4464	151.5053	173.5441	190.1303	216.4696	(45)
Energy content (annual)										Total = Sum(45)m =		2116.3446	
Distribution loss (46)m = 0.15 x (45)m	32.9291	28.9750	30.4428	25.9895	24.6587	21.6407	20.9516	22.1170	22.7258	26.0316	28.5195	32.4704	(46)

Water storage loss:

Store volume 210.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.7016 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.9188 (55)

Total storage loss

28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(56)

If cylinder contains dedicated solar storage

28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(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

271.2737	239.9055	254.6988	223.3406	216.1377	194.3489	191.4236	199.1930	201.5827	225.2907	240.2076	268.2162	(62)
-31.0589	-27.4687	-28.7637	-23.8175	-22.1970	-18.9941	-17.8040	-18.9328	-19.6521	-23.1676	-26.2461	-30.4837	(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

240.2148	212.4367	225.9351	199.5232	193.9407	175.3548	173.6196	180.2603	181.9306	202.1231	213.9615	237.7325	(64)
									Total per year (kWh/year) = Sum(64)m =		2437.0327	(64)

12Total per year (kWh/year) 2437 (64)

Electric shower(s)

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

Heat gains from water heating, kWh/month

114.3900	101.6190	108.8789	97.6719	96.0573	88.0322	87.8399	90.4232	90.4374	99.1007	103.2802	113.3734	(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	130.3753	130.3753	130.3753	130.3753	130.3753	130.3753	130.3753	130.3753	130.3753	130.3753	130.3753	130.3753	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	124.8747	138.2542	124.8747	129.0372	124.8747	129.0372	124.8747	124.8747	129.0372	124.8747	129.0372	124.8747	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	236.6656	239.1215	232.9328	219.7579	203.1269	187.4962	177.0538	174.5980	180.7867	193.9616	210.5926	226.2233	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0375	36.0375	36.0375	36.0375	36.0375	36.0375	36.0375	36.0375	36.0375	36.0375	36.0375	36.0375	(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)	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	(71)
Water heating gains (Table 5)	153.7500	151.2187	146.3426	135.6554	129.1093	122.2669	118.0644	121.5366	125.6075	133.1998	143.4447	152.3836	(72)
Total internal gains	580.4030	593.7069	569.2627	549.5631	522.2235	500.9129	482.1055	483.1219	497.5439	517.1487	548.1870	568.5942	(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	9.8400	10.6334	0.6300	0.7000	0.7700	31.9771	(74)
South	4.1600	46.7521	0.6300	0.7000	0.7700	59.4382	(78)

Solar gains	91.4153	158.4544	227.8402	306.9411	370.7289	381.0796	361.8908	311.5252	254.3823	177.7385	109.9024	78.0178	(83)
Total gains	671.8183	752.1613	797.1029	856.5042	892.9524	881.9924	843.9963	794.6470	751.9262	694.8872	658.0895	646.6120	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	50.6026	50.7365	50.8684	51.4973	51.6167	52.1799	52.1799	52.2855	51.9615	51.6167	51.3757	51.1262	
alpha	4.3735	4.3824	4.3912	4.4332	4.4411	4.4787	4.4787	4.4857	4.4641	4.4411	4.4250	4.4084	
util living area	0.9876	0.9786	0.9623	0.9151	0.8139	0.6399	0.4817	0.5286	0.7561	0.9282	0.9772	0.9894	(86)
MIT	19.6022	19.7976	20.0731	20.4546	20.7650	20.9414	20.9868	20.9803	20.8746	20.4925	19.9944	19.5744	(87)
Th 2	20.0026	20.0049	20.0073	20.0182	20.0202	20.0298	20.0298	20.0315	20.0261	20.0202	20.0161	20.0118	(88)
util rest of house	0.9844	0.9732	0.9524	0.8923	0.7655	0.5588	0.3805	0.4251	0.6828	0.9041	0.9705	0.9867	(89)
MIT 2	18.3859	18.6346	18.9825	19.4576	19.8129	19.9924	20.0246	20.0231	19.9350	19.5128	18.8939	18.3571	(90)
Living area fraction									fLA = Living area / (4) =			0.3709	(91)
MIT	18.8370	19.0660	19.3870	19.8274	20.1660	20.3444	20.3815	20.3781	20.2835	19.8762	19.3021	18.8086	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8370	19.0660	19.3870	19.8274	20.1660	20.3444	20.3815	20.3781	20.2835	19.8762	19.3021	18.8086	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9795	0.9666	0.9447	0.8871	0.7734	0.5862	0.4179	0.4631	0.7037	0.8999	0.9642	0.9822	(94)
Useful gains	658.0131	727.0124	752.9934	759.8414	690.5890	517.0295	352.7039	368.0018	529.1455	625.3256	634.5080	635.1242	(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	1415.6425	1375.8692	1248.4062	1045.6446	808.2422	542.4888	357.1187	374.9279	586.4134	885.5861	1170.3803	1408.0449	(97)
Space heating kWh	563.6763	436.0318	368.5872	205.7783	87.5340	0.0000	0.0000	0.0000	0.0000	193.6338	385.8281	575.0531	(98a)
Space heating requirement - total per year (kWh/year)												2816.1224	
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	563.6763	436.0318	368.5872	205.7783	87.5340	0.0000	0.0000	0.0000	0.0000	193.6338	385.8281	575.0531	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2816.1224	
Space heating per m2										(98c) / (4) =		31.7488	(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	563.6763	436.0318	368.5872	205.7783	87.5340	0.0000	0.0000	0.0000	0.0000	193.6338	385.8281	575.0531	(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)	610.7002	472.4071	399.3361	222.9451	94.8364	0.0000	0.0000	0.0000	0.0000	209.7874	418.0153	623.0261	(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	240.2148	212.4367	225.9351	199.5232	193.9407	175.3548	173.6196	180.2603	181.9306	202.1231	213.9615	237.7325	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.9049	85.6360	85.1504	84.1291	82.3970	79.8000	79.8000	79.8000	79.8000	83.9636	85.3655	85.9642	(217)
Fuel for water heating, kWh/month	279.6287	248.0694	265.3364	237.1631	235.3734	219.7428	217.5684	225.8901	227.9832	240.7269	250.6415	276.5481	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	25.9465	20.8152	18.7418	13.7311	10.6063	8.6654	9.6754	12.5764	16.3356	21.4331	24.2087	26.6676	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.4856	-29.1274	-44.3554	-52.9220	-59.7532	-56.7469	-56.0459	-51.5679	-44.1586	-34.6170	-21.9994	-16.6582	(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	-6.4893	-13.9994	-28.4920	-43.7970	-58.9158	-59.5802	-58.8896	-49.4043	-35.6109	-20.3535	-8.7681	-5.1066	(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												3051.0536	(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	2924.6720	(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)	209.4031	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-876.8439	(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	5394.2848	(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	3051.0536	0.2100	640.7212	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2924.6720	0.2100	614.1811	(264)
Space and water heating			1254.9024	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	209.4031	0.1443	30.2233	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-487.4373	0.1334	-65.0169	
PV Unit electricity exported	-389.4066	0.1252	-48.7607	
Total			-113.7776	(269)
Total CO2, kg/year			1183.2773	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.3400	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3051.0536	1.1300	3447.6905	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2924.6720	1.1300	3304.8794	(278)
Space and water heating			6752.5699	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	209.4031	1.5338	321.1895	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-487.4373	1.4929	-727.6956	
PV Unit electricity exported	-389.4066	0.4596	-178.9723	
Total			-906.6679	(283)
Total Primary energy kWh/year			6297.1923	(286)
Target Primary Energy Rate (TPER)			70.9900	(287)

Full SAP Calculation Printout

Property Reference	Plot 02.02	**Issued on Date**	24/09/2024
Assessment Reference	0001	**Prop Type Ref**	3B5P MF
Property	Plot 02.02, 33-35, Jamestown Road, London, NW1 7DB		

SAP Rating	86 B	**DER**	2.71	**TER**	10.53
Environmental	98 A	**% DER < TER**			74.26
CO_2 Emissions (t/year)	0.23	**DFEE**	22.81	**TFEE**	25.22
Compliance Check	See BREL	**% DFEE < TFEE**			9.54
% DPER < TPER	48.05	**DPER**	29.04	**TPER**	55.89

Assessor Details	Mr. Gary Ormiston	**Assessor ID**	AW68-0001
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	88.7000	(1b)	x 2.8000	(2b) =	248.3600	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.7000					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		248.3600	(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) =	81.0000 (23c)

Effective ac	0.2576	0.2544	0.2512	0.2352	0.2321	0.2161	0.2161	0.2129	0.2225	0.2321	0.2384	0.2448	(25)

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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 = 1.20)			14.0000	1.1450	16.0305			(27)
External Wall	43.1200	14.0000	29.1200	0.1500	4.3680			(29a)
Wall to stairs/lifts	11.2000		11.2000	0.1400	1.5680			(29a)
Total net area of external elements Aum(A, m2)			54.3200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	21.9665			(33)
Corridor			35.8400	0.0000	0.0000			(32)
Dwellings			42.0000	0.0000	0.0000			(32)
Party Floor 1			88.7000					(32d)
Party Ceiling			88.7000					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	200.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	38.8000	0.0500	1.9400
E16 Corner (normal)	2.8000	0.0900	0.2520

E18 Party wall between dwellings	5.6000	0.0900	0.5040		
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	55.6000	0.0000	0.0000		
E2 Other lintels (including other steel lintels)	8.8000	0.0300	0.2640		
E3 Sill	8.8000	0.0300	0.2640		
E4 Jamb	19.6000	0.0300	0.5880		
E25 Staggered party wall between dwellings	8.4000	0.2400	2.0160		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				5.8280	(36)
Point Thermal bridges			(36a) =	0.0000	
Total fabric heat loss			(33) + (36) + (36a) =	27.7945	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	21.1095	20.8483	20.5870	19.2808	19.0196	17.7133	17.7133	17.4521	18.2358	19.0196	19.5421	20.0645	(38)
Heat transfer coeff	48.9040	48.6428	48.3816	47.0753	46.8141	45.5079	45.5079	45.2466	46.0304	46.8141	47.3366	47.8591	(39)
Average = Sum(39)m / 12 =												47.0100	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.5513	0.5484	0.5455	0.5307	0.5278	0.5131	0.5131	0.5101	0.5189	0.5278	0.5337	0.5396	(40)
HLP (average)												0.5300	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6075	(42)
Hot water usage for mixer showers	93.4162	92.0123	89.9666	86.0525	83.1640	79.9428	78.1119	80.1421	82.3676	85.8262	89.8244	93.0583	(42a)
Hot water usage for baths	29.3392	28.9035	28.2899	27.1585	26.3114	25.3720	24.8646	25.4739	26.1374	27.1425	28.2972	29.2400	(42b)
Hot water usage for other uses	41.3335	39.8304	38.3274	36.8244	35.3213	33.8183	33.8183	35.3213	36.8244	38.3274	39.8304	41.3335	(42c)
Average daily hot water use (litres/day)												150.9045	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	164.0889	160.7462	156.5839	150.0354	144.7967	139.1331	136.7948	140.9373	145.3293	151.2961	157.9520	163.6318	(44)
Energy conte	259.8767	228.9005	240.6636	205.3910	194.9242	171.0804	165.4414	174.5099	179.2056	205.3074	225.0315	256.2078	(45)
Energy content (annual)										Total = Sum(45)m =		2506.5400	
Distribution loss (46)m = 0.15 x (45)m	38.9815	34.3351	36.0995	30.8086	29.2386	25.6621	24.8162	26.1765	26.8808	30.7961	33.7547	38.4312	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(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	315.1535	278.8279	295.9404	258.8847	250.2010	224.5741	220.7182	229.7867	232.6992	260.5842	278.5252	311.4846	(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	315.1535	278.8279	295.9404	258.8847	250.2010	224.5741	220.7182	229.7867	232.6992	260.5842	278.5252	311.4846	(64)
										Total per year (kWh/year) = Sum(64)m =		3157.3797	(64)
12Total per year (kWh/year)												3157	(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	130.6304	116.0514	124.2421	111.0874	109.0338	99.6792	99.2307	102.2460	102.3808	112.4861	117.6179	129.4105	(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	130.3753	130.3753	130.3753	130.3753	130.3753	130.3753	130.3753	130.3753	130.3753	130.3753	130.3753	130.3753	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	124.8747	138.2542	124.8747	129.0372	124.8747	129.0372	124.8747	124.8747	129.0372	124.8747	129.0372	124.8747	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	236.6656	239.1215	232.9328	219.7579	203.1269	187.4962	177.0538	174.5980	180.7867	193.9616	210.5926	226.2233	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0375	36.0375	36.0375	36.0375	36.0375	36.0375	36.0375	36.0375	36.0375	36.0375	36.0375	36.0375	(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)	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	(71)
Water heating gains (Table 5)	175.5785	172.6955	166.9921	154.2881	146.5507	138.4433	133.3746	137.4274	142.1955	151.1911	163.3582	173.9389	(72)
Total internal gains	599.2315	612.1837	586.9122	565.1958	536.6650	517.0892	497.4158	499.0127	514.1320	532.1399	565.1006	587.1495	(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	9.8400	10.6334	0.4000	0.0000	0.7700	32.2268	(74)
South	4.1600	46.7521	0.4000	0.0000	0.7700	59.9025	(78)
Solar gains	92.1293	159.6920	229.6197	309.3384	373.6244	384.0560	364.7173	313.9583	256.3691	179.1267	110.7608	78.6271	(83)
Total gains	691.3608	771.8757	816.5319	874.5342	910.2894	901.1452	862.1331	812.9710	770.5011	711.2666	675.8614	665.7767	(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	100.7642	101.3054	101.8524	104.6785	105.2627	108.2841	108.2841	108.9093	107.0549	105.2627	104.1008	102.9643	
alpha	7.7176	7.7537	7.7902	7.9786	8.0175	8.2189	8.2189	8.2606	8.1370	8.0175	7.9401	7.8643	
util living area	0.9446	0.8921	0.8088	0.6437	0.4776	0.3232	0.2323	0.2560	0.4120	0.6738	0.8759	0.9520	(86)
MIT	20.7302	20.8439	20.9321	20.9890	20.9990	21.0000	21.0000	21.0000	20.9998	20.9874	20.8907	20.7185	(87)
Th 2	20.4740	20.4767	20.4793	20.4927	20.4954	20.5089	20.5089	20.5116	20.5035	20.4954	20.4901	20.4847	(88)
util rest of house	0.9355	0.8774	0.7878	0.6185	0.4519	0.2984	0.2063	0.2288	0.3825	0.6438	0.8576	0.9439	(89)
MIT 2	20.2362	20.3439	20.4247	20.4847	20.4948	20.5089	20.5089	20.5116	20.5034	20.4866	20.4003	20.2350	(90)
Living area fraction									fLA = Living area / (4) =			0.3709	(91)
MIT	20.4194	20.5293	20.6129	20.6718	20.6818	20.6910	20.6910	20.6927	20.6875	20.6724	20.5822	20.4143	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.4194	20.5293	20.6129	20.6718	20.6818	20.6910	20.6910	20.6927	20.6875	20.6724	20.5822	20.4143	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9344	0.8789	0.7933	0.6275	0.4614	0.3076	0.2159	0.2389	0.3934	0.6545	0.8611	0.9427	(94)
Useful gains	646.0415	678.4252	647.7712	548.7413	420.0117	277.1777	186.1742	194.2308	303.1317	465.4938	581.9559	627.6167	(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	788.3035	760.2554	682.8044	554.1602	420.4748	277.1895	186.1747	194.2319	303.2248	471.5290	638.1996	776.0037	(97)
Space heating kWh	105.8429	54.9898	26.0647	3.9016	0.3445	0.0000	0.0000	0.0000	0.0000	4.4902	40.4954	110.4000	(98a)
Space heating requirement - total per year (kWh/year)												346.5292	
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	105.8429	54.9898	26.0647	3.9016	0.3445	0.0000	0.0000	0.0000	0.0000	4.4902	40.4954	110.4000	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												346.5292	
Space heating per m2										(98c) / (4) =		3.9068	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(301)
Fraction of space heat from community system												1.0000	(302)
Fraction of heat from community Heat pump-Space and Water												1.0000	(303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0500	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.0200	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	105.8429	54.9898	26.0647	3.9016	0.3445	0.0000	0.0000	0.0000	0.0000	4.4902	40.4954	110.4000	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.02													
307a	113.3578	58.8941	27.9152	4.1787	0.3690	0.0000	0.0000	0.0000	0.0000	4.8090	43.3706	118.2384	
Space heating requirement													
	113.3578	58.8941	27.9152	4.1787	0.3690	0.0000	0.0000	0.0000	0.0000	4.8090	43.3706	118.2384	(307)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)												0.0000	(308)
Space heating fuel for secondary/supplementary system													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)
Water heating													
Annual water heating requirement													
	315.1535	278.8279	295.9404	258.8847	250.2010	224.5741	220.7182	229.7867	232.6992	260.5842	278.5252	311.4846	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.02													
310a	321.4565	284.4045	301.8592	264.0624	255.2051	229.0656	225.1326	234.3824	237.3532	265.7959	284.0957	317.7143	
Water heating fuel													
	321.4565	284.4045	301.8592	264.0624	255.2051	229.0656	225.1326	234.3824	237.3532	265.7959	284.0957	317.7143	(310)
Cooling System Energy Efficiency Ratio												0.0000	(314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(315)
Pumps and Fa	22.2343	20.0826	22.2343	21.5171	22.2343	21.5171	22.2343	22.2343	21.5171	22.2343	21.5171	22.2343	(331)
Lighting	23.7999	19.0932	17.1913	12.5951	9.7288	7.9485	8.8749	11.5360	14.9841	19.6599	22.2059	24.4614	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335a)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(335b)
Annual totals kWh/year													
Space heating fuel - community heating												371.1327	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												3220.5273	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												3.7113	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.6000, SFP = 0.8640)													
mechanical ventilation fans (SFP = 0.8640)												261.7913	(330a)
Total electricity for the above, kWh/year												261.7913	(331)
Electricity for lighting (calculated in Appendix L)												192.0789	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(333)
Wind generation												0.0000	(334)
Hydro-electric generation (Appendix N)												0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(335)
Appendix Q - special features													

Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4045.5303	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			300.0000	(367)
Space and Water heating from Heat pump	1197.2200	0.1598	19.7645	(367)
Electrical energy for heat distribution (space & water)	3.7113	0.0000	5.1335	(372)
Overall CO2 factor for heat network			0.0491	(386)
Total CO2 associated with community systems			176.2494	(373)
Space and water heating			176.2494	(376)
Pumps, fans and electric keep-hot	261.7913	0.1387	36.3137	(378)
Energy for lighting	192.0789	0.1443	27.7229	(379)
Total CO2, kg/year			240.2860	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.7100	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			300.0000	(467a)
Space and Water heating from Heat pump	1197.2200	1.5913	196.8630	(467)
Electrical energy for heat distribution (space & water)	3.7113	0.0000	54.9006	(472)
Overall CO2 factor for heat network			0.5248	(486)
Total CO2 associated with community systems			1884.9202	(473)
Space and water heating			1884.9202	(476)
Pumps, fans and electric keep-hot	261.7913	1.5128	396.0379	(478)
Energy for lighting	192.0789	1.5338	294.6171	(479)
Total Primary energy kWh/year			2575.5752	(483)
Dwelling Primary energy Rate (DPER)			29.0400	(484)

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	88.7000	(1b) x	2.8000	(2b) =	248.3600	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		248.3600	(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) =	0.1208	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3708	(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) =	0.3152	(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	0.4018	0.3940	0.3861	0.3467	0.3388	0.2994	0.2994	0.2915	0.3152	0.3388	0.3546	0.3703	(22b)
Effective ac	0.5807	0.5776	0.5745	0.5601	0.5574	0.5448	0.5448	0.5425	0.5497	0.5574	0.5629	0.5686	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opening Type (Uw = 1.20)			14.0000	1.1450	16.0305			(27)
External Wall	43.1200	14.0000	29.1200	0.1800	5.2416			(29a)
Wall to stairs/lifts	11.2000		11.2000	0.1800	2.0160			(29a)
Total net area of external elements Aum(A, m2)			54.3200					(31)

Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =	23.2881		(33)
Corridor	35.8400	0.0000	0.0000		(32)
Dwellings	42.0000	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 200.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	38.8000	0.0700	2.7160
E16 Corner (normal)	2.8000	0.0900	0.2520
E18 Party wall between dwellings	5.6000	0.0600	0.3360
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	55.6000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	8.8000	0.0500	0.4400
E3 Sill	8.8000	0.0500	0.4400
E4 Jamb	19.6000	0.0500	0.9800
E25 Staggered party wall between dwellings	8.4000	0.0600	0.5040

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.6680 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 28.9561 (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	47.5968	47.3398	47.0879	45.9049	45.6836	44.6532	44.6532	44.4624	45.0501	45.6836	46.1313	46.5995	(38)
Heat transfer coeff	76.5529	76.2959	76.0441	74.8610	74.6397	73.6093	73.6093	73.4185	74.0062	74.6397	75.0875	75.5556	(39)
Average = Sum(39)m / 12 =												74.8600	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8631	0.8602	0.8573	0.8440	0.8415	0.8299	0.8299	0.8277	0.8343	0.8415	0.8465	0.8518	(40)
HLP (average)												0.8440	
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 2.6075 (42)

Hot water usage for mixer showers

67.9390	66.9180	65.4303	62.5837	60.4829	58.1402	56.8086	58.2851	59.9037	62.4191	65.3268	67.6787	(42a)

Hot water usage for baths

29.3392	28.9035	28.2899	27.1585	26.3114	25.3720	24.8646	25.4739	26.1374	27.1425	28.2972	29.2400	(42b)

Hot water usage for other uses

41.3335	39.8304	38.3274	36.8244	35.3213	33.8183	33.8183	35.3213	36.8244	38.3274	39.8304	41.3335	(42c)

Average daily hot water use (litres/day) 127.4155 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	138.6117	135.6520	132.0476	126.5666	122.1156	117.3305	115.4915	119.0804	122.8654	127.8890	133.4544	138.2522	(44)
Energy conte	219.5271	193.1666	202.9522	173.2633	164.3911	144.2716	139.6770	147.4464	151.5053	173.5441	190.1303	216.4696	(45)
Energy content (annual)										Total = Sum(45)m =		2116.3446	
Distribution loss (46)m = 0.15 x (45)m													
	32.9291	28.9750	30.4428	25.9895	24.6587	21.6407	20.9516	22.1170	22.7258	26.0316	28.5195	32.4704	(46)

Water storage loss:

Store volume 210.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.7016 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.9188 (55)

Total storage loss

28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(56)

If cylinder contains dedicated solar storage

28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(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

271.2737	239.9055	254.6988	223.3406	216.1377	194.3489	191.4236	199.1930	201.5827	225.2907	240.2076	268.2162	(62)
WWHRS -31.0589	-27.4687	-28.7637	-23.8175	-22.1970	-18.9941	-17.8040	-18.9328	-19.6521	-23.1676	-26.2461	-30.4837	(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													
240.2148	212.4367	225.9351	199.5232	193.9407	175.3548	173.6196	180.2603	181.9306	202.1231	213.9615	237.7325	(64)
									Total per year (kWh/year) = Sum(64)m =		2437.0327	(64)
12Total per year (kWh/year)												2437	(64)

Electric shower(s)

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

Heat gains from water heating, kWh/month

114.3900	101.6190	108.8789	97.6719	96.0573	88.0322	87.8399	90.4232	90.4374	99.1007	103.2802	113.3734	(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	130.3753	130.3753	130.3753	130.3753	130.3753	130.3753	130.3753	130.3753	130.3753	130.3753	130.3753	130.3753	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	124.8747	138.2542	124.8747	129.0372	124.8747	129.0372	124.8747	124.8747	129.0372	124.8747	129.0372	124.8747	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	236.6656	239.1215	232.9328	219.7579	203.1269	187.4962	177.0538	174.5980	180.7867	193.9616	210.5926	226.2233	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.0375	36.0375	36.0375	36.0375	36.0375	36.0375	36.0375	36.0375	36.0375	36.0375	36.0375	36.0375	(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)													
	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	-104.3002	(71)
Water heating gains (Table 5)													
	153.7500	151.2187	146.3426	135.6554	129.1093	122.2669	118.0644	121.5366	125.6075	133.1998	143.4447	152.3836	(72)
Total internal gains													
	580.4030	593.7069	569.2627	549.5631	522.2235	500.9129	482.1055	483.1219	497.5439	517.1487	548.1870	568.5942	(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				9.8400	10.6334	0.6300	0.7000	0.7700				31.9771	(74)
South				4.1600	46.7521	0.6300	0.7000	0.7700				59.4382	(78)
Solar gains	91.4153	158.4544	227.8402	306.9411	370.7289	381.0796	361.8908	311.5252	254.3823	177.7385	109.9024	78.0178	(83)
Total gains	671.8183	752.1613	797.1029	856.5042	892.9524	881.9924	843.9963	794.6470	751.9262	694.8872	658.0895	646.6120	(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	64.3709	64.5877	64.8016	65.8257	66.0209	66.9450	66.9450	67.1190	66.5860	66.0209	65.6272	65.2206	
alpha	5.2914	5.3058	5.3201	5.3884	5.4014	5.4630	5.4630	5.4746	5.4391	5.4014	5.3751	5.3480	
util living area	0.9840	0.9699	0.9434	0.8661	0.7219	0.5259	0.3825	0.4227	0.6502	0.8865	0.9673	0.9865	(86)
MIT	20.0551	20.2360	20.4626	20.7479	20.9238	20.9888	20.9984	20.9972	20.9665	20.7535	20.3745	20.0310	(87)
Th 2	20.1990	20.2015	20.2039	20.2154	20.2175	20.2275	20.2275	20.2294	20.2237	20.2175	20.2132	20.2087	(88)
util rest of house	0.9802	0.9632	0.9308	0.8388	0.6750	0.4656	0.3160	0.3530	0.5868	0.8572	0.9588	0.9833	(89)
MIT 2	19.1020	19.3309	19.6136	19.9615	20.1524	20.2205	20.2268	20.2282	20.2001	19.9763	19.5160	19.0790	(90)
Living area fraction									fLA = Living area / (4) =			0.3709	(91)
MIT	19.4555	19.6666	19.9285	20.2532	20.4386	20.5055	20.5130	20.5134	20.4843	20.2646	19.8344	19.4321	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4555	19.6666	19.9285	20.2532	20.4386	20.5055	20.5130	20.5134	20.4843	20.2646	19.8344	19.4321	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9759	0.9577	0.9257	0.8402	0.6888	0.4876	0.3406	0.3789	0.6087	0.8591	0.9539	0.9794	(94)
Useful gains	655.5955	720.3700	737.9123	719.6255	615.0340	430.0278	287.4995	301.0609	457.7135	596.9893	627.7489	633.2911	(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	1160.1979	1126.6350	1021.1603	849.9123	652.2429	434.6961	288.0340	302.0006	472.4814	721.3616	956.1948	1150.8732	(97)
Space heating kWh	375.4242	273.0101	210.7365	93.8065	27.6834	0.0000	0.0000	0.0000	0.0000	92.5329	236.4811	385.0811	(98a)
Space heating requirement - total per year (kWh/year)												1694.7559	
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	375.4242	273.0101	210.7365	93.8065	27.6834	0.0000	0.0000	0.0000	0.0000	92.5329	236.4811	385.0811	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1694.7559	
Space heating per m2										(98c) / (4) =		19.1066	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement	375.4242	273.0101	210.7365	93.8065	27.6834	0.0000	0.0000	0.0000	0.0000	92.5329	236.4811	385.0811	(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)	406.7434	295.7856	228.3169	101.6322	29.9928	0.0000	0.0000	0.0000	0.0000	100.2524	256.2092	417.2060	(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	240.2148	212.4367	225.9351	199.5232	193.9407	175.3548	173.6196	180.2603	181.9306	202.1231	213.9615	237.7325	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.0570	84.6234	83.9039	82.4731	80.8232	79.8000	79.8000	79.8000	79.8000	82.4234	84.2847	85.1350	(217)
Fuel for water heating, kWh/month	282.4164	251.0377	269.2784	241.9251	239.9567	219.7428	217.5684	225.8901	227.9832	245.2254	253.8556	279.2419	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	25.9465	20.8152	18.7418	13.7311	10.6063	8.6654	9.6754	12.5764	16.3356	21.4331	24.2087	26.6676	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-19.4856	-29.1274	-44.3554	-52.9220	-59.7532	-56.7469	-56.0459	-51.5679	-44.1586	-34.6170	-21.9994	-16.6582	(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	-6.4893	-13.9994	-28.4920	-43.7970	-58.9158	-59.5802	-58.8896	-49.4043	-35.6109	-20.3535	-8.7681	-5.1066	(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												1836.1385	(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												2954.1216	(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)	209.4031	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-876.8439	(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	4208.8193	(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	1836.1385	0.2100	385.5891	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2954.1216	0.2100	620.3655	(264)
Space and water heating			1005.9546	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	209.4031	0.1443	30.2233	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-487.4373	0.1334	-65.0169	
PV Unit electricity exported	-389.4066	0.1252	-48.7607	
Total			-113.7776	(269)
Total CO2, kg/year			934.3296	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.5300	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1836.1385	1.1300	2074.8365	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2954.1216	1.1300	3338.1574	(278)
Space and water heating			5412.9939	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	209.4031	1.5338	321.1895	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-487.4373	1.4929	-727.6956	
PV Unit electricity exported	-389.4066	0.4596	-178.9723	
Total			-906.6679	(283)
Total Primary energy kWh/year			4957.6163	(286)
Target Primary Energy Rate (TPER)			55.8900	(287)

Full SAP Calculation Printout

Property Reference	Plot 05.03	**Issued on Date**	24/09/2024
Assessment Reference	0001	**Prop Type Ref**	2B3P TF
Property	Plot 05.03, 33-35, Jamestown Road, London, NW1 7DB		

SAP Rating	83 B	**DER**	3.67	**TER**	16.03
Environmental	97 A	**% DER < TER**			77.11
CO_2 Emissions (t/year)	0.22	**DFEE**	34.68	**TFEE**	44.34
Compliance Check	See BREL	**% DFEE < TFEE**			21.78
% DPER < TPER	54.43	**DPER**	39.03	**TPER**	85.65

Assessor Details	Mr. Gary Ormiston	**Assessor ID**	AW68-0001
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	65.0000	(1b)	x 2.8000	(2b) =	182.0000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	182.0000	(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) =	81.0000	(23c)

Effective ac	0.2576	0.2544	0.2512	0.2352	0.2321	0.2161	0.2161	0.2129	0.2225	0.2321	0.2384	0.2448	(25)

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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 = 1.20)			18.5200	1.1450	21.2061			(27)
External Wall	63.2800	18.5200	44.7600	0.1500	6.7140			(29a)
External Roof 1	65.0000		65.0000	0.1000	6.5000			(30)
Total net area of external elements Aum(A, m2)			128.2800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.4201			(33)
Dwellings			29.1200	0.0000	0.0000			(32)
Party Floor 1			65.0000					(32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	200.0000 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	22.6000	0.0500	1.1300
E16 Corner (normal)	5.6000	0.0900	0.5040
E18 Party wall between dwellings	5.6000	0.0900	0.5040
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.4000	0.0000	0.0000

E2 Other lintels (including other steel lintels)	10.8000	0.0300	0.3240		
E3 Sill	10.8000	0.0300	0.3240		
E4 Jamb	24.0000	0.0300	0.7200		
E15 Flat roof with parapet	22.6000	0.2000	4.5200		
P5 Party wall - Roof (insulation at rafter level)	10.4000	0.0800	0.8320		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				8.8580	(36)
Point Thermal bridges			(36a) =	0.0000	
Total fabric heat loss			(33) + (36) + (36a) =	43.2781	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	15.4692	15.2778	15.0863	14.1291	13.9377	12.9805	12.9805	12.7890	13.3633	13.9377	14.3206	14.7034	(38)
Heat transfer coeff	58.7473	58.5559	58.3644	57.4072	57.2158	56.2586	56.2586	56.0671	56.6415	57.2158	57.5987	57.9815	(39)
Average = Sum(39)m / 12 =												57.3594	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9038	0.9009	0.8979	0.8832	0.8802	0.8655	0.8655	0.8626	0.8714	0.8802	0.8861	0.8920	(40)
HLP (average)												0.8825	
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												2.1189	(42)
Hot water usage for mixer showers	82.1519	80.9174	79.1183	75.6762	73.1360	70.3032	68.6930	70.4785	72.4356	75.4772	78.9932	81.8372	(42a)
Hot water usage for baths	25.8163	25.4329	24.8930	23.8975	23.1521	22.3255	21.8790	22.4152	22.9989	23.8834	24.8994	25.7291	(42b)
Hot water usage for other uses	36.3298	35.0087	33.6877	32.3666	31.0455	29.7244	29.7244	31.0455	32.3666	33.6877	35.0087	36.3298	(42c)
Average daily hot water use (litres/day)												132.7043	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	144.2981	141.3590	137.6990	131.9403	127.3336	122.3531	120.2965	123.9391	127.8011	133.0482	138.9014	143.8961	(44)
Energy conte	228.5329	201.2934	211.6382	180.6196	171.4154	150.4474	145.4882	153.4625	157.5915	180.5452	197.8905	225.3065	(45)
Energy content (annual)										Total = Sum(45)m =		2204.2314	
Distribution loss (46)m = 0.15 x (45)m	34.2799	30.1940	31.7457	27.0929	25.7123	22.5671	21.8232	23.0194	23.6387	27.0818	29.6836	33.7960	(46)
Water storage loss:													
Store volume												110.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(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	283.8097	251.2208	266.9150	234.1133	226.6922	203.9411	200.7650	208.7393	211.0852	235.8220	251.3842	280.5833	(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	283.8097	251.2208	266.9150	234.1133	226.6922	203.9411	200.7650	208.7393	211.0852	235.8220	251.3842	280.5833	(64)
										Total per year (kWh/year) = Sum(64)m =		2855.0711	(64)
12Total per year (kWh/year)												2855	(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	120.2086	106.8720	114.5912	102.8510	101.2171	92.8187	92.5963	95.2477	95.1941	104.2527	108.5935	119.1358	(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	105.9458	105.9458	105.9458	105.9458	105.9458	105.9458	105.9458	105.9458	105.9458	105.9458	105.9458	105.9458	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	93.4922	103.5092	93.4922	96.6086	93.4922	96.6086	93.4922	93.4922	96.6086	93.4922	96.6086	93.4922	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	185.3587	187.2821	182.4351	172.1164	159.0908	146.8487	138.6702	136.7467	141.5937	151.9125	164.9380	177.1801	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.5946	33.5946	33.5946	33.5946	33.5946	33.5946	33.5946	33.5946	33.5946	33.5946	33.5946	33.5946	(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)	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	(71)
Water heating gains (Table 5)	161.5708	159.0357	154.0204	142.8486	136.0445	128.9149	124.4573	128.0211	132.2141	140.1246	150.8243	160.1288	(72)
Total internal gains	495.2053	504.6107	484.7314	466.3573	443.4112	427.1559	411.4034	413.0438	425.2001	440.3130	467.1546	485.5849	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	7.7200	10.6334	0.4000	0.0000	0.7700	25.2837	(74)
East	4.0000	19.6403	0.4000	0.0000	0.7700	24.1968	(76)
South	6.8000	46.7521	0.4000	0.0000	0.7700	97.9175	(78)

Solar gains	147.3980	256.0161	364.3321	476.4452	557.5722	564.3466	539.5720	477.2053	402.7677	286.6498	177.4269	125.5857	(83)
Total gains	642.6033	760.6269	849.0634	942.8025	1000.9835	991.5025	950.9754	890.2491	827.9678	726.9628	644.5815	611.1706	(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	61.4685	61.6695	61.8718	62.9034	63.1139	64.1877	64.1877	64.4069	63.7539	63.1139	62.6944	62.2804	
alpha	5.0979	5.1113	5.1248	5.1936	5.2076	5.2792	5.2792	5.2938	5.2503	5.2076	5.1796	5.1520	
util living area	0.9568	0.9117	0.8354	0.6900	0.5221	0.3620	0.2601	0.2894	0.4671	0.7449	0.9141	0.9642	(86)
MIT	20.2422	20.4839	20.7161	20.9084	20.9803	20.9977	20.9997	20.9995	20.9916	20.8887	20.5608	20.2017	(87)
Th 2	20.1643	20.1668	20.1693	20.1818	20.1843	20.1969	20.1969	20.1994	20.1919	20.1843	20.1793	20.1743	(88)
util rest of house	0.9479	0.8959	0.8096	0.6530	0.4791	0.3171	0.2127	0.2392	0.4143	0.7027	0.8959	0.9567	(89)
MIT 2	19.4963	19.7267	19.9406	20.1154	20.1722	20.1959	20.1968	20.1993	20.1876	20.1062	19.8139	19.4658	(90)
Living area fraction									fLA = Living area / (4) =			0.3477	(91)
MIT	19.7557	19.9900	20.2102	20.3911	20.4532	20.4747	20.4760	20.4775	20.4671	20.3783	20.0736	19.7216	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7557	19.9900	20.2102	20.3911	20.4532	20.4747	20.4760	20.4775	20.4671	20.3783	20.0736	19.7216	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9429	0.8921	0.8110	0.6628	0.4934	0.3327	0.2292	0.2567	0.4324	0.7132	0.8933	0.9518	(94)
Useful gains	605.9076	678.5864	688.5522	624.8560	493.9302	329.8320	217.9858	228.4853	358.0376	518.4374	575.8015	581.7399	(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	907.9785	883.6073	800.1885	659.6719	500.8190	330.4999	218.0564	228.6126	360.6444	559.4712	747.2627	899.9684	(97)
Space heating kWh	224.7407	137.7740	83.0575	25.0674	5.1253	0.0000	0.0000	0.0000	0.0000	30.5291	123.4520	236.7620	(98a)
Space heating requirement - total per year (kWh/year)												866.5081	
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	224.7407	137.7740	83.0575	25.0674	5.1253	0.0000	0.0000	0.0000	0.0000	30.5291	123.4520	236.7620	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												866.5081	
Space heating per m2											(98c) / (4) =	13.3309	(99)

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (301)

Fraction of space heat from community system 1.0000 (302)

Fraction of heat from community Heat pump-Space and Water 1.0000 (303a)

Factor for control and charging method (Table 4c(3)) for space heating 1.0500 (305)

Factor for charging method (Table 4c(3)) for water heating 1.0000 (305a)

Distribution loss factor (Table 12c) for community heating system 1.0200 (306)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

Space heating:

Space heating requirement

	224.7407	137.7740	83.0575	25.0674	5.1253	0.0000	0.0000	0.0000	0.0000	30.5291	123.4520	236.7620 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.02												
307a	240.6973	147.5560	88.9545	26.8472	5.4892	0.0000	0.0000	0.0000	0.0000	32.6967	132.2171	253.5721
Space heating requirement												
	240.6973	147.5560	88.9545	26.8472	5.4892	0.0000	0.0000	0.0000	0.0000	32.6967	132.2171	253.5721 (307)

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0.0000 (308)

Space heating fuel for secondary/supplementary system												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)

Water heating

Annual water heating requirement

	283.8097	251.2208	266.9150	234.1133	226.6922	203.9411	200.7650	208.7393	211.0852	235.8220	251.3842	280.5833 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.02												
310a	289.4859	256.2452	272.2533	238.7956	231.2261	208.0199	204.7803	212.9141	215.3069	240.5384	256.4118	286.1949
Water heating fuel												
	289.4859	256.2452	272.2533	238.7956	231.2261	208.0199	204.7803	212.9141	215.3069	240.5384	256.4118	286.1949 (310)

Cooling System Energy Efficiency Ratio 0.0000 (314)

Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	16.2935	14.7167	16.2935	15.7679	16.2935	15.7679	16.2935	16.2935	15.7679	16.2935	15.7679	16.2935 (331)
Lighting	17.8187	14.2948	12.8709	9.4298	7.2838	5.9510	6.6446	8.6368	11.2184	14.7192	16.6252	18.3139 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)

Annual totals kWh/year

Space heating fuel - community heating 928.0301 (307)

Space heating fuel - secondary 0.0000 (309)

Water heating fuel - community heating 2912.1726 (310)

Efficiency of water heater 0.0000 (311)

Electricity used for heat distribution 9.2803 (313)

Space cooling fuel 0.0000 (321)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.6000, SFP = 0.8640)

mechanical ventilation fans (SFP = 0.8640) 191.8426 (330a)

Total electricity for the above, kWh/year 191.8426 (331)

Electricity for lighting (calculated in Appendix L) 143.8071 (332)

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

PV generation 0.0000 (333)

Wind generation 0.0000 (334)

Hydro-electric generation (Appendix N) 0.0000 (335a)

Electricity generated - Micro CHP (Appendix N) 0.0000 (335)

Appendix Q - special features

Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	4175.8524	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			300.0000	(367)
Space and Water heating from Heat pump	1280.0676	0.1581	48.9201	(367)
Electrical energy for heat distribution (space & water)	9.2803	0.0000	5.5716	(372)
Overall CO2 factor for heat network			0.0498	(386)
Total CO2 associated with community systems			191.2909	(373)
Space and water heating			191.2909	(376)
Pumps, fans and electric keep-hot	191.8426	0.1387	26.6109	(378)
Energy for lighting	143.8071	0.1443	20.7558	(379)
Total CO2, kg/year			238.6577	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.6700	(384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Efficiency of heat source Heat pump			300.0000	(467a)
Space and Water heating from Heat pump	1280.0676	1.5854	490.4243	(467)
Electrical energy for heat distribution (space & water)	9.2803	0.0000	59.0095	(472)
Overall CO2 factor for heat network			0.5276	(486)
Total CO2 associated with community systems			2025.9935	(473)
Space and water heating			2025.9935	(476)
Pumps, fans and electric keep-hot	191.8426	1.5128	290.2194	(478)
Energy for lighting	143.8071	1.5338	220.5762	(479)
Total Primary energy kWh/year			2536.7891	(483)
Dwelling Primary energy Rate (DPER)			39.0300	(484)

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		65.0000	(1b)	x 2.8000	(2b) =	182.0000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.0000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		182.0000	(5)

2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1099	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3599	(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) =	0.3059	(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	0.3900	0.3824	0.3747	0.3365	0.3288	0.2906	0.2906	0.2830	0.3059	0.3288	0.3441	0.3594	(22b)
Effective ac	0.5761	0.5731	0.5702	0.5566	0.5541	0.5422	0.5422	0.5400	0.5468	0.5541	0.5592	0.5646	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opening Type (Uw = 1.20)			16.2600	1.1450	18.6183			(27)
External Wall	63.2800	16.2600	47.0200	0.1800	8.4636			(29a)
External Roof 1	65.0000		65.0000	0.1100	7.1500			(30)
Total net area of external elements Aum(A, m2)			128.2800					(31)

Fabric heat loss, W/K = Sum (A x U) (26)...(30) + (32) = 34.2319 (33)
Dwellings 29.1200 0.0000 0.0000 (32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 200.0000 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	22.6000	0.0700	1.5820
E16 Corner (normal)	5.6000	0.0900	0.5040
E18 Party wall between dwellings	5.6000	0.0600	0.3360
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	10.4000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	10.8000	0.0500	0.5400
E3 Sill	10.8000	0.0500	0.5400
E4 Jamb	24.0000	0.0500	1.2000
E15 Flat roof with parapet	22.6000	0.5600	12.6560
P5 Party wall - Roof (insulation at rafter level)	10.4000	0.0800	0.8320

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 18.1900 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 52.4219 (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	34.5983	34.4209	34.2470	33.4303	33.2775	32.5662	32.5662	32.4345	32.8402	33.2775	33.5866	33.9098	(38)
Heat transfer coeff	87.0202	86.8428	86.6689	85.8522	85.6994	84.9881	84.9881	84.8564	85.2621	85.6994	86.0085	86.3317	(39)
Average = Sum(39)m / 12 =												85.8515	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3388	1.3360	1.3334	1.3208	1.3185	1.3075	1.3075	1.3055	1.3117	1.3185	1.3232	1.3282	(40)
HLP (average)												1.3208	
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 2.1189 (42)
Hot water usage for mixer showers

59.7469	58.8490	57.5406	55.0372	53.1898	51.1296	49.9586	51.2571	52.6804	54.8925	57.4496	59.5180	(42a)

Hot water usage for baths

25.8163	25.4329	24.8930	23.8975	23.1521	22.3255	21.8790	22.4152	22.9989	23.8834	24.8994	25.7291	(42b)

Hot water usage for other uses

36.3298	35.0087	33.6877	32.3666	31.0455	29.7244	29.7244	31.0455	32.3666	33.6877	35.0087	36.3298	(42c)

Average daily hot water use (litres/day) 112.0475 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	121.8930	119.2907	116.1213	111.3013	107.3874	103.1795	101.5620	104.7177	108.0459	112.4635	117.3578	121.5768	(44)
Energy conte	193.0488	169.8683	178.4741	152.3659	144.5640	126.8712	122.8304	129.6624	133.2315	152.6120	167.1977	190.3600	(45)
Energy content (annual)										Total = Sum(45)m =		1861.0862	

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

28.9573	25.4802	26.7711	22.8549	21.6846	19.0307	18.4246	19.4494	19.9847	22.8918	25.0796	28.5540	(46)

Water storage loss:
Store volume 210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.7016 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9188 (55)
Total storage loss

28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(56)

If cylinder contains dedicated solar storage

28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(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

244.7954	216.6072	230.2207	202.4433	196.3106	176.9486	174.5770	181.4090	183.3088	204.3585	217.2750	242.1065	(62)
-27.3138	-24.1565	-25.2953	-20.9455	-19.5205	-16.7038	-15.6572	-16.6498	-17.2824	-20.3741	-23.0813	-26.8080	(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

217.4816	192.4506	204.9253	181.4977	176.7902	160.2448	158.9199	164.7592	166.0264	183.9845	194.1937	215.2986	(64)
									Total per year (kWh/year) = Sum(64)m =		2216.5724	(64)

12Total per year (kWh/year) 2217 (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

105.5860	93.8723	100.7399	90.7235	89.4648	82.2466	82.2384	84.5100	84.3613	92.1407	95.6551	104.6920	(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	105.9458	105.9458	105.9458	105.9458	105.9458	105.9458	105.9458	105.9458	105.9458	105.9458	105.9458	105.9458	(66)

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

93.4922	103.5092	93.4922	96.6086	93.4922	96.6086	93.4922	93.4922	96.6086	93.4922	96.6086	93.4922	(67)

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

185.3587	187.2821	182.4351	172.1164	159.0908	146.8487	138.6702	136.7467	141.5937	151.9125	164.9380	177.1801	(68)

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

33.5946	33.5946	33.5946	33.5946	33.5946	33.5946	33.5946	33.5946	33.5946	33.5946	33.5946	33.5946	(69)
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)

Pumps, fans
Losses e.g. evaporation (negative values) (Table 5)

-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	-84.7567	(71)

Water heating gains (Table 5)

141.9166	139.6909	135.4031	126.0049	120.2484	114.2313	110.5355	113.5887	117.1685	123.8451	132.8543	140.7150	(72)

Total internal gains

478.5512	488.2659	469.1141	452.5136	430.6152	412.4723	397.4815	398.6114	410.1546	427.0335	452.1846	469.1710	(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				6.7800		10.6334		0.6300		0.7000		0.7700	22.0330 (74)
East				3.5100		19.6403		0.6300		0.7000		0.7700	21.0681 (76)
South				5.9700		46.7521		0.6300		0.7000		0.7700	85.2996 (78)
Solar gains	128.4007	223.0187	317.3733	415.0382	485.7133	491.6169	470.0341	415.7018	350.8553	249.7037	154.5591	109.3999 (83)	
Total gains	606.9519	711.2846	786.4874	867.5518	916.3284	904.0893	867.5157	814.3131	761.0098	676.7371	606.7437	578.5709 (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	41.4974	41.5822	41.6656	42.0619	42.1369	42.4896	42.4896	42.5556	42.3531	42.1369	41.9855	41.8283	
alpha	3.7665	3.7721	3.7777	3.8041	3.8091	3.8326	3.8326	3.8370	3.8235	3.8091	3.7990	3.7886	
util living area	0.9779	0.9600	0.9287	0.8566	0.7336	0.5642	0.4211	0.4641	0.6808	0.8851	0.9611	0.9813	(86)
MIT	19.3820	19.6530	20.0084	20.4414	20.7641	20.9360	20.9837	20.9764	20.8672	20.4476	19.8437	19.3352	(87)
Th 2	19.8106	19.8127	19.8148	19.8246	19.8264	19.8350	19.8350	19.8365	19.8317	19.8264	19.8227	19.8188	(88)
util rest of house	0.9723	0.9501	0.9109	0.8215	0.6725	0.4750	0.3143	0.3536	0.5943	0.8488	0.9496	0.9764	(89)
MIT 2	17.9761	18.3164	18.7569	19.2787	19.6319	19.7975	19.8294	19.8276	19.7431	19.3019	18.5675	17.9226	(90)
Living area fraction										fLA = Living area / (4) =		0.3477	(91)
MIT	18.4649	18.7811	19.1920	19.6830	20.0256	20.1933	20.2307	20.2270	20.1339	19.7002	19.0112	18.4137	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4649	18.7811	19.1920	19.6830	20.0256	20.1933	20.2307	20.2270	20.1339	19.7002	19.0112	18.4137	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9635	0.9390	0.8995	0.8167	0.6837	0.5036	0.3513	0.3917	0.6183	0.8442	0.9394	0.9685	(94)
Useful gains	584.8266	667.9286	707.4630	708.5619	626.4768	455.2801	304.7582	318.9449	470.5146	571.3014	569.9468	560.3577	(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	1232.6362	1205.4732	1100.0045	925.7428	713.4972	475.3647	308.5672	324.7495	514.4665	779.8838	1024.4641	1227.0970	(97)
Space heating kWh	481.9703	361.2299	292.0509	156.3703	64.7432	0.0000	0.0000	0.0000	0.0000	155.1853	327.2525	496.0540	(98a)
Space heating requirement - total per year (kWh/year)												2334.8563	
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	481.9703	361.2299	292.0509	156.3703	64.7432	0.0000	0.0000	0.0000	0.0000	155.1853	327.2525	496.0540	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2334.8563	
Space heating per m2											(98c) / (4) =	35.9209	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												92.3000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement	481.9703	361.2299	292.0509	156.3703	64.7432	0.0000	0.0000	0.0000	0.0000	155.1853	327.2525	496.0540	(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)	522.1780	391.3650	316.4148	169.4152	70.1443	0.0000	0.0000	0.0000	0.0000	168.1314	354.5530	537.4366	(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	217.4816	192.4506	204.9253	181.4977	176.7902	160.2448	158.9199	164.7592	166.0264	183.9845	194.1937	215.2986	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.7915	85.4502	84.8539	83.7274	82.0285	79.8000	79.8000	79.8000	79.8000	83.6805	85.2206	85.8689	(217)
Fuel for water heating, kWh/month	253.5001	225.2195	241.5038	216.7722	215.5229	200.8080	199.1477	206.4651	208.0531	219.8654	227.8717	250.7294	(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	19.4258	15.5841	14.0318	10.2803	7.9408	6.4877	7.2438	9.4158	12.2302	16.0467	18.1247	19.9657	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-14.4451	-21.6859	-33.1712	-39.7716	-45.0922	-42.9083	-42.3914	-38.9179	-33.1921	-25.8638	-16.3444	-12.3398	(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	-4.5894	-9.9177	-20.2119	-31.1048	-41.8693	-42.3370	-41.8341	-35.0753	-25.2635	-14.4190	-6.2022	-3.6096	(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												2529.6385	(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												2665.4591	(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)	156.7775	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-642.5576	(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	4795.3175	(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	2529.6385	0.2100	531.2241	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2665.4591	0.2100	559.7464	(264)
Space and water heating			1090.9705	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	156.7775	0.1443	22.6278	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-366.1237	0.1333	-48.7986	
PV Unit electricity exported	-276.4338	0.1252	-34.6077	
Total			-83.4062	(269)
Total CO2, kg/year			1042.1214	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.0300	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2529.6385	1.1300	2858.4915	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2665.4591	1.1300	3011.9688	(278)
Space and water heating			5870.4603	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	156.7775	1.5338	240.4706	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-366.1237	1.4925	-546.4477	
PV Unit electricity exported	-276.4338	0.4595	-127.0247	
Total			-673.4724	(283)
Total Primary energy kWh/year			5567.5593	(286)
Target Primary Energy Rate (TPER)			85.6500	(287)

Appendix C - Non-Domestic BRUKL Calcs

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

Jamestown Road PBSA - Be Lean

As designed

Date: Wed Sep 18 10:21:33 2024

Administrative information

Building Details

Address: 33-35 Jamestown Road, London, NW1 7DB

Certifier details

Name: Gary Ormiston

Telephone number: Phone

Address: The Garment Factory, 10 Montrose Street, Glasgow, G1 1RE

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.26

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.26

BRUKL compliance module version: v6.1.e.1

Foundation area [m^2]: 756.53

The CO_2 emission and primary energy rates of the building must not exceed the targets

Target CO_2 emission rate (TER), $kgCO_2/m^2$.annum	3.48	
Building CO_2 emission rate (BER), $kgCO_2/m^2$.annum	2.93	
Target primary energy rate (TPER), kWh_{PE}/m^2.annum	37.2	
Building primary energy rate (BPER), kWh_{PE}/m^2.annum	31.38	
Do the building's emission and primary energy rates exceed the targets?	BER =< TER	BPER =< TPER

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

Fabric element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.15	0.15	BB000001:Surf[1]
Floors	0.18	0.1	0.1	BB000001:Surf[0]
Pitched roofs	0.16	-	-	No pitched roofs in building
Flat roofs	0.18	0.1	0.1	BB000022:Surf[1]
Windows** and roof windows	1.6	1.2	1.2	0000000F:Surf[0]
Rooflights***	2.2	-	-	No roof lights in building
Personnel doors^	1.6	1.2	1.2	BB000013:Surf[0]
Vehicle access & similar large doors	1.3	-	-	No vehicle access doors in building
High usage entrance doors	3	-	-	No high usage entrance doors in building

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$] $U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]

$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$]

* Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

** Display windows and similar glazing are excluded from the U-value check. *** Values for rooflights refer to the horizontal position.

^ For fire doors, limiting U-value is 1.8 W/m^2K

NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

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

Building services

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

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	>0.95

1- 02a VRF - Be Lean

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.64	6	0	1.6	0.78
Standard value	2.5*	N/A	N/A	2^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.

^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.

2- 01d - Space Heating NV - Be Lean

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.64	-	0.2	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.

3- 01b - Space Heating + MVHR - Be Lean

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.64	-	0	-	0.89
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.

4- 01c - Space Heating + Ext - Be Lean

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.64	-	0	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.

5- 01a - Space Heating + MVHR (Coolbox) - Be Lean

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.64	-	0	-	0.88
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.

1- 00b DHW - Be Lean

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	3.43	-
Standard value	2*	N/A

* Standard shown is for all types except absorption and gas engine heat pumps.

Zone-level mechanical ventilation, exhaust, and terminal units

ID	System type in the Approved Documents
A	Local supply or extract ventilation units
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal balanced supply and extract ventilation system
E	Local balanced supply and extract ventilation units
F	Other local ventilation units
G	Fan assisted terminal variable air volume units
H	Fan coil units
I	Kitchen extract with the fan remote from the zone and a grease filter

NB: Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
BB-NonResi-Cleaners Cupboard	-	-	-	1.1	-	-	-	-	-	-	N/A
BB-NonResi-Cleaners Cupboard	-	-	-	1.1	-	-	-	-	-	-	N/A
00-NonResi-WC	-	-	0.4	-	-	-	-	-	-	-	N/A
00-NonResi-Management	-	-	-	1.1	-	-	-	-	-	-	N/A
00-NonResi-Post Room	-	-	-	1.1	-	-	-	-	-	-	N/A
00-NonResi-WC Shower Room	-	-	0.4	-	-	-	-	-	-	-	N/A
00-NonResi-WC	-	-	0.4	-	-	-	-	-	-	-	N/A
00-NonResi-WC	-	-	0.4	-	-	-	-	-	-	-	N/A
00-PBSA-01-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
00-PBSA-06-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
00-PBSA-02-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
00-PBSA-07-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
00-PBSA-04-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
00-PBSA-03-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
00-PBSA-05-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
00-PBSA-09-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
00-PBSA-08-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
00-PBSA-10-Studio(P)	-	-	-	0.6	-	-	-	-	-	-	N/A
00-PBSA-11-Studio(WCA)	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-01-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
01-PBSA-02-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
01-PBSA-03-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
01-PBSA-05-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
01-PBSA-04-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
01-PBSA-01-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
01-PBSA-02-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
01-PBSA-03-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
01-PBSA-04-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
01-PBSA-05-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
01-PBSA-11-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
01-PBSA-11-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-12-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-12-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-13-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-13-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-14-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-14-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-15-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-15-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-06-Studio(P)	-	-	-	0.7	-	-	-	-	-	-	N/A
01-PBSA-06-Studio(P)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
01-PBSA-07-Studio(P)	-	-	-	0.7	-	-	-	-	-	-	N/A
01-PBSA-07-Studio(P)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
01-PBSA-08-Studio(P)	-	-	-	0.7	-	-	-	-	-	-	N/A
01-PBSA-08-Studio(P)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
01-PBSA-09-Studio(WCA)	-	-	-	0.7	-	-	-	-	-	-	N/A
01-PBSA-09-Studio(WCA)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
01-PBSA-10-Studio(WCA)	-	-	-	0.7	-	-	-	-	-	-	N/A
01-PBSA-10-Studio(WCA)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
01-PBSA-16-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-16-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-17-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-17-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-18-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-18-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-19-Studio(P)	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-19-Studio(P)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-20-Studio(P)	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-21-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-20-Studio(P)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-21-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-22-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-23-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-24-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-25-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-26-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-27-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-28-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-29-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-30-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-31-Studio(P)	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-32-Studio(WCA)	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-22-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
01-PBSA-23-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-24-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-25-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-26-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-27-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-28-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-29-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-30-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-31-Studio(P)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-32-Studio(WCA)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-01-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
02-PBSA-02-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
02-PBSA-03-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
02-PBSA-05-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
02-PBSA-04-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
02-PBSA-01-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
02-PBSA-02-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
02-PBSA-03-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
02-PBSA-04-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
02-PBSA-05-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
02-PBSA-11-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-11-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-12-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-12-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-13-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-13-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-14-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-14-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-15-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-15-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-06-Studio(P)	-	-	-	0.7	-	-	-	-	-	-	N/A
02-PBSA-06-Studio(P)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
02-PBSA-07-Studio(P)	-	-	-	0.7	-	-	-	-	-	-	N/A
02-PBSA-07-Studio(P)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
02-PBSA-08-Studio(P)	-	-	-	0.7	-	-	-	-	-	-	N/A
02-PBSA-08-Studio(P)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
02-PBSA-09-Studio(WCA)	-	-	-	0.7	-	-	-	-	-	-	N/A
02-PBSA-09-Studio(WCA)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
02-PBSA-10-Studio(WCA)	-	-	-	0.7	-	-	-	-	-	-	N/A
02-PBSA-10-Studio(WCA)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
02-PBSA-16-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-16-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-17-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
02-PBSA-17-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-18-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-18-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-19-Studio(P)	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-19-Studio(P)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-20-Studio(P)	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-21-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-20-Studio(P)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-21-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-22-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-23-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-24-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-25-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-26-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-27-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-28-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-29-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-30-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-31-Studio(P)	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-32-Studio(WCA)	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-22-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-23-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-24-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-25-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-26-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-27-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-28-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-29-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-30-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-31-Studio(P)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-32-Studio(WCA)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-01-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
03-PBSA-02-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
03-PBSA-03-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
03-PBSA-05-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
03-PBSA-04-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
03-PBSA-01-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
03-PBSA-02-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
03-PBSA-03-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
03-PBSA-04-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
03-PBSA-05-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
03-PBSA-11-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-11-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
03-PBSA-12-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-12-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-13-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-13-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-14-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-14-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-15-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-15-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-06-Studio(P)	-	-	-	0.7	-	-	-	-	-	-	N/A
03-PBSA-06-Studio(P)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
03-PBSA-07-Studio(P)	-	-	-	0.7	-	-	-	-	-	-	N/A
03-PBSA-07-Studio(P)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
03-PBSA-08-Studio(P)	-	-	-	0.7	-	-	-	-	-	-	N/A
03-PBSA-08-Studio(P)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
03-PBSA-09-Studio(WCA)	-	-	-	0.7	-	-	-	-	-	-	N/A
03-PBSA-09-Studio(WCA)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
03-PBSA-10-Studio(WCA)	-	-	-	0.7	-	-	-	-	-	-	N/A
03-PBSA-10-Studio(WCA)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
03-PBSA-16-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-16-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-17-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-17-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-18-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-18-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-19-Studio(P)	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-19-Studio(P)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-20-Studio(P)	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-21-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-20-Studio(P)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-21-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-22-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-23-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-24-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-25-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-26-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-27-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-28-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-29-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-30-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-31-Studio(P)	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-32-Studio(WCA)	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-22-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-23-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
03-PBSA-24-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-25-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-26-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-27-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-28-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-29-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-30-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-31-Studio(P)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-32-Studio(WCA)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-01-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
04-PBSA-02-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
04-PBSA-03-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
04-PBSA-05-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
04-PBSA-04-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
04-PBSA-01-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
04-PBSA-02-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
04-PBSA-03-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
04-PBSA-04-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
04-PBSA-05-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
04-PBSA-11-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-11-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-12-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-12-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-13-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-13-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-14-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-14-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-15-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-15-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-06-Studio(P)	-	-	-	0.7	-	-	-	-	-	-	N/A
04-PBSA-06-Studio(P)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
04-PBSA-07-Studio(P)	-	-	-	0.7	-	-	-	-	-	-	N/A
04-PBSA-07-Studio(P)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
04-PBSA-08-Studio(P)	-	-	-	0.7	-	-	-	-	-	-	N/A
04-PBSA-08-Studio(P)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
04-PBSA-09-Studio(WCA)	-	-	-	0.7	-	-	-	-	-	-	N/A
04-PBSA-09-Studio(WCA)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
04-PBSA-10-Studio(WCA)	-	-	-	0.7	-	-	-	-	-	-	N/A
04-PBSA-10-Studio(WCA)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
04-PBSA-16-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-16-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-17-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-17-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
04-PBSA-18-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-18-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-19-Studio(P)	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-19-Studio(P)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-20-Studio(P)	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-21-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-20-Studio(P)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-21-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-22-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-23-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-24-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-25-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-26-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-27-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-28-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-29-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-30-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-31-Studio(P)	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-32-Studio(WCA)	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-22-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-23-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-24-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-25-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-26-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-27-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-28-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-29-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-30-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-31-Studio(P)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-32-Studio(WCA)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-01-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-02-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-03-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-05-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-04-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-01-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-02-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-03-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-04-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-05-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-11-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-11-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-12-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
05-PBSA-12-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-13-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-13-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-14-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-14-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-15-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-15-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-06-Studio(P)	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-06-Studio(P)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-07-Studio(P)	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-07-Studio(P)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-08-Studio(P)	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-08-Studio(P)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-09-Studio(WCA)	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-09-Studio(WCA)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-10-Studio(WCA)	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-10-Studio(WCA)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-16-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-16-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-17-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-17-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-18-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-18-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-19-Studio(P)	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-19-Studio(P)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-20-Studio(P)	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-21-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-20-Studio(P)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-21-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-22-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-32-Studio(WCA)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-32-Studio(WCA)	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-22-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-31-Studio(P)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-31-Studio(P)	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-01-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-02-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-03-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-05-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-04-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-01-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-02-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-03-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
05-PBSA-04-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-05-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-11-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-11-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-12-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-12-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-13-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-13-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-14-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-14-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-15-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-15-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-06-Studio(P)	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-06-Studio(P)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-07-Studio(P)	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-07-Studio(P)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-08-Studio(P)	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-08-Studio(P)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-09-Studio(WCA)	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-09-Studio(WCA)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-10-Studio(WCA)	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-10-Studio(WCA)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-16-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-16-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-17-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-17-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-18-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-18-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-19-Studio(P)	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-19-Studio(P)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-20-Studio(P)	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-21-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-20-Studio(P)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-21-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-22-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-32-Studio(WCA)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-32-Studio(WCA)	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-22-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-31-Studio(P)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-31-Studio(P)	-	-	-	0.6	-	-	-	-	-	-	N/A
00-PBSA-05-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
00-PBSA-04-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
00-PBSA-03-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
00-PBSA-02-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
00-PBSA-01-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
00-PBSA-06-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
00-PBSA-07-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
00-PBSA-08-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
00-PBSA-09-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
00-PBSA-10-Studio(P)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
00-PBSA-11-Studio(WCA)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A

General lighting and display lighting	General luminaire	Display light source	
Zone name	Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
Standard value	95	80	0.3
BB-NonResi-Cold Water Storage Tank	110	-	-
BB-NonResi-LV Room	110	-	-
BB-NonResi-Comms Room	110	-	-
BB-NonResi-Circulation	110	-	-
BB-NonResi-Flixible	110	-	-
BB-NonResi-Private Study	110	-	-
BB-NonResi-Stairs	110	-	-
BB-NonResi-Cleaners Cupboard	110	-	-
BB-NonResi-Commercial Sprinkler Water Storage	110	-	-
BB-NonResi-Gym	110	-	-
BB-NonResi-Cleaners Cupboard	110	-	-
BB-NonResi-Dinning & Kitchen	110	-	-
BB-NonResi-Cinema	110	-	-
BB-NonResi-Circulation	110	-	-
BB-NonResi-Lounge/Games	110	-	-
BB-NonResi-Laundry	110	-	-
00-NonResi-WC	110	-	-
00-NonResi-Management	110	-	-
00-NonResi-Post Room	110	-	-
00-NonResi-Stairs	110	-	-
00-NonResi-Circulation	110	-	-
00-NonResi-Cycle Lift Circulation	110	-	-
00-NonResi-Circulation	110	-	-
00-NonResi-Flexible	110	-	-
00-NonResi-Generator Room	110	-	-
00-NonResi-WC Circulation	110	-	-
00-NonResi-WC Shower Room	110	-	-
00-NonResi-WC	110	-	-
00-NonResi-WC	110	-	-
00-NonResi-Reception	100	110	2.684
00-PBSA-Circulation	110	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
00-PBSA-Stairs	110	-	-
00-PBSA-01-Studio(R)	110	-	-
00-PBSA-06-Studio(R)	110	-	-
00-PBSA-02-Studio(R)	110	-	-
00-PBSA-07-Studio(R)	110	-	-
00-PBSA-04-Studio(R)	110	-	-
00-PBSA-03-Studio(R)	110	-	-
00-PBSA-05-Studio(R)	110	-	-
00-PBSA-09-Studio(R)	110	-	-
00-PBSA-08-Studio(R)	110	-	-
00-PBSA-10-Studio(P)	110	-	-
00-PBSA-11-Studio(WCA)	110	-	-
01-PBSA-Stairs	110	-	-
01-PBSA-Stairs	110	-	-
01-PBSA-01-Studio(R)	110	-	-
01-PBSA-02-Studio(R)	110	-	-
01-PBSA-03-Studio(R)	110	-	-
01-PBSA-05-Studio(R)	110	-	-
01-PBSA-04-Studio(R)	110	-	-
01-PBSA-01-Studio(R)-WC	110	-	-
01-PBSA-02-Studio(R)-WC	110	-	-
01-PBSA-03-Studio(R)-WC	110	-	-
01-PBSA-04-Studio(R)-WC	110	-	-
01-PBSA-05-Studio(R)-WC	110	-	-
01-PBSA-11-Studio(R)	110	-	-
01-PBSA-11-Studio(R)-WC	110	-	-
01-PBSA-12-Studio(R)-WC	110	-	-
01-PBSA-12-Studio(R)	110	-	-
01-PBSA-13-Studio(R)	110	-	-
01-PBSA-13-Studio(R)-WC	110	-	-
01-PBSA-14-Studio(R)	110	-	-
01-PBSA-14-Studio(R)-WC	110	-	-
01-PBSA-15-Studio(R)	110	-	-
01-PBSA-15-Studio(R)-WC	110	-	-
01-PBSA-06-Studio(P)	110	-	-
01-PBSA-06-Studio(P)-WC	110	-	-
01-PBSA-07-Studio(P)	110	-	-
01-PBSA-07-Studio(P)-WC	110	-	-
01-PBSA-08-Studio(P)	110	-	-
01-PBSA-08-Studio(P)-WC	110	-	-
01-PBSA-09-Studio(WCA)	110	-	-
01-PBSA-09-Studio(WCA)-WC	110	-	-
01-PBSA-10-Studio(WCA)	110	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
01-PBSA-10-Studio(WCA)-WC	110	-	-
01-PBSA-16-Studio(R)	110	-	-
01-PBSA-16-Studio(R)-WC	110	-	-
01-PBSA-17-Studio(R)	110	-	-
01-PBSA-17-Studio(R)-WC	110	-	-
01-PBSA-18-Studio(R)	110	-	-
01-PBSA-18-Studio(R)-WC	110	-	-
01-PBSA-19-Studio(P)	110	-	-
01-PBSA-19-Studio(P)-WC	110	-	-
01-PBSA-20-Studio(P)	110	-	-
01-PBSA-21-Studio(R)	110	-	-
01-PBSA-20-Studio(P)-WC	110	-	-
01-PBSA-21-Studio(R)-WC	110	-	-
01-PBSA-22-Studio(R)	110	-	-
01-PBSA-23-Studio(R)	110	-	-
01-PBSA-24-Studio(R)	110	-	-
01-PBSA-25-Studio(R)	110	-	-
01-PBSA-26-Studio(R)	110	-	-
01-PBSA-Circulation	110	-	-
01-PBSA-27-Studio(R)	110	-	-
01-PBSA-28-Studio(R)	110	-	-
01-PBSA-29-Studio(R)	110	-	-
01-PBSA-30-Studio(R)	110	-	-
01-PBSA-31-Studio(P)	110	-	-
01-PBSA-32-Studio(WCA)	110	-	-
01-PBSA-22-Studio(R)-WC	110	-	-
01-PBSA-23-Studio(R)-WC	110	-	-
01-PBSA-24-Studio(R)-WC	110	-	-
01-PBSA-25-Studio(R)-WC	110	-	-
01-PBSA-26-Studio(R)-WC	110	-	-
01-PBSA-27-Studio(R)-WC	110	-	-
01-PBSA-28-Studio(R)-WC	110	-	-
01-PBSA-29-Studio(R)-WC	110	-	-
01-PBSA-30-Studio(R)-WC	110	-	-
01-PBSA-31-Studio(P)-WC	110	-	-
01-PBSA-32-Studio(WCA)-WC	110	-	-
02-PBSA-Stairs	110	-	-
02-PBSA-Stairs	110	-	-
02-PBSA-01-Studio(R)	110	-	-
02-PBSA-02-Studio(R)	110	-	-
02-PBSA-03-Studio(R)	110	-	-
02-PBSA-05-Studio(R)	110	-	-
02-PBSA-04-Studio(R)	110	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
02-PBSA-01-Studio(R)-WC	110	-	-
02-PBSA-02-Studio(R)-WC	110	-	-
02-PBSA-03-Studio(R)-WC	110	-	-
02-PBSA-04-Studio(R)-WC	110	-	-
02-PBSA-05-Studio(R)-WC	110	-	-
02-PBSA-11-Studio(R)	110	-	-
02-PBSA-11-Studio(R)-WC	110	-	-
02-PBSA-12-Studio(R)-WC	110	-	-
02-PBSA-12-Studio(R)	110	-	-
02-PBSA-13-Studio(R)	110	-	-
02-PBSA-13-Studio(R)-WC	110	-	-
02-PBSA-14-Studio(R)	110	-	-
02-PBSA-14-Studio(R)-WC	110	-	-
02-PBSA-15-Studio(R)	110	-	-
02-PBSA-15-Studio(R)-WC	110	-	-
02-PBSA-06-Studio(P)	110	-	-
02-PBSA-06-Studio(P)-WC	110	-	-
02-PBSA-07-Studio(P)	110	-	-
02-PBSA-07-Studio(P)-WC	110	-	-
02-PBSA-08-Studio(P)	110	-	-
02-PBSA-08-Studio(P)-WC	110	-	-
02-PBSA-09-Studio(WCA)	110	-	-
02-PBSA-09-Studio(WCA)-WC	110	-	-
02-PBSA-10-Studio(WCA)	110	-	-
02-PBSA-10-Studio(WCA)-WC	110	-	-
02-PBSA-16-Studio(R)	110	-	-
02-PBSA-16-Studio(R)-WC	110	-	-
02-PBSA-17-Studio(R)	110	-	-
02-PBSA-17-Studio(R)-WC	110	-	-
02-PBSA-18-Studio(R)	110	-	-
02-PBSA-18-Studio(R)-WC	110	-	-
02-PBSA-19-Studio(P)	110	-	-
02-PBSA-19-Studio(P)-WC	110	-	-
02-PBSA-20-Studio(P)	110	-	-
02-PBSA-21-Studio(R)	110	-	-
02-PBSA-20-Studio(P)-WC	110	-	-
02-PBSA-21-Studio(R)-WC	110	-	-
02-PBSA-22-Studio(R)	110	-	-
02-PBSA-23-Studio(R)	110	-	-
02-PBSA-24-Studio(R)	110	-	-
02-PBSA-25-Studio(R)	110	-	-
02-PBSA-26-Studio(R)	110	-	-
02-PBSA-Circulation	110	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
02-PBSA-27-Studio(R)	110	-	-
02-PBSA-28-Studio(R)	110	-	-
02-PBSA-29-Studio(R)	110	-	-
02-PBSA-30-Studio(R)	110	-	-
02-PBSA-31-Studio(P)	110	-	-
02-PBSA-32-Studio(WCA)	110	-	-
02-PBSA-22-Studio(R)-WC	110	-	-
02-PBSA-23-Studio(R)-WC	110	-	-
02-PBSA-24-Studio(R)-WC	110	-	-
02-PBSA-25-Studio(R)-WC	110	-	-
02-PBSA-26-Studio(R)-WC	110	-	-
02-PBSA-27-Studio(R)-WC	110	-	-
02-PBSA-28-Studio(R)-WC	110	-	-
02-PBSA-29-Studio(R)-WC	110	-	-
02-PBSA-30-Studio(R)-WC	110	-	-
02-PBSA-31-Studio(P)-WC	110	-	-
02-PBSA-32-Studio(WCA)-WC	110	-	-
03-PBSA-Stairs	110	-	-
03-PBSA-Stairs	110	-	-
03-PBSA-01-Studio(R)	110	-	-
03-PBSA-02-Studio(R)	110	-	-
03-PBSA-03-Studio(R)	110	-	-
03-PBSA-05-Studio(R)	110	-	-
03-PBSA-04-Studio(R)	110	-	-
03-PBSA-01-Studio(R)-WC	110	-	-
03-PBSA-02-Studio(R)-WC	110	-	-
03-PBSA-03-Studio(R)-WC	110	-	-
03-PBSA-04-Studio(R)-WC	110	-	-
03-PBSA-05-Studio(R)-WC	110	-	-
03-PBSA-11-Studio(R)	110	-	-
03-PBSA-11-Studio(R)-WC	110	-	-
03-PBSA-12-Studio(R)-WC	110	-	-
03-PBSA-12-Studio(R)	110	-	-
03-PBSA-13-Studio(R)	110	-	-
03-PBSA-13-Studio(R)-WC	110	-	-
03-PBSA-14-Studio(R)	110	-	-
03-PBSA-14-Studio(R)-WC	110	-	-
03-PBSA-15-Studio(R)	110	-	-
03-PBSA-15-Studio(R)-WC	110	-	-
03-PBSA-06-Studio(P)	110	-	-
03-PBSA-06-Studio(P)-WC	110	-	-
03-PBSA-07-Studio(P)	110	-	-
03-PBSA-07-Studio(P)-WC	110	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
03-PBSA-08-Studio(P)	110	-	-
03-PBSA-08-Studio(P)-WC	110	-	-
03-PBSA-09-Studio(WCA)	110	-	-
03-PBSA-09-Studio(WCA)-WC	110	-	-
03-PBSA-10-Studio(WCA)	110	-	-
03-PBSA-10-Studio(WCA)-WC	110	-	-
03-PBSA-16-Studio(R)	110	-	-
03-PBSA-16-Studio(R)-WC	110	-	-
03-PBSA-17-Studio(R)	110	-	-
03-PBSA-17-Studio(R)-WC	110	-	-
03-PBSA-18-Studio(R)	110	-	-
03-PBSA-18-Studio(R)-WC	110	-	-
03-PBSA-19-Studio(P)	110	-	-
03-PBSA-19-Studio(P)-WC	110	-	-
03-PBSA-20-Studio(P)	110	-	-
03-PBSA-21-Studio(R)	110	-	-
03-PBSA-20-Studio(P)-WC	110	-	-
03-PBSA-21-Studio(R)-WC	110	-	-
03-PBSA-22-Studio(R)	110	-	-
03-PBSA-23-Studio(R)	110	-	-
03-PBSA-24-Studio(R)	110	-	-
03-PBSA-25-Studio(R)	110	-	-
03-PBSA-26-Studio(R)	110	-	-
03-PBSA-Circulation	110	-	-
03-PBSA-27-Studio(R)	110	-	-
03-PBSA-28-Studio(R)	110	-	-
03-PBSA-29-Studio(R)	110	-	-
03-PBSA-30-Studio(R)	110	-	-
03-PBSA-31-Studio(P)	110	-	-
03-PBSA-32-Studio(WCA)	110	-	-
03-PBSA-22-Studio(R)-WC	110	-	-
03-PBSA-23-Studio(R)-WC	110	-	-
03-PBSA-24-Studio(R)-WC	110	-	-
03-PBSA-25-Studio(R)-WC	110	-	-
03-PBSA-26-Studio(R)-WC	110	-	-
03-PBSA-27-Studio(R)-WC	110	-	-
03-PBSA-28-Studio(R)-WC	110	-	-
03-PBSA-29-Studio(R)-WC	110	-	-
03-PBSA-30-Studio(R)-WC	110	-	-
03-PBSA-31-Studio(P)-WC	110	-	-
03-PBSA-32-Studio(WCA)-WC	110	-	-
04-PBSA-Stairs	110	-	-
04-PBSA-Stairs	110	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
04-PBSA-01-Studio(R)	110	-	-
04-PBSA-02-Studio(R)	110	-	-
04-PBSA-03-Studio(R)	110	-	-
04-PBSA-05-Studio(R)	110	-	-
04-PBSA-04-Studio(R)	110	-	-
04-PBSA-01-Studio(R)-WC	110	-	-
04-PBSA-02-Studio(R)-WC	110	-	-
04-PBSA-03-Studio(R)-WC	110	-	-
04-PBSA-04-Studio(R)-WC	110	-	-
04-PBSA-05-Studio(R)-WC	110	-	-
04-PBSA-11-Studio(R)	110	-	-
04-PBSA-11-Studio(R)-WC	110	-	-
04-PBSA-12-Studio(R)-WC	110	-	-
04-PBSA-12-Studio(R)	110	-	-
04-PBSA-13-Studio(R)	110	-	-
04-PBSA-13-Studio(R)-WC	110	-	-
04-PBSA-14-Studio(R)	110	-	-
04-PBSA-14-Studio(R)-WC	110	-	-
04-PBSA-15-Studio(R)	110	-	-
04-PBSA-15-Studio(R)-WC	110	-	-
04-PBSA-06-Studio(P)	110	-	-
04-PBSA-06-Studio(P)-WC	110	-	-
04-PBSA-07-Studio(P)	110	-	-
04-PBSA-07-Studio(P)-WC	110	-	-
04-PBSA-08-Studio(P)	110	-	-
04-PBSA-08-Studio(P)-WC	110	-	-
04-PBSA-09-Studio(WCA)	110	-	-
04-PBSA-09-Studio(WCA)-WC	110	-	-
04-PBSA-10-Studio(WCA)	110	-	-
04-PBSA-10-Studio(WCA)-WC	110	-	-
04-PBSA-16-Studio(R)	110	-	-
04-PBSA-16-Studio(R)-WC	110	-	-
04-PBSA-17-Studio(R)	110	-	-
04-PBSA-17-Studio(R)-WC	110	-	-
04-PBSA-18-Studio(R)	110	-	-
04-PBSA-18-Studio(R)-WC	110	-	-
04-PBSA-19-Studio(P)	110	-	-
04-PBSA-19-Studio(P)-WC	110	-	-
04-PBSA-20-Studio(P)	110	-	-
04-PBSA-21-Studio(R)	110	-	-
04-PBSA-20-Studio(P)-WC	110	-	-
04-PBSA-21-Studio(R)-WC	110	-	-
04-PBSA-22-Studio(R)	110	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
04-PBSA-23-Studio(R)	110	-	-
04-PBSA-24-Studio(R)	110	-	-
04-PBSA-25-Studio(R)	110	-	-
04-PBSA-26-Studio(R)	110	-	-
04-PBSA-Circulation	110	-	-
04-PBSA-27-Studio(R)	110	-	-
04-PBSA-28-Studio(R)	110	-	-
04-PBSA-29-Studio(R)	110	-	-
04-PBSA-30-Studio(R)	110	-	-
04-PBSA-31-Studio(P)	110	-	-
04-PBSA-32-Studio(WCA)	110	-	-
04-PBSA-22-Studio(R)-WC	110	-	-
04-PBSA-23-Studio(R)-WC	110	-	-
04-PBSA-24-Studio(R)-WC	110	-	-
04-PBSA-25-Studio(R)-WC	110	-	-
04-PBSA-26-Studio(R)-WC	110	-	-
04-PBSA-27-Studio(R)-WC	110	-	-
04-PBSA-28-Studio(R)-WC	110	-	-
04-PBSA-29-Studio(R)-WC	110	-	-
04-PBSA-30-Studio(R)-WC	110	-	-
04-PBSA-31-Studio(P)-WC	110	-	-
04-PBSA-32-Studio(WCA)-WC	110	-	-
05-PBSA-Stairs	110	-	-
05-PBSA-Stairs	110	-	-
05-PBSA-01-Studio(R)	110	-	-
05-PBSA-02-Studio(R)	110	-	-
05-PBSA-03-Studio(R)	110	-	-
05-PBSA-05-Studio(R)	110	-	-
05-PBSA-04-Studio(R)	110	-	-
05-PBSA-01-Studio(R)-WC	110	-	-
05-PBSA-02-Studio(R)-WC	110	-	-
05-PBSA-03-Studio(R)-WC	110	-	-
05-PBSA-04-Studio(R)-WC	110	-	-
05-PBSA-05-Studio(R)-WC	110	-	-
05-PBSA-11-Studio(R)	110	-	-
05-PBSA-11-Studio(R)-WC	110	-	-
05-PBSA-12-Studio(R)-WC	110	-	-
05-PBSA-12-Studio(R)	110	-	-
05-PBSA-13-Studio(R)	110	-	-
05-PBSA-13-Studio(R)-WC	110	-	-
05-PBSA-14-Studio(R)	110	-	-
05-PBSA-14-Studio(R)-WC	110	-	-
05-PBSA-15-Studio(R)	110	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
05-PBSA-15-Studio(R)-WC	110	-	-
05-PBSA-06-Studio(P)	110	-	-
05-PBSA-06-Studio(P)-WC	110	-	-
05-PBSA-07-Studio(P)	110	-	-
05-PBSA-07-Studio(P)-WC	110	-	-
05-PBSA-08-Studio(P)	110	-	-
05-PBSA-08-Studio(P)-WC	110	-	-
05-PBSA-09-Studio(WCA)	110	-	-
05-PBSA-09-Studio(WCA)-WC	110	-	-
05-PBSA-10-Studio(WCA)	110	-	-
05-PBSA-10-Studio(WCA)-WC	110	-	-
05-PBSA-16-Studio(R)	110	-	-
05-PBSA-16-Studio(R)-WC	110	-	-
05-PBSA-17-Studio(R)	110	-	-
05-PBSA-17-Studio(R)-WC	110	-	-
05-PBSA-18-Studio(R)	110	-	-
05-PBSA-18-Studio(R)-WC	110	-	-
05-PBSA-19-Studio(P)	110	-	-
05-PBSA-19-Studio(P)-WC	110	-	-
05-PBSA-20-Studio(P)	110	-	-
05-PBSA-21-Studio(R)	110	-	-
05-PBSA-20-Studio(P)-WC	110	-	-
05-PBSA-21-Studio(R)-WC	110	-	-
05-PBSA-22-Studio(R)-WC	110	-	-
05-PBSA-32-Studio(WCA)-WC	110	-	-
05-PBSA-32-Studio(WCA)	110	-	-
05-PBSA-22-Studio(R)	110	-	-
05-PBSA-Circulation	110	-	-
05-PBSA-31-Studio(P)-WC	110	-	-
05-PBSA-31-Studio(P)	110	-	-
05-PBSA-Stairs	110	-	-
05-PBSA-Stairs	110	-	-
05-PBSA-01-Studio(R)	110	-	-
05-PBSA-02-Studio(R)	110	-	-
05-PBSA-03-Studio(R)	110	-	-
05-PBSA-05-Studio(R)	110	-	-
05-PBSA-04-Studio(R)	110	-	-
05-PBSA-01-Studio(R)-WC	110	-	-
05-PBSA-02-Studio(R)-WC	110	-	-
05-PBSA-03-Studio(R)-WC	110	-	-
05-PBSA-04-Studio(R)-WC	110	-	-
05-PBSA-05-Studio(R)-WC	110	-	-
05-PBSA-11-Studio(R)	110	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
05-PBSA-11-Studio(R)-WC	110	-	-
05-PBSA-12-Studio(R)-WC	110	-	-
05-PBSA-12-Studio(R)	110	-	-
05-PBSA-13-Studio(R)	110	-	-
05-PBSA-13-Studio(R)-WC	110	-	-
05-PBSA-14-Studio(R)	110	-	-
05-PBSA-14-Studio(R)-WC	110	-	-
05-PBSA-15-Studio(R)	110	-	-
05-PBSA-15-Studio(R)-WC	110	-	-
05-PBSA-06-Studio(P)	110	-	-
05-PBSA-06-Studio(P)-WC	110	-	-
05-PBSA-07-Studio(P)	110	-	-
05-PBSA-07-Studio(P)-WC	110	-	-
05-PBSA-08-Studio(P)	110	-	-
05-PBSA-08-Studio(P)-WC	110	-	-
05-PBSA-09-Studio(WCA)	110	-	-
05-PBSA-09-Studio(WCA)-WC	110	-	-
05-PBSA-10-Studio(WCA)	110	-	-
05-PBSA-10-Studio(WCA)-WC	110	-	-
05-PBSA-16-Studio(R)	110	-	-
05-PBSA-16-Studio(R)-WC	110	-	-
05-PBSA-17-Studio(R)	110	-	-
05-PBSA-17-Studio(R)-WC	110	-	-
05-PBSA-18-Studio(R)	110	-	-
05-PBSA-18-Studio(R)-WC	110	-	-
05-PBSA-19-Studio(P)	110	-	-
05-PBSA-19-Studio(P)-WC	110	-	-
05-PBSA-20-Studio(P)	110	-	-
05-PBSA-21-Studio(R)	110	-	-
05-PBSA-20-Studio(P)-WC	110	-	-
05-PBSA-21-Studio(R)-WC	110	-	-
05-PBSA-22-Studio(R)-WC	110	-	-
05-PBSA-32-Studio(WCA)-WC	110	-	-
05-PBSA-32-Studio(WCA)	110	-	-
05-PBSA-22-Studio(R)	110	-	-
05-PBSA-Circulation	110	-	-
05-PBSA-31-Studio(P)-WC	110	-	-
05-PBSA-31-Studio(P)	110	-	-
00-PBSA-05-Studio(R)-WC	110	-	-
00-PBSA-04-Studio(R)-WC	110	-	-
00-PBSA-03-Studio(R)-WC	110	-	-
00-PBSA-02-Studio(R)-WC	110	-	-
00-PBSA-01-Studio(R)-WC	110	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
00-PBSA-06-Studio(R)-WC	110	-	-
00-PBSA-07-Studio(R)-WC	110	-	-
00-PBSA-08-Studio(R)-WC	110	-	-
00-PBSA-09-Studio(R)-WC	110	-	-
00-PBSA-10-Studio(P)-WC	110	-	-
00-PBSA-11-Studio(WCA)-WC	110	-	-

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

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
BB-NonResi-Comms Room	N/A	N/A
BB-NonResi-Flixible	N/A	N/A
BB-NonResi-Private Study	NO (-100%)	NO
BB-NonResi-Gym	NO (-100%)	NO
BB-NonResi-Dinning & Kitchen	NO (-7.5%)	NO
BB-NonResi-Cinema	N/A	N/A
BB-NonResi-Lounge/Games	N/A	N/A
BB-NonResi-Laundry	NO (-100%)	NO
00-NonResi-Management	N/A	N/A
00-NonResi-Post Room	N/A	N/A
00-NonResi-Flexible	NO (-47.2%)	NO
00-NonResi-Reception	NO (-45.8%)	NO
00-PBSA-01-Studio(R)	NO (-90%)	NO
00-PBSA-06-Studio(R)	NO (-82.8%)	NO
00-PBSA-02-Studio(R)	NO (-72.6%)	NO
00-PBSA-07-Studio(R)	NO (-55.8%)	NO
00-PBSA-04-Studio(R)	NO (-72.6%)	NO
00-PBSA-03-Studio(R)	NO (-72.4%)	NO
00-PBSA-05-Studio(R)	NO (-70.7%)	NO
00-PBSA-09-Studio(R)	NO (-55%)	NO
00-PBSA-08-Studio(R)	NO (-55.6%)	NO
00-PBSA-10-Studio(P)	NO (-59.1%)	NO
00-PBSA-11-Studio(WCA)	NO (-64.4%)	NO
01-PBSA-01-Studio(R)	NO (-87.9%)	NO
01-PBSA-02-Studio(R)	NO (-75.8%)	NO
01-PBSA-03-Studio(R)	NO (-75.6%)	NO
01-PBSA-05-Studio(R)	NO (-75.6%)	NO
01-PBSA-04-Studio(R)	NO (-75.5%)	NO
01-PBSA-11-Studio(R)	NO (-72.3%)	NO
01-PBSA-12-Studio(R)	NO (-43.3%)	NO
01-PBSA-13-Studio(R)	NO (-44.4%)	NO
01-PBSA-14-Studio(R)	NO (-46.1%)	NO
01-PBSA-15-Studio(R)	NO (-49%)	NO
01-PBSA-06-Studio(P)	NO (-69.1%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
01-PBSA-07-Studio(P)	NO (-69.8%)	NO
01-PBSA-08-Studio(P)	NO (-70%)	NO
01-PBSA-09-Studio(WCA)	NO (-74.2%)	NO
01-PBSA-10-Studio(WCA)	NO (-81.8%)	NO
01-PBSA-16-Studio(R)	NO (-60.4%)	NO
01-PBSA-17-Studio(R)	NO (-54.3%)	NO
01-PBSA-18-Studio(R)	NO (-60%)	NO
01-PBSA-19-Studio(P)	NO (-67.9%)	NO
01-PBSA-20-Studio(P)	NO (-65.2%)	NO
01-PBSA-21-Studio(R)	NO (-46.8%)	NO
01-PBSA-22-Studio(R)	NO (-67.5%)	NO
01-PBSA-23-Studio(R)	NO (-65%)	NO
01-PBSA-24-Studio(R)	NO (-60.4%)	NO
01-PBSA-25-Studio(R)	NO (-59.5%)	NO
01-PBSA-26-Studio(R)	NO (-83.9%)	NO
01-PBSA-27-Studio(R)	NO (-80.9%)	NO
01-PBSA-28-Studio(R)	NO (-50.8%)	NO
01-PBSA-29-Studio(R)	NO (-50.6%)	NO
01-PBSA-30-Studio(R)	NO (-49.4%)	NO
01-PBSA-31-Studio(P)	NO (-54.7%)	NO
01-PBSA-32-Studio(WCA)	NO (-61.3%)	NO
02-PBSA-01-Studio(R)	NO (-87.2%)	NO
02-PBSA-02-Studio(R)	NO (-74.4%)	NO
02-PBSA-03-Studio(R)	NO (-74.4%)	NO
02-PBSA-05-Studio(R)	NO (-74.8%)	NO
02-PBSA-04-Studio(R)	NO (-74.5%)	NO
02-PBSA-11-Studio(R)	NO (-79.7%)	NO
02-PBSA-12-Studio(R)	NO (-58.3%)	NO
02-PBSA-13-Studio(R)	NO (-58.2%)	NO
02-PBSA-14-Studio(R)	NO (-58.3%)	NO
02-PBSA-15-Studio(R)	NO (-58.8%)	NO
02-PBSA-06-Studio(P)	NO (-68.3%)	NO
02-PBSA-07-Studio(P)	NO (-69.5%)	NO
02-PBSA-08-Studio(P)	NO (-69.6%)	NO
02-PBSA-09-Studio(WCA)	NO (-73.7%)	NO
02-PBSA-10-Studio(WCA)	NO (-81.5%)	NO
02-PBSA-16-Studio(R)	NO (-67.1%)	NO
02-PBSA-17-Studio(R)	NO (-63.6%)	NO
02-PBSA-18-Studio(R)	NO (-66.6%)	NO
02-PBSA-19-Studio(P)	NO (-69.5%)	NO
02-PBSA-20-Studio(P)	NO (-68.5%)	NO
02-PBSA-21-Studio(R)	NO (-52%)	NO
02-PBSA-22-Studio(R)	NO (-69.5%)	NO
02-PBSA-23-Studio(R)	NO (-66.4%)	NO
02-PBSA-24-Studio(R)	NO (-62.6%)	NO
02-PBSA-25-Studio(R)	NO (-59.4%)	NO
02-PBSA-26-Studio(R)	NO (-83.2%)	NO
02-PBSA-27-Studio(R)	NO (-80.1%)	NO
02-PBSA-28-Studio(R)	NO (-48.7%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
02-PBSA-29-Studio(R)	NO (-49%)	NO
02-PBSA-30-Studio(R)	NO (-48.7%)	NO
02-PBSA-31-Studio(P)	NO (-54.5%)	NO
02-PBSA-32-Studio(WCA)	NO (-60.8%)	NO
03-PBSA-01-Studio(R)	NO (-86.5%)	NO
03-PBSA-02-Studio(R)	NO (-73.1%)	NO
03-PBSA-03-Studio(R)	NO (-73%)	NO
03-PBSA-05-Studio(R)	NO (-73.3%)	NO
03-PBSA-04-Studio(R)	NO (-73.2%)	NO
03-PBSA-11-Studio(R)	NO (-79.7%)	NO
03-PBSA-12-Studio(R)	NO (-58.2%)	NO
03-PBSA-13-Studio(R)	NO (-58.1%)	NO
03-PBSA-14-Studio(R)	NO (-58%)	NO
03-PBSA-15-Studio(R)	NO (-58.3%)	NO
03-PBSA-06-Studio(P)	NO (-66.3%)	NO
03-PBSA-07-Studio(P)	NO (-67.4%)	NO
03-PBSA-08-Studio(P)	NO (-67.4%)	NO
03-PBSA-09-Studio(WCA)	NO (-71.6%)	NO
03-PBSA-10-Studio(WCA)	NO (-79.9%)	NO
03-PBSA-16-Studio(R)	NO (-66.4%)	NO
03-PBSA-17-Studio(R)	NO (-60.7%)	NO
03-PBSA-18-Studio(R)	NO (-64.4%)	NO
03-PBSA-19-Studio(P)	NO (-67.7%)	NO
03-PBSA-20-Studio(P)	NO (-68%)	NO
03-PBSA-21-Studio(R)	NO (-50.2%)	NO
03-PBSA-22-Studio(R)	NO (-68.2%)	NO
03-PBSA-23-Studio(R)	NO (-65.3%)	NO
03-PBSA-24-Studio(R)	NO (-60.9%)	NO
03-PBSA-25-Studio(R)	NO (-57.9%)	NO
03-PBSA-26-Studio(R)	NO (-83%)	NO
03-PBSA-27-Studio(R)	NO (-79.7%)	NO
03-PBSA-28-Studio(R)	NO (-48.1%)	NO
03-PBSA-29-Studio(R)	NO (-48.3%)	NO
03-PBSA-30-Studio(R)	NO (-48.1%)	NO
03-PBSA-31-Studio(P)	NO (-54%)	NO
03-PBSA-32-Studio(WCA)	NO (-60.2%)	NO
04-PBSA-01-Studio(R)	NO (-85%)	NO
04-PBSA-02-Studio(R)	NO (-69.6%)	NO
04-PBSA-03-Studio(R)	NO (-69.5%)	NO
04-PBSA-05-Studio(R)	NO (-69.6%)	NO
04-PBSA-04-Studio(R)	NO (-69.4%)	NO
04-PBSA-11-Studio(R)	NO (-79.6%)	NO
04-PBSA-12-Studio(R)	NO (-58.1%)	NO
04-PBSA-13-Studio(R)	NO (-58.1%)	NO
04-PBSA-14-Studio(R)	NO (-57.9%)	NO
04-PBSA-15-Studio(R)	NO (-58%)	NO
04-PBSA-06-Studio(P)	NO (-61.5%)	NO
04-PBSA-07-Studio(P)	NO (-62.8%)	NO
04-PBSA-08-Studio(P)	NO (-63.1%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
04-PBSA-09-Studio(WCA)	NO (-68%)	NO
04-PBSA-10-Studio(WCA)	NO (-77.7%)	NO
04-PBSA-16-Studio(R)	NO (-65.9%)	NO
04-PBSA-17-Studio(R)	NO (-59.4%)	NO
04-PBSA-18-Studio(R)	NO (-60.7%)	NO
04-PBSA-19-Studio(P)	NO (-64.5%)	NO
04-PBSA-20-Studio(P)	NO (-66.7%)	NO
04-PBSA-21-Studio(R)	NO (-46.6%)	NO
04-PBSA-22-Studio(R)	NO (-67%)	NO
04-PBSA-23-Studio(R)	NO (-61.5%)	NO
04-PBSA-24-Studio(R)	NO (-59.3%)	NO
04-PBSA-25-Studio(R)	NO (-56.6%)	NO
04-PBSA-26-Studio(R)	NO (-82.7%)	NO
04-PBSA-27-Studio(R)	NO (-79.7%)	NO
04-PBSA-28-Studio(R)	NO (-47.8%)	NO
04-PBSA-29-Studio(R)	NO (-48%)	NO
04-PBSA-30-Studio(R)	NO (-47.6%)	NO
04-PBSA-31-Studio(P)	NO (-53.7%)	NO
04-PBSA-32-Studio(WCA)	NO (-59.7%)	NO
05-PBSA-01-Studio(R)	NO (-83.8%)	NO
05-PBSA-02-Studio(R)	NO (-67.2%)	NO
05-PBSA-03-Studio(R)	NO (-67.4%)	NO
05-PBSA-05-Studio(R)	NO (-67.1%)	NO
05-PBSA-04-Studio(R)	NO (-67.1%)	NO
05-PBSA-11-Studio(R)	NO (-79.6%)	NO
05-PBSA-12-Studio(R)	NO (-58%)	NO
05-PBSA-13-Studio(R)	NO (-57.9%)	NO
05-PBSA-14-Studio(R)	NO (-57.7%)	NO
05-PBSA-15-Studio(R)	NO (-57.9%)	NO
05-PBSA-06-Studio(P)	NO (-57.8%)	NO
05-PBSA-07-Studio(P)	NO (-59.4%)	NO
05-PBSA-08-Studio(P)	NO (-59.2%)	NO
05-PBSA-09-Studio(WCA)	NO (-64.4%)	NO
05-PBSA-10-Studio(WCA)	NO (-75.1%)	NO
05-PBSA-16-Studio(R)	NO (-65.2%)	NO
05-PBSA-17-Studio(R)	NO (-58%)	NO
05-PBSA-18-Studio(R)	NO (-58.9%)	NO
05-PBSA-19-Studio(P)	NO (-61.1%)	NO
05-PBSA-20-Studio(P)	NO (-64.2%)	NO
05-PBSA-21-Studio(R)	NO (-45.1%)	NO
05-PBSA-32-Studio(WCA)	NO (-59.5%)	NO
05-PBSA-22-Studio(R)	NO (-84.9%)	NO
05-PBSA-31-Studio(P)	NO (-72.6%)	NO
05-PBSA-01-Studio(R)	NO (-81.7%)	NO
05-PBSA-02-Studio(R)	NO (-62.3%)	NO
05-PBSA-03-Studio(R)	NO (-62.3%)	NO
05-PBSA-05-Studio(R)	NO (-62.2%)	NO
05-PBSA-04-Studio(R)	NO (-62%)	NO
05-PBSA-11-Studio(R)	NO (-79.6%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
05-PBSA-12-Studio(R)	NO (-58%)	NO
05-PBSA-13-Studio(R)	NO (-57.9%)	NO
05-PBSA-14-Studio(R)	NO (-57.7%)	NO
05-PBSA-15-Studio(R)	NO (-57.7%)	NO
05-PBSA-06-Studio(P)	NO (-51.9%)	NO
05-PBSA-07-Studio(P)	NO (-54%)	NO
05-PBSA-08-Studio(P)	NO (-53.8%)	NO
05-PBSA-09-Studio(WCA)	NO (-60%)	NO
05-PBSA-10-Studio(WCA)	NO (-79.2%)	NO
05-PBSA-16-Studio(R)	NO (-64.9%)	NO
05-PBSA-17-Studio(R)	NO (-57.4%)	NO
05-PBSA-18-Studio(R)	NO (-57.3%)	NO
05-PBSA-19-Studio(P)	NO (-55.9%)	NO
05-PBSA-20-Studio(P)	NO (-62%)	NO
05-PBSA-21-Studio(R)	NO (-42.4%)	NO
05-PBSA-32-Studio(WCA)	NO (-74.3%)	NO
05-PBSA-22-Studio(R)	NO (-83%)	NO
05-PBSA-31-Studio(P)	NO (-72.9%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	6270.1	6270.1
External area [m^2]	5697.8	5697.8
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	3	3
Average conductance [W/K]	1513.7	2618.49
Average U-value [W/m^2K]	0.27	0.46
Alpha value* [%]	10.49	10

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

Building Use

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

Energy Consumption by End Use [kWh/m^2]

	Actual	Notional
Heating	5.74	7.29
Cooling	0.55	0.34
Auxiliary	3.88	4.5
Lighting	5.85	6.92
Hot water	5.03	5.9
Equipment*	21.38	21.38
TOTAL**	**21.06**	**24.96**

* Energy used by equipment does not count towards the total for consumption or calculating emissions.
** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m^2]

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

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	59.51	76.41
Primary energy [kWh_{PE}/m^2]	31.38	37.2
Total emissions [kg/m^2]	2.93	3.48

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Central heating using water: radiators, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	16.6	0	1.9	0	11.6	2.48	0	2.64	0
	Notional	108.3	0	10.8	0	16.8	2.78	0	----	----
[ST] Central heating using water: radiators, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	71	0	8	0	4.1	2.48	0	2.64	0
	Notional	100	0	10	0	4.4	2.78	0	----	----
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	1.2	73.4	0.1	4.9	4.8	2.72	4.16	2.64	6
	Notional	7.5	30.7	0.7	3	9.2	2.78	2.84	----	----
[ST] Central heating using water: radiators, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	47.2	0	5.3	0	1.9	2.48	0	2.64	0
	Notional	64.3	0	6.4	0	1.9	2.78	0	----	----
[ST] Central heating using water: radiators, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	60.5	0	6.8	0	3.7	2.48	0	2.64	0
	Notional	86.1	0	8.6	0	4.3	2.78	0	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----

Key to terms

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

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

Jamestown Road PBSA

As designed

Date: Fri Sep 20 08:23:09 2024

Administrative information

Building Details

Address: 33-35 Jamestown Road, London, NW1 7DB

Certifier details

Name: Gary Ormiston

Telephone number: Phone

Address: The Garment Factory, 10 Montrose Street, Glasgow, G1 1RE

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.26

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.26

BRUKL compliance module version: v6.1.e.1

Foundation area [m^2]: 756.53

The CO_2 emission and primary energy rates of the building must not exceed the targets

Target CO_2 emission rate (TER), $kgCO_2/m^2$.annum	3.48	
Building CO_2 emission rate (BER), $kgCO_2/m^2$.annum	2.22	
Target primary energy rate (TPER), kWh_{PE}/m^2.annum	37.2	
Building primary energy rate (BPER), kWh_{PE}/m^2.annum	23.42	
Do the building's emission and primary energy rates exceed the targets?	BER =< TER	BPER =< TPER

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

Fabric element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.15	0.15	BB000001:Surf[1]
Floors	0.18	0.1	0.1	BB000001:Surf[0]
Pitched roofs	0.16	-	-	No pitched roofs in building
Flat roofs	0.18	0.1	0.1	BB000022:Surf[1]
Windows** and roof windows	1.6	1.2	1.2	0000000F:Surf[0]
Rooflights***	2.2	-	-	No roof lights in building
Personnel doors^	1.6	1.2	1.2	BB000013:Surf[0]
Vehicle access & similar large doors	1.3	-	-	No vehicle access doors in building
High usage entrance doors	3	-	-	No high usage entrance doors in building

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$] $U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]

$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$]

* Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

** Display windows and similar glazing are excluded from the U-value check. *** Values for rooflights refer to the horizontal position.

^ For fire doors, limiting U-value is 1.8 W/m^2K

NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

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

Building services

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

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	>0.95

1- 02a VRF - Be Green

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	3.46	6	0	1.6	0.78
Standard value	2.5*	N/A	N/A	2^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.

^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.

2- 01d - Space Heating NV - Be Green

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	3.26	-	0.2	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.

3- 01b - Space Heating + MVHR - Be Green

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	3.26	-	0	-	0.79
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.

4- 01c - Space Heating + Ext - Be Green

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	3.26	-	0	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.

5- 01a - Space Heating + MVHR (Coolbox) - Be Green

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	3.26	-	0	-	0.88
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.

1- 00b DHW - Be Green

	Water heating efficiency	**Storage loss factor [kWh/litre per day]**
This building	4.27	-
Standard value	2*	N/A

* Standard shown is for all types except absorption and gas engine heat pumps.

Zone-level mechanical ventilation, exhaust, and terminal units

ID	System type in the Approved Documents
A	Local supply or extract ventilation units
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal balanced supply and extract ventilation system
E	Local balanced supply and extract ventilation units
F	Other local ventilation units
G	Fan assisted terminal variable air volume units
H	Fan coil units
I	Kitchen extract with the fan remote from the zone and a grease filter

NB: Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
BB-NonResi-Cleaners Cupboard	-	-	-	0.6	-	-	-	-	-	-	N/A
BB-NonResi-Cleaners Cupboard	-	-	-	0.6	-	-	-	-	-	-	N/A
00-NonResi-WC	-	-	0.4	-	-	-	-	-	-	-	N/A
00-NonResi-Management	-	-	-	1.1	-	-	-	-	-	-	N/A
00-NonResi-Post Room	-	-	-	1.1	-	-	-	-	-	-	N/A
00-NonResi-WC Shower Room	-	-	0.4	-	-	-	-	-	-	-	N/A
00-NonResi-WC	-	-	0.4	-	-	-	-	-	-	-	N/A
00-NonResi-WC	-	-	0.4	-	-	-	-	-	-	-	N/A
00-PBSA-01-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
00-PBSA-06-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
00-PBSA-02-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
00-PBSA-07-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
00-PBSA-04-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
00-PBSA-03-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
00-PBSA-05-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
00-PBSA-09-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
00-PBSA-08-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
00-PBSA-10-Studio(P)	-	-	-	0.6	-	-	-	-	-	-	N/A
00-PBSA-11-Studio(WCA)	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-01-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
01-PBSA-02-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
01-PBSA-03-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
01-PBSA-05-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
01-PBSA-04-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
01-PBSA-01-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
01-PBSA-02-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
01-PBSA-03-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
01-PBSA-04-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
01-PBSA-05-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
01-PBSA-11-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
01-PBSA-11-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-12-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-12-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-13-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-13-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-14-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-14-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-15-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-15-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-06-Studio(P)	-	-	-	0.7	-	-	-	-	-	-	N/A
01-PBSA-06-Studio(P)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
01-PBSA-07-Studio(P)	-	-	-	0.7	-	-	-	-	-	-	N/A
01-PBSA-07-Studio(P)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
01-PBSA-08-Studio(P)	-	-	-	0.7	-	-	-	-	-	-	N/A
01-PBSA-08-Studio(P)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
01-PBSA-09-Studio(WCA)	-	-	-	0.7	-	-	-	-	-	-	N/A
01-PBSA-09-Studio(WCA)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
01-PBSA-10-Studio(WCA)	-	-	-	0.7	-	-	-	-	-	-	N/A
01-PBSA-10-Studio(WCA)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
01-PBSA-16-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-16-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-17-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-17-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-18-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-18-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-19-Studio(P)	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-19-Studio(P)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-20-Studio(P)	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-21-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-20-Studio(P)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-21-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-22-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-23-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-24-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-25-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-26-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-27-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-28-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-29-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-30-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-31-Studio(P)	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-32-Studio(WCA)	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-22-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
01-PBSA-23-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-24-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-25-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-26-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-27-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-28-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-29-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-30-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-31-Studio(P)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
01-PBSA-32-Studio(WCA)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-01-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
02-PBSA-02-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
02-PBSA-03-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
02-PBSA-05-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
02-PBSA-04-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
02-PBSA-01-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
02-PBSA-02-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
02-PBSA-03-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
02-PBSA-04-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
02-PBSA-05-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
02-PBSA-11-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-11-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-12-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-12-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-13-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-13-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-14-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-14-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-15-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-15-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-06-Studio(P)	-	-	-	0.7	-	-	-	-	-	-	N/A
02-PBSA-06-Studio(P)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
02-PBSA-07-Studio(P)	-	-	-	0.7	-	-	-	-	-	-	N/A
02-PBSA-07-Studio(P)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
02-PBSA-08-Studio(P)	-	-	-	0.7	-	-	-	-	-	-	N/A
02-PBSA-08-Studio(P)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
02-PBSA-09-Studio(WCA)	-	-	-	0.7	-	-	-	-	-	-	N/A
02-PBSA-09-Studio(WCA)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
02-PBSA-10-Studio(WCA)	-	-	-	0.7	-	-	-	-	-	-	N/A
02-PBSA-10-Studio(WCA)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
02-PBSA-16-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-16-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-17-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
02-PBSA-17-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-18-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-18-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-19-Studio(P)	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-19-Studio(P)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-20-Studio(P)	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-21-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-20-Studio(P)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-21-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-22-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-23-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-24-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-25-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-26-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-27-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-28-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-29-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-30-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-31-Studio(P)	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-32-Studio(WCA)	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-22-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-23-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-24-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-25-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-26-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-27-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-28-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-29-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-30-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-31-Studio(P)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
02-PBSA-32-Studio(WCA)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-01-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
03-PBSA-02-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
03-PBSA-03-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
03-PBSA-05-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
03-PBSA-04-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
03-PBSA-01-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
03-PBSA-02-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
03-PBSA-03-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
03-PBSA-04-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
03-PBSA-05-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
03-PBSA-11-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-11-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
03-PBSA-12-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-12-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-13-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-13-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-14-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-14-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-15-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-15-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-06-Studio(P)	-	-	-	0.7	-	-	-	-	-	-	N/A
03-PBSA-06-Studio(P)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
03-PBSA-07-Studio(P)	-	-	-	0.7	-	-	-	-	-	-	N/A
03-PBSA-07-Studio(P)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
03-PBSA-08-Studio(P)	-	-	-	0.7	-	-	-	-	-	-	N/A
03-PBSA-08-Studio(P)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
03-PBSA-09-Studio(WCA)	-	-	-	0.7	-	-	-	-	-	-	N/A
03-PBSA-09-Studio(WCA)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
03-PBSA-10-Studio(WCA)	-	-	-	0.7	-	-	-	-	-	-	N/A
03-PBSA-10-Studio(WCA)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
03-PBSA-16-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-16-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-17-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-17-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-18-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-18-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-19-Studio(P)	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-19-Studio(P)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-20-Studio(P)	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-21-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-20-Studio(P)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-21-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-22-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-23-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-24-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-25-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-26-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-27-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-28-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-29-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-30-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-31-Studio(P)	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-32-Studio(WCA)	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-22-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-23-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
03-PBSA-24-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-25-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-26-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-27-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-28-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-29-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-30-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-31-Studio(P)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
03-PBSA-32-Studio(WCA)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-01-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
04-PBSA-02-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
04-PBSA-03-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
04-PBSA-05-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
04-PBSA-04-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
04-PBSA-01-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
04-PBSA-02-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
04-PBSA-03-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
04-PBSA-04-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
04-PBSA-05-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
04-PBSA-11-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-11-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-12-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-12-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-13-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-13-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-14-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-14-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-15-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-15-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-06-Studio(P)	-	-	-	0.7	-	-	-	-	-	-	N/A
04-PBSA-06-Studio(P)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
04-PBSA-07-Studio(P)	-	-	-	0.7	-	-	-	-	-	-	N/A
04-PBSA-07-Studio(P)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
04-PBSA-08-Studio(P)	-	-	-	0.7	-	-	-	-	-	-	N/A
04-PBSA-08-Studio(P)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
04-PBSA-09-Studio(WCA)	-	-	-	0.7	-	-	-	-	-	-	N/A
04-PBSA-09-Studio(WCA)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
04-PBSA-10-Studio(WCA)	-	-	-	0.7	-	-	-	-	-	-	N/A
04-PBSA-10-Studio(WCA)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
04-PBSA-16-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-16-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-17-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-17-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
04-PBSA-18-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-18-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-19-Studio(P)	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-19-Studio(P)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-20-Studio(P)	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-21-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-20-Studio(P)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-21-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-22-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-23-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-24-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-25-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-26-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-27-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-28-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-29-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-30-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-31-Studio(P)	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-32-Studio(WCA)	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-22-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-23-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-24-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-25-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-26-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-27-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-28-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-29-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-30-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-31-Studio(P)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
04-PBSA-32-Studio(WCA)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-01-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-02-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-03-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-05-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-04-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-01-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-02-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-03-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-04-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-05-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-11-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-11-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-12-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
05-PBSA-12-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-13-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-13-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-14-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-14-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-15-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-15-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-06-Studio(P)	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-06-Studio(P)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-07-Studio(P)	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-07-Studio(P)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-08-Studio(P)	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-08-Studio(P)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-09-Studio(WCA)	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-09-Studio(WCA)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-10-Studio(WCA)	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-10-Studio(WCA)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-16-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-16-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-17-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-17-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-18-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-18-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-19-Studio(P)	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-19-Studio(P)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-20-Studio(P)	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-21-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-20-Studio(P)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-21-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-22-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-32-Studio(WCA)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-32-Studio(WCA)	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-22-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-31-Studio(P)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-31-Studio(P)	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-01-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-02-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-03-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-05-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-04-Studio(R)	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-01-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-02-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-03-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
05-PBSA-04-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-05-Studio(R)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-11-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-11-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-12-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-12-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-13-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-13-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-14-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-14-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-15-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-15-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-06-Studio(P)	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-06-Studio(P)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-07-Studio(P)	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-07-Studio(P)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-08-Studio(P)	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-08-Studio(P)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-09-Studio(WCA)	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-09-Studio(WCA)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-10-Studio(WCA)	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-10-Studio(WCA)-WC	-	-	-	0.7	-	-	-	-	-	-	N/A
05-PBSA-16-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-16-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-17-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-17-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-18-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-18-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-19-Studio(P)	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-19-Studio(P)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-20-Studio(P)	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-21-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-20-Studio(P)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-21-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-22-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-32-Studio(WCA)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-32-Studio(WCA)	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-22-Studio(R)	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-31-Studio(P)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
05-PBSA-31-Studio(P)	-	-	-	0.6	-	-	-	-	-	-	N/A
00-PBSA-05-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
00-PBSA-04-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
00-PBSA-03-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
00-PBSA-02-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
00-PBSA-01-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
00-PBSA-06-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
00-PBSA-07-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
00-PBSA-08-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
00-PBSA-09-Studio(R)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
00-PBSA-10-Studio(P)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A
00-PBSA-11-Studio(WCA)-WC	-	-	-	0.6	-	-	-	-	-	-	N/A

General lighting and display lighting	General luminaire	Display light source	
Zone name	Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
Standard value	95	80	0.3
BB-NonResi-Cold Water Storage Tank	110	-	-
BB-NonResi-LV Room	110	-	-
BB-NonResi-Comms Room	110	-	-
BB-NonResi-Circulation	110	-	-
BB-NonResi-Flixible	110	-	-
BB-NonResi-Private Study	110	-	-
BB-NonResi-Stairs	110	-	-
BB-NonResi-Cleaners Cupboard	110	-	-
BB-NonResi-Commercial Sprinkler Water Storage	110	-	-
BB-NonResi-Gym	110	-	-
BB-NonResi-Cleaners Cupboard	110	-	-
BB-NonResi-Dinning & Kitchen	110	-	-
BB-NonResi-Cinema	110	-	-
BB-NonResi-Circulation	110	-	-
BB-NonResi-Lounge/Games	110	-	-
BB-NonResi-Laundry	110	-	-
00-NonResi-WC	110	-	-
00-NonResi-Management	110	-	-
00-NonResi-Post Room	110	-	-
00-NonResi-Stairs	110	-	-
00-NonResi-Circulation	110	-	-
00-NonResi-Cycle Lift Circulation	110	-	-
00-NonResi-Circulation	110	-	-
00-NonResi-Flexible	110	-	-
00-NonResi-Generator Room	110	-	-
00-NonResi-WC Circulation	110	-	-
00-NonResi-WC Shower Room	110	-	-
00-NonResi-WC	110	-	-
00-NonResi-WC	110	-	-
00-NonResi-Reception	100	110	2.684
00-PBSA-Circulation	110	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
00-PBSA-Stairs	110	-	-
00-PBSA-01-Studio(R)	110	-	-
00-PBSA-06-Studio(R)	110	-	-
00-PBSA-02-Studio(R)	110	-	-
00-PBSA-07-Studio(R)	110	-	-
00-PBSA-04-Studio(R)	110	-	-
00-PBSA-03-Studio(R)	110	-	-
00-PBSA-05-Studio(R)	110	-	-
00-PBSA-09-Studio(R)	110	-	-
00-PBSA-08-Studio(R)	110	-	-
00-PBSA-10-Studio(P)	110	-	-
00-PBSA-11-Studio(WCA)	110	-	-
01-PBSA-Stairs	110	-	-
01-PBSA-Stairs	110	-	-
01-PBSA-01-Studio(R)	110	-	-
01-PBSA-02-Studio(R)	110	-	-
01-PBSA-03-Studio(R)	110	-	-
01-PBSA-05-Studio(R)	110	-	-
01-PBSA-04-Studio(R)	110	-	-
01-PBSA-01-Studio(R)-WC	110	-	-
01-PBSA-02-Studio(R)-WC	110	-	-
01-PBSA-03-Studio(R)-WC	110	-	-
01-PBSA-04-Studio(R)-WC	110	-	-
01-PBSA-05-Studio(R)-WC	110	-	-
01-PBSA-11-Studio(R)	110	-	-
01-PBSA-11-Studio(R)-WC	110	-	-
01-PBSA-12-Studio(R)-WC	110	-	-
01-PBSA-12-Studio(R)	110	-	-
01-PBSA-13-Studio(R)	110	-	-
01-PBSA-13-Studio(R)-WC	110	-	-
01-PBSA-14-Studio(R)	110	-	-
01-PBSA-14-Studio(R)-WC	110	-	-
01-PBSA-15-Studio(R)	110	-	-
01-PBSA-15-Studio(R)-WC	110	-	-
01-PBSA-06-Studio(P)	110	-	-
01-PBSA-06-Studio(P)-WC	110	-	-
01-PBSA-07-Studio(P)	110	-	-
01-PBSA-07-Studio(P)-WC	110	-	-
01-PBSA-08-Studio(P)	110	-	-
01-PBSA-08-Studio(P)-WC	110	-	-
01-PBSA-09-Studio(WCA)	110	-	-
01-PBSA-09-Studio(WCA)-WC	110	-	-
01-PBSA-10-Studio(WCA)	110	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
01-PBSA-10-Studio(WCA)-WC	110	-	-
01-PBSA-16-Studio(R)	110	-	-
01-PBSA-16-Studio(R)-WC	110	-	-
01-PBSA-17-Studio(R)	110	-	-
01-PBSA-17-Studio(R)-WC	110	-	-
01-PBSA-18-Studio(R)	110	-	-
01-PBSA-18-Studio(R)-WC	110	-	-
01-PBSA-19-Studio(P)	110	-	-
01-PBSA-19-Studio(P)-WC	110	-	-
01-PBSA-20-Studio(P)	110	-	-
01-PBSA-21-Studio(R)	110	-	-
01-PBSA-20-Studio(P)-WC	110	-	-
01-PBSA-21-Studio(R)-WC	110	-	-
01-PBSA-22-Studio(R)	110	-	-
01-PBSA-23-Studio(R)	110	-	-
01-PBSA-24-Studio(R)	110	-	-
01-PBSA-25-Studio(R)	110	-	-
01-PBSA-26-Studio(R)	110	-	-
01-PBSA-Circulation	110	-	-
01-PBSA-27-Studio(R)	110	-	-
01-PBSA-28-Studio(R)	110	-	-
01-PBSA-29-Studio(R)	110	-	-
01-PBSA-30-Studio(R)	110	-	-
01-PBSA-31-Studio(P)	110	-	-
01-PBSA-32-Studio(WCA)	110	-	-
01-PBSA-22-Studio(R)-WC	110	-	-
01-PBSA-23-Studio(R)-WC	110	-	-
01-PBSA-24-Studio(R)-WC	110	-	-
01-PBSA-25-Studio(R)-WC	110	-	-
01-PBSA-26-Studio(R)-WC	110	-	-
01-PBSA-27-Studio(R)-WC	110	-	-
01-PBSA-28-Studio(R)-WC	110	-	-
01-PBSA-29-Studio(R)-WC	110	-	-
01-PBSA-30-Studio(R)-WC	110	-	-
01-PBSA-31-Studio(P)-WC	110	-	-
01-PBSA-32-Studio(WCA)-WC	110	-	-
02-PBSA-Stairs	110	-	-
02-PBSA-Stairs	110	-	-
02-PBSA-01-Studio(R)	110	-	-
02-PBSA-02-Studio(R)	110	-	-
02-PBSA-03-Studio(R)	110	-	-
02-PBSA-05-Studio(R)	110	-	-
02-PBSA-04-Studio(R)	110	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
02-PBSA-01-Studio(R)-WC	110	-	-
02-PBSA-02-Studio(R)-WC	110	-	-
02-PBSA-03-Studio(R)-WC	110	-	-
02-PBSA-04-Studio(R)-WC	110	-	-
02-PBSA-05-Studio(R)-WC	110	-	-
02-PBSA-11-Studio(R)	110	-	-
02-PBSA-11-Studio(R)-WC	110	-	-
02-PBSA-12-Studio(R)-WC	110	-	-
02-PBSA-12-Studio(R)	110	-	-
02-PBSA-13-Studio(R)	110	-	-
02-PBSA-13-Studio(R)-WC	110	-	-
02-PBSA-14-Studio(R)	110	-	-
02-PBSA-14-Studio(R)-WC	110	-	-
02-PBSA-15-Studio(R)	110	-	-
02-PBSA-15-Studio(R)-WC	110	-	-
02-PBSA-06-Studio(P)	110	-	-
02-PBSA-06-Studio(P)-WC	110	-	-
02-PBSA-07-Studio(P)	110	-	-
02-PBSA-07-Studio(P)-WC	110	-	-
02-PBSA-08-Studio(P)	110	-	-
02-PBSA-08-Studio(P)-WC	110	-	-
02-PBSA-09-Studio(WCA)	110	-	-
02-PBSA-09-Studio(WCA)-WC	110	-	-
02-PBSA-10-Studio(WCA)	110	-	-
02-PBSA-10-Studio(WCA)-WC	110	-	-
02-PBSA-16-Studio(R)	110	-	-
02-PBSA-16-Studio(R)-WC	110	-	-
02-PBSA-17-Studio(R)	110	-	-
02-PBSA-17-Studio(R)-WC	110	-	-
02-PBSA-18-Studio(R)	110	-	-
02-PBSA-18-Studio(R)-WC	110	-	-
02-PBSA-19-Studio(P)	110	-	-
02-PBSA-19-Studio(P)-WC	110	-	-
02-PBSA-20-Studio(P)	110	-	-
02-PBSA-21-Studio(R)	110	-	-
02-PBSA-20-Studio(P)-WC	110	-	-
02-PBSA-21-Studio(R)-WC	110	-	-
02-PBSA-22-Studio(R)	110	-	-
02-PBSA-23-Studio(R)	110	-	-
02-PBSA-24-Studio(R)	110	-	-
02-PBSA-25-Studio(R)	110	-	-
02-PBSA-26-Studio(R)	110	-	-
02-PBSA-Circulation	110	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
02-PBSA-27-Studio(R)	110	-	-
02-PBSA-28-Studio(R)	110	-	-
02-PBSA-29-Studio(R)	110	-	-
02-PBSA-30-Studio(R)	110	-	-
02-PBSA-31-Studio(P)	110	-	-
02-PBSA-32-Studio(WCA)	110	-	-
02-PBSA-22-Studio(R)-WC	110	-	-
02-PBSA-23-Studio(R)-WC	110	-	-
02-PBSA-24-Studio(R)-WC	110	-	-
02-PBSA-25-Studio(R)-WC	110	-	-
02-PBSA-26-Studio(R)-WC	110	-	-
02-PBSA-27-Studio(R)-WC	110	-	-
02-PBSA-28-Studio(R)-WC	110	-	-
02-PBSA-29-Studio(R)-WC	110	-	-
02-PBSA-30-Studio(R)-WC	110	-	-
02-PBSA-31-Studio(P)-WC	110	-	-
02-PBSA-32-Studio(WCA)-WC	110	-	-
03-PBSA-Stairs	110	-	-
03-PBSA-Stairs	110	-	-
03-PBSA-01-Studio(R)	110	-	-
03-PBSA-02-Studio(R)	110	-	-
03-PBSA-03-Studio(R)	110	-	-
03-PBSA-05-Studio(R)	110	-	-
03-PBSA-04-Studio(R)	110	-	-
03-PBSA-01-Studio(R)-WC	110	-	-
03-PBSA-02-Studio(R)-WC	110	-	-
03-PBSA-03-Studio(R)-WC	110	-	-
03-PBSA-04-Studio(R)-WC	110	-	-
03-PBSA-05-Studio(R)-WC	110	-	-
03-PBSA-11-Studio(R)	110	-	-
03-PBSA-11-Studio(R)-WC	110	-	-
03-PBSA-12-Studio(R)-WC	110	-	-
03-PBSA-12-Studio(R)	110	-	-
03-PBSA-13-Studio(R)	110	-	-
03-PBSA-13-Studio(R)-WC	110	-	-
03-PBSA-14-Studio(R)	110	-	-
03-PBSA-14-Studio(R)-WC	110	-	-
03-PBSA-15-Studio(R)	110	-	-
03-PBSA-15-Studio(R)-WC	110	-	-
03-PBSA-06-Studio(P)	110	-	-
03-PBSA-06-Studio(P)-WC	110	-	-
03-PBSA-07-Studio(P)	110	-	-
03-PBSA-07-Studio(P)-WC	110	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
03-PBSA-08-Studio(P)	110	-	-
03-PBSA-08-Studio(P)-WC	110	-	-
03-PBSA-09-Studio(WCA)	110	-	-
03-PBSA-09-Studio(WCA)-WC	110	-	-
03-PBSA-10-Studio(WCA)	110	-	-
03-PBSA-10-Studio(WCA)-WC	110	-	-
03-PBSA-16-Studio(R)	110	-	-
03-PBSA-16-Studio(R)-WC	110	-	-
03-PBSA-17-Studio(R)	110	-	-
03-PBSA-17-Studio(R)-WC	110	-	-
03-PBSA-18-Studio(R)	110	-	-
03-PBSA-18-Studio(R)-WC	110	-	-
03-PBSA-19-Studio(P)	110	-	-
03-PBSA-19-Studio(P)-WC	110	-	-
03-PBSA-20-Studio(P)	110	-	-
03-PBSA-21-Studio(R)	110	-	-
03-PBSA-20-Studio(P)-WC	110	-	-
03-PBSA-21-Studio(R)-WC	110	-	-
03-PBSA-22-Studio(R)	110	-	-
03-PBSA-23-Studio(R)	110	-	-
03-PBSA-24-Studio(R)	110	-	-
03-PBSA-25-Studio(R)	110	-	-
03-PBSA-26-Studio(R)	110	-	-
03-PBSA-Circulation	110	-	-
03-PBSA-27-Studio(R)	110	-	-
03-PBSA-28-Studio(R)	110	-	-
03-PBSA-29-Studio(R)	110	-	-
03-PBSA-30-Studio(R)	110	-	-
03-PBSA-31-Studio(P)	110	-	-
03-PBSA-32-Studio(WCA)	110	-	-
03-PBSA-22-Studio(R)-WC	110	-	-
03-PBSA-23-Studio(R)-WC	110	-	-
03-PBSA-24-Studio(R)-WC	110	-	-
03-PBSA-25-Studio(R)-WC	110	-	-
03-PBSA-26-Studio(R)-WC	110	-	-
03-PBSA-27-Studio(R)-WC	110	-	-
03-PBSA-28-Studio(R)-WC	110	-	-
03-PBSA-29-Studio(R)-WC	110	-	-
03-PBSA-30-Studio(R)-WC	110	-	-
03-PBSA-31-Studio(P)-WC	110	-	-
03-PBSA-32-Studio(WCA)-WC	110	-	-
04-PBSA-Stairs	110	-	-
04-PBSA-Stairs	110	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
04-PBSA-01-Studio(R)	110	-	-
04-PBSA-02-Studio(R)	110	-	-
04-PBSA-03-Studio(R)	110	-	-
04-PBSA-05-Studio(R)	110	-	-
04-PBSA-04-Studio(R)	110	-	-
04-PBSA-01-Studio(R)-WC	110	-	-
04-PBSA-02-Studio(R)-WC	110	-	-
04-PBSA-03-Studio(R)-WC	110	-	-
04-PBSA-04-Studio(R)-WC	110	-	-
04-PBSA-05-Studio(R)-WC	110	-	-
04-PBSA-11-Studio(R)	110	-	-
04-PBSA-11-Studio(R)-WC	110	-	-
04-PBSA-12-Studio(R)-WC	110	-	-
04-PBSA-12-Studio(R)	110	-	-
04-PBSA-13-Studio(R)	110	-	-
04-PBSA-13-Studio(R)-WC	110	-	-
04-PBSA-14-Studio(R)	110	-	-
04-PBSA-14-Studio(R)-WC	110	-	-
04-PBSA-15-Studio(R)	110	-	-
04-PBSA-15-Studio(R)-WC	110	-	-
04-PBSA-06-Studio(P)	110	-	-
04-PBSA-06-Studio(P)-WC	110	-	-
04-PBSA-07-Studio(P)	110	-	-
04-PBSA-07-Studio(P)-WC	110	-	-
04-PBSA-08-Studio(P)	110	-	-
04-PBSA-08-Studio(P)-WC	110	-	-
04-PBSA-09-Studio(WCA)	110	-	-
04-PBSA-09-Studio(WCA)-WC	110	-	-
04-PBSA-10-Studio(WCA)	110	-	-
04-PBSA-10-Studio(WCA)-WC	110	-	-
04-PBSA-16-Studio(R)	110	-	-
04-PBSA-16-Studio(R)-WC	110	-	-
04-PBSA-17-Studio(R)	110	-	-
04-PBSA-17-Studio(R)-WC	110	-	-
04-PBSA-18-Studio(R)	110	-	-
04-PBSA-18-Studio(R)-WC	110	-	-
04-PBSA-19-Studio(P)	110	-	-
04-PBSA-19-Studio(P)-WC	110	-	-
04-PBSA-20-Studio(P)	110	-	-
04-PBSA-21-Studio(R)	110	-	-
04-PBSA-20-Studio(P)-WC	110	-	-
04-PBSA-21-Studio(R)-WC	110	-	-
04-PBSA-22-Studio(R)	110	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
04-PBSA-23-Studio(R)	110	-	-
04-PBSA-24-Studio(R)	110	-	-
04-PBSA-25-Studio(R)	110	-	-
04-PBSA-26-Studio(R)	110	-	-
04-PBSA-Circulation	110	-	-
04-PBSA-27-Studio(R)	110	-	-
04-PBSA-28-Studio(R)	110	-	-
04-PBSA-29-Studio(R)	110	-	-
04-PBSA-30-Studio(R)	110	-	-
04-PBSA-31-Studio(P)	110	-	-
04-PBSA-32-Studio(WCA)	110	-	-
04-PBSA-22-Studio(R)-WC	110	-	-
04-PBSA-23-Studio(R)-WC	110	-	-
04-PBSA-24-Studio(R)-WC	110	-	-
04-PBSA-25-Studio(R)-WC	110	-	-
04-PBSA-26-Studio(R)-WC	110	-	-
04-PBSA-27-Studio(R)-WC	110	-	-
04-PBSA-28-Studio(R)-WC	110	-	-
04-PBSA-29-Studio(R)-WC	110	-	-
04-PBSA-30-Studio(R)-WC	110	-	-
04-PBSA-31-Studio(P)-WC	110	-	-
04-PBSA-32-Studio(WCA)-WC	110	-	-
05-PBSA-Stairs	110	-	-
05-PBSA-Stairs	110	-	-
05-PBSA-01-Studio(R)	110	-	-
05-PBSA-02-Studio(R)	110	-	-
05-PBSA-03-Studio(R)	110	-	-
05-PBSA-05-Studio(R)	110	-	-
05-PBSA-04-Studio(R)	110	-	-
05-PBSA-01-Studio(R)-WC	110	-	-
05-PBSA-02-Studio(R)-WC	110	-	-
05-PBSA-03-Studio(R)-WC	110	-	-
05-PBSA-04-Studio(R)-WC	110	-	-
05-PBSA-05-Studio(R)-WC	110	-	-
05-PBSA-11-Studio(R)	110	-	-
05-PBSA-11-Studio(R)-WC	110	-	-
05-PBSA-12-Studio(R)-WC	110	-	-
05-PBSA-12-Studio(R)	110	-	-
05-PBSA-13-Studio(R)	110	-	-
05-PBSA-13-Studio(R)-WC	110	-	-
05-PBSA-14-Studio(R)	110	-	-
05-PBSA-14-Studio(R)-WC	110	-	-
05-PBSA-15-Studio(R)	110	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
05-PBSA-15-Studio(R)-WC	110	-	-
05-PBSA-06-Studio(P)	110	-	-
05-PBSA-06-Studio(P)-WC	110	-	-
05-PBSA-07-Studio(P)	110	-	-
05-PBSA-07-Studio(P)-WC	110	-	-
05-PBSA-08-Studio(P)	110	-	-
05-PBSA-08-Studio(P)-WC	110	-	-
05-PBSA-09-Studio(WCA)	110	-	-
05-PBSA-09-Studio(WCA)-WC	110	-	-
05-PBSA-10-Studio(WCA)	110	-	-
05-PBSA-10-Studio(WCA)-WC	110	-	-
05-PBSA-16-Studio(R)	110	-	-
05-PBSA-16-Studio(R)-WC	110	-	-
05-PBSA-17-Studio(R)	110	-	-
05-PBSA-17-Studio(R)-WC	110	-	-
05-PBSA-18-Studio(R)	110	-	-
05-PBSA-18-Studio(R)-WC	110	-	-
05-PBSA-19-Studio(P)	110	-	-
05-PBSA-19-Studio(P)-WC	110	-	-
05-PBSA-20-Studio(P)	110	-	-
05-PBSA-21-Studio(R)	110	-	-
05-PBSA-20-Studio(P)-WC	110	-	-
05-PBSA-21-Studio(R)-WC	110	-	-
05-PBSA-22-Studio(R)-WC	110	-	-
05-PBSA-32-Studio(WCA)-WC	110	-	-
05-PBSA-32-Studio(WCA)	110	-	-
05-PBSA-22-Studio(R)	110	-	-
05-PBSA-Circulation	110	-	-
05-PBSA-31-Studio(P)-WC	110	-	-
05-PBSA-31-Studio(P)	110	-	-
05-PBSA-Stairs	110	-	-
05-PBSA-Stairs	110	-	-
05-PBSA-01-Studio(R)	110	-	-
05-PBSA-02-Studio(R)	110	-	-
05-PBSA-03-Studio(R)	110	-	-
05-PBSA-05-Studio(R)	110	-	-
05-PBSA-04-Studio(R)	110	-	-
05-PBSA-01-Studio(R)-WC	110	-	-
05-PBSA-02-Studio(R)-WC	110	-	-
05-PBSA-03-Studio(R)-WC	110	-	-
05-PBSA-04-Studio(R)-WC	110	-	-
05-PBSA-05-Studio(R)-WC	110	-	-
05-PBSA-11-Studio(R)	110	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
05-PBSA-11-Studio(R)-WC	110	-	-
05-PBSA-12-Studio(R)-WC	110	-	-
05-PBSA-12-Studio(R)	110	-	-
05-PBSA-13-Studio(R)	110	-	-
05-PBSA-13-Studio(R)-WC	110	-	-
05-PBSA-14-Studio(R)	110	-	-
05-PBSA-14-Studio(R)-WC	110	-	-
05-PBSA-15-Studio(R)	110	-	-
05-PBSA-15-Studio(R)-WC	110	-	-
05-PBSA-06-Studio(P)	110	-	-
05-PBSA-06-Studio(P)-WC	110	-	-
05-PBSA-07-Studio(P)	110	-	-
05-PBSA-07-Studio(P)-WC	110	-	-
05-PBSA-08-Studio(P)	110	-	-
05-PBSA-08-Studio(P)-WC	110	-	-
05-PBSA-09-Studio(WCA)	110	-	-
05-PBSA-09-Studio(WCA)-WC	110	-	-
05-PBSA-10-Studio(WCA)	110	-	-
05-PBSA-10-Studio(WCA)-WC	110	-	-
05-PBSA-16-Studio(R)	110	-	-
05-PBSA-16-Studio(R)-WC	110	-	-
05-PBSA-17-Studio(R)	110	-	-
05-PBSA-17-Studio(R)-WC	110	-	-
05-PBSA-18-Studio(R)	110	-	-
05-PBSA-18-Studio(R)-WC	110	-	-
05-PBSA-19-Studio(P)	110	-	-
05-PBSA-19-Studio(P)-WC	110	-	-
05-PBSA-20-Studio(P)	110	-	-
05-PBSA-21-Studio(R)	110	-	-
05-PBSA-20-Studio(P)-WC	110	-	-
05-PBSA-21-Studio(R)-WC	110	-	-
05-PBSA-22-Studio(R)-WC	110	-	-
05-PBSA-32-Studio(WCA)-WC	110	-	-
05-PBSA-32-Studio(WCA)	110	-	-
05-PBSA-22-Studio(R)	110	-	-
05-PBSA-Circulation	110	-	-
05-PBSA-31-Studio(P)-WC	110	-	-
05-PBSA-31-Studio(P)	110	-	-
00-PBSA-05-Studio(R)-WC	110	-	-
00-PBSA-04-Studio(R)-WC	110	-	-
00-PBSA-03-Studio(R)-WC	110	-	-
00-PBSA-02-Studio(R)-WC	110	-	-
00-PBSA-01-Studio(R)-WC	110	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
00-PBSA-06-Studio(R)-WC	110	-	-
00-PBSA-07-Studio(R)-WC	110	-	-
00-PBSA-08-Studio(R)-WC	110	-	-
00-PBSA-09-Studio(R)-WC	110	-	-
00-PBSA-10-Studio(P)-WC	110	-	-
00-PBSA-11-Studio(WCA)-WC	110	-	-

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

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
BB-NonResi-Comms Room	N/A	N/A
BB-NonResi-Flixible	N/A	N/A
BB-NonResi-Private Study	NO (-100%)	NO
BB-NonResi-Gym	NO (-100%)	NO
BB-NonResi-Dinning & Kitchen	NO (-7.5%)	NO
BB-NonResi-Cinema	N/A	N/A
BB-NonResi-Lounge/Games	N/A	N/A
BB-NonResi-Laundry	NO (-100%)	NO
00-NonResi-Management	N/A	N/A
00-NonResi-Post Room	N/A	N/A
00-NonResi-Flexible	NO (-47.2%)	NO
00-NonResi-Reception	NO (-45.8%)	NO
00-PBSA-01-Studio(R)	NO (-90%)	NO
00-PBSA-06-Studio(R)	NO (-82.8%)	NO
00-PBSA-02-Studio(R)	NO (-72.6%)	NO
00-PBSA-07-Studio(R)	NO (-55.8%)	NO
00-PBSA-04-Studio(R)	NO (-72.6%)	NO
00-PBSA-03-Studio(R)	NO (-72.4%)	NO
00-PBSA-05-Studio(R)	NO (-70.7%)	NO
00-PBSA-09-Studio(R)	NO (-55%)	NO
00-PBSA-08-Studio(R)	NO (-55.6%)	NO
00-PBSA-10-Studio(P)	NO (-59.1%)	NO
00-PBSA-11-Studio(WCA)	NO (-64.4%)	NO
01-PBSA-01-Studio(R)	NO (-87.9%)	NO
01-PBSA-02-Studio(R)	NO (-75.8%)	NO
01-PBSA-03-Studio(R)	NO (-75.6%)	NO
01-PBSA-05-Studio(R)	NO (-75.6%)	NO
01-PBSA-04-Studio(R)	NO (-75.5%)	NO
01-PBSA-11-Studio(R)	NO (-72.3%)	NO
01-PBSA-12-Studio(R)	NO (-43.3%)	NO
01-PBSA-13-Studio(R)	NO (-44.4%)	NO
01-PBSA-14-Studio(R)	NO (-46.1%)	NO
01-PBSA-15-Studio(R)	NO (-49%)	NO
01-PBSA-06-Studio(P)	NO (-69.1%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
01-PBSA-07-Studio(P)	NO (-69.8%)	NO
01-PBSA-08-Studio(P)	NO (-70%)	NO
01-PBSA-09-Studio(WCA)	NO (-74.2%)	NO
01-PBSA-10-Studio(WCA)	NO (-81.8%)	NO
01-PBSA-16-Studio(R)	NO (-60.4%)	NO
01-PBSA-17-Studio(R)	NO (-54.3%)	NO
01-PBSA-18-Studio(R)	NO (-60%)	NO
01-PBSA-19-Studio(P)	NO (-67.9%)	NO
01-PBSA-20-Studio(P)	NO (-65.2%)	NO
01-PBSA-21-Studio(R)	NO (-46.8%)	NO
01-PBSA-22-Studio(R)	NO (-67.5%)	NO
01-PBSA-23-Studio(R)	NO (-65%)	NO
01-PBSA-24-Studio(R)	NO (-60.4%)	NO
01-PBSA-25-Studio(R)	NO (-59.5%)	NO
01-PBSA-26-Studio(R)	NO (-83.9%)	NO
01-PBSA-27-Studio(R)	NO (-80.9%)	NO
01-PBSA-28-Studio(R)	NO (-50.8%)	NO
01-PBSA-29-Studio(R)	NO (-50.6%)	NO
01-PBSA-30-Studio(R)	NO (-49.4%)	NO
01-PBSA-31-Studio(P)	NO (-54.7%)	NO
01-PBSA-32-Studio(WCA)	NO (-61.3%)	NO
02-PBSA-01-Studio(R)	NO (-87.2%)	NO
02-PBSA-02-Studio(R)	NO (-74.4%)	NO
02-PBSA-03-Studio(R)	NO (-74.4%)	NO
02-PBSA-05-Studio(R)	NO (-74.8%)	NO
02-PBSA-04-Studio(R)	NO (-74.5%)	NO
02-PBSA-11-Studio(R)	NO (-79.7%)	NO
02-PBSA-12-Studio(R)	NO (-58.3%)	NO
02-PBSA-13-Studio(R)	NO (-58.2%)	NO
02-PBSA-14-Studio(R)	NO (-58.3%)	NO
02-PBSA-15-Studio(R)	NO (-58.8%)	NO
02-PBSA-06-Studio(P)	NO (-68.3%)	NO
02-PBSA-07-Studio(P)	NO (-69.5%)	NO
02-PBSA-08-Studio(P)	NO (-69.6%)	NO
02-PBSA-09-Studio(WCA)	NO (-73.7%)	NO
02-PBSA-10-Studio(WCA)	NO (-81.5%)	NO
02-PBSA-16-Studio(R)	NO (-67.1%)	NO
02-PBSA-17-Studio(R)	NO (-63.6%)	NO
02-PBSA-18-Studio(R)	NO (-66.6%)	NO
02-PBSA-19-Studio(P)	NO (-69.5%)	NO
02-PBSA-20-Studio(P)	NO (-68.5%)	NO
02-PBSA-21-Studio(R)	NO (-52%)	NO
02-PBSA-22-Studio(R)	NO (-69.5%)	NO
02-PBSA-23-Studio(R)	NO (-66.4%)	NO
02-PBSA-24-Studio(R)	NO (-62.6%)	NO
02-PBSA-25-Studio(R)	NO (-59.4%)	NO
02-PBSA-26-Studio(R)	NO (-83.2%)	NO
02-PBSA-27-Studio(R)	NO (-80.1%)	NO
02-PBSA-28-Studio(R)	NO (-48.7%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
02-PBSA-29-Studio(R)	NO (-49%)	NO
02-PBSA-30-Studio(R)	NO (-48.7%)	NO
02-PBSA-31-Studio(P)	NO (-54.5%)	NO
02-PBSA-32-Studio(WCA)	NO (-60.8%)	NO
03-PBSA-01-Studio(R)	NO (-86.5%)	NO
03-PBSA-02-Studio(R)	NO (-73.1%)	NO
03-PBSA-03-Studio(R)	NO (-73%)	NO
03-PBSA-05-Studio(R)	NO (-73.3%)	NO
03-PBSA-04-Studio(R)	NO (-73.2%)	NO
03-PBSA-11-Studio(R)	NO (-79.7%)	NO
03-PBSA-12-Studio(R)	NO (-58.2%)	NO
03-PBSA-13-Studio(R)	NO (-58.1%)	NO
03-PBSA-14-Studio(R)	NO (-58%)	NO
03-PBSA-15-Studio(R)	NO (-58.3%)	NO
03-PBSA-06-Studio(P)	NO (-66.3%)	NO
03-PBSA-07-Studio(P)	NO (-67.4%)	NO
03-PBSA-08-Studio(P)	NO (-67.4%)	NO
03-PBSA-09-Studio(WCA)	NO (-71.6%)	NO
03-PBSA-10-Studio(WCA)	NO (-79.9%)	NO
03-PBSA-16-Studio(R)	NO (-66.4%)	NO
03-PBSA-17-Studio(R)	NO (-60.7%)	NO
03-PBSA-18-Studio(R)	NO (-64.4%)	NO
03-PBSA-19-Studio(P)	NO (-67.7%)	NO
03-PBSA-20-Studio(P)	NO (-68%)	NO
03-PBSA-21-Studio(R)	NO (-50.2%)	NO
03-PBSA-22-Studio(R)	NO (-68.2%)	NO
03-PBSA-23-Studio(R)	NO (-65.3%)	NO
03-PBSA-24-Studio(R)	NO (-60.9%)	NO
03-PBSA-25-Studio(R)	NO (-57.9%)	NO
03-PBSA-26-Studio(R)	NO (-83%)	NO
03-PBSA-27-Studio(R)	NO (-79.7%)	NO
03-PBSA-28-Studio(R)	NO (-48.1%)	NO
03-PBSA-29-Studio(R)	NO (-48.3%)	NO
03-PBSA-30-Studio(R)	NO (-48.1%)	NO
03-PBSA-31-Studio(P)	NO (-54%)	NO
03-PBSA-32-Studio(WCA)	NO (-60.2%)	NO
04-PBSA-01-Studio(R)	NO (-85%)	NO
04-PBSA-02-Studio(R)	NO (-69.6%)	NO
04-PBSA-03-Studio(R)	NO (-69.5%)	NO
04-PBSA-05-Studio(R)	NO (-69.6%)	NO
04-PBSA-04-Studio(R)	NO (-69.4%)	NO
04-PBSA-11-Studio(R)	NO (-79.6%)	NO
04-PBSA-12-Studio(R)	NO (-58.1%)	NO
04-PBSA-13-Studio(R)	NO (-58.1%)	NO
04-PBSA-14-Studio(R)	NO (-57.9%)	NO
04-PBSA-15-Studio(R)	NO (-58%)	NO
04-PBSA-06-Studio(P)	NO (-61.5%)	NO
04-PBSA-07-Studio(P)	NO (-62.8%)	NO
04-PBSA-08-Studio(P)	NO (-63.1%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
04-PBSA-09-Studio(WCA)	NO (-68%)	NO
04-PBSA-10-Studio(WCA)	NO (-77.7%)	NO
04-PBSA-16-Studio(R)	NO (-65.9%)	NO
04-PBSA-17-Studio(R)	NO (-59.4%)	NO
04-PBSA-18-Studio(R)	NO (-60.7%)	NO
04-PBSA-19-Studio(P)	NO (-64.5%)	NO
04-PBSA-20-Studio(P)	NO (-66.7%)	NO
04-PBSA-21-Studio(R)	NO (-46.6%)	NO
04-PBSA-22-Studio(R)	NO (-67%)	NO
04-PBSA-23-Studio(R)	NO (-61.5%)	NO
04-PBSA-24-Studio(R)	NO (-59.3%)	NO
04-PBSA-25-Studio(R)	NO (-56.6%)	NO
04-PBSA-26-Studio(R)	NO (-82.7%)	NO
04-PBSA-27-Studio(R)	NO (-79.7%)	NO
04-PBSA-28-Studio(R)	NO (-47.8%)	NO
04-PBSA-29-Studio(R)	NO (-48%)	NO
04-PBSA-30-Studio(R)	NO (-47.6%)	NO
04-PBSA-31-Studio(P)	NO (-53.7%)	NO
04-PBSA-32-Studio(WCA)	NO (-59.7%)	NO
05-PBSA-01-Studio(R)	NO (-83.8%)	NO
05-PBSA-02-Studio(R)	NO (-67.2%)	NO
05-PBSA-03-Studio(R)	NO (-67.4%)	NO
05-PBSA-05-Studio(R)	NO (-67.1%)	NO
05-PBSA-04-Studio(R)	NO (-67.1%)	NO
05-PBSA-11-Studio(R)	NO (-79.6%)	NO
05-PBSA-12-Studio(R)	NO (-58%)	NO
05-PBSA-13-Studio(R)	NO (-57.9%)	NO
05-PBSA-14-Studio(R)	NO (-57.7%)	NO
05-PBSA-15-Studio(R)	NO (-57.9%)	NO
05-PBSA-06-Studio(P)	NO (-57.8%)	NO
05-PBSA-07-Studio(P)	NO (-59.4%)	NO
05-PBSA-08-Studio(P)	NO (-59.2%)	NO
05-PBSA-09-Studio(WCA)	NO (-64.4%)	NO
05-PBSA-10-Studio(WCA)	NO (-75.1%)	NO
05-PBSA-16-Studio(R)	NO (-65.2%)	NO
05-PBSA-17-Studio(R)	NO (-58%)	NO
05-PBSA-18-Studio(R)	NO (-58.9%)	NO
05-PBSA-19-Studio(P)	NO (-61.1%)	NO
05-PBSA-20-Studio(P)	NO (-64.2%)	NO
05-PBSA-21-Studio(R)	NO (-45.1%)	NO
05-PBSA-32-Studio(WCA)	NO (-59.5%)	NO
05-PBSA-22-Studio(R)	NO (-84.9%)	NO
05-PBSA-31-Studio(P)	NO (-72.6%)	NO
05-PBSA-01-Studio(R)	NO (-81.7%)	NO
05-PBSA-02-Studio(R)	NO (-62.3%)	NO
05-PBSA-03-Studio(R)	NO (-62.3%)	NO
05-PBSA-05-Studio(R)	NO (-62.2%)	NO
05-PBSA-04-Studio(R)	NO (-62%)	NO
05-PBSA-11-Studio(R)	NO (-79.6%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
05-PBSA-12-Studio(R)	NO (-58%)	NO
05-PBSA-13-Studio(R)	NO (-57.9%)	NO
05-PBSA-14-Studio(R)	NO (-57.7%)	NO
05-PBSA-15-Studio(R)	NO (-57.7%)	NO
05-PBSA-06-Studio(P)	NO (-51.9%)	NO
05-PBSA-07-Studio(P)	NO (-54%)	NO
05-PBSA-08-Studio(P)	NO (-53.8%)	NO
05-PBSA-09-Studio(WCA)	NO (-60%)	NO
05-PBSA-10-Studio(WCA)	NO (-79.2%)	NO
05-PBSA-16-Studio(R)	NO (-64.9%)	NO
05-PBSA-17-Studio(R)	NO (-57.4%)	NO
05-PBSA-18-Studio(R)	NO (-57.3%)	NO
05-PBSA-19-Studio(P)	NO (-55.9%)	NO
05-PBSA-20-Studio(P)	NO (-62%)	NO
05-PBSA-21-Studio(R)	NO (-42.4%)	NO
05-PBSA-32-Studio(WCA)	NO (-74.3%)	NO
05-PBSA-22-Studio(R)	NO (-83%)	NO
05-PBSA-31-Studio(P)	NO (-72.9%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	6270.1	6270.1
External area [m^2]	5697.8	5697.8
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	3	3
Average conductance [W/K]	1513.7	2618.49
Average U-value [W/m^2K]	0.27	0.46
Alpha value* [%]	10.49	10

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

Building Use

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

Energy Consumption by End Use [kWh/m^2]

	Actual	Notional
Heating	4.74	7.29
Cooling	0.55	0.34
Auxiliary	3.88	4.5
Lighting	5.94	6.92
Hot water	4.04	5.9
Equipment*	21.38	21.38
TOTAL**	**19.15**	**24.96**

* Energy used by equipment does not count towards the total for consumption or calculating emissions.
** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m^2]

	Actual	Notional
Photovoltaic systems	3.48	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*3.48*	*0*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	60.58	76.41
Primary energy [kWh_{PE}/m^2]	23.42	37.2
Total emissions [kg/m^2]	2.22	3.48

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Central heating using water: radiators, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	16.5	0	1.5	0	11.6	3.06	0	3.26	0
	Notional	108.3	0	10.8	0	16.8	2.78	0	----	----
[ST] Central heating using water: radiators, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	70.9	0	6.4	0	4.1	3.06	0	3.26	0
	Notional	100	0	10	0	4.4	2.78	0	----	----
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	1.2	73.6	0.1	4.9	4.8	3.56	4.16	3.46	6
	Notional	7.5	30.7	0.7	3	9.2	2.78	2.84	----	----
[ST] Central heating using water: radiators, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	46.7	0	4.2	0	1.9	3.06	0	3.26	0
	Notional	64.3	0	6.4	0	1.9	2.78	0	----	----
[ST] Central heating using water: radiators, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	63.2	0	5.7	0	3.7	3.06	0	3.26	0
	Notional	86.1	0	8.6	0	4.3	2.78	0	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----

Key to terms

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

Appendix D - Overheating Results

Scenario 1 DSY1 Overheating Results

Scenario 1 DSY1 CIBSE TM59 Results				
Room Names	**Criteria a % Hours >26°C**	**Pass/Fail?**	**Criteria b Total Hours >26°C (22:00 - 07:00) (Bedrooms Only)**	**Pass/Fail?**
00-C3-01-DUP-KLR	1.40	Pass	N/A	-
00-C3-02-DUP-KLR	1.40	Pass	N/A	-
00-C3-03-2B3P-Double Bedroom	0.70	Pass	13	Pass
00-C3-03-2B3P-KLR	1.10	Pass	N/A	-
00-C3-03-2B3P-Single Bedroom	0.80	Pass	12	Pass
00-C3-03-DUP-KLR	1.60	Pass	N/A	-
00-PBSA-22-Studio-NW	0.60	Pass	27	Pass
00-PBSA-23-Studio-NW	0.70	Pass	29	Pass
00-PBSA-24-Studio-NW	0.70	Pass	29	Pass
00-PBSA-25-Studio-NW	0.70	Pass	27	Pass
00-PBSA-26-Studio-NW	0.70	Pass	26	Pass
00-PBSA-27-Studio-SE	0.80	Pass	26	Pass
00-PBSA-28-Studio-SE	0.70	Pass	30	Pass
00-PBSA-29-Studio-SE	0.70	Pass	30	Pass
00-PBSA-30-Studio-SE	0.70	Pass	29	Pass
00-PBSA-31-Premium Studio-SE	0.60	Pass	25	Pass
00-PBSA-32-Acc Studio-SE	0.60	Pass	23	Pass
01-C3-01-DUP-Double Bedroom 1	0.50	Pass	12	Pass
01-C3-01-DUP-Double Bedroom 2	0.40	Pass	11	Pass
01-C3-01-DUP-Single Bedroom	0.70	Pass	10	Pass
01-C3-02-DUP-Double Bedroom 1	0.60	Pass	12	Pass
01-C3-02-DUP-Double Bedroom 2	0.40	Pass	11	Pass
01-C3-02-DUP-Single Bedroom	0.70	Pass	11	Pass
01-C3-03-DUP-Double Bedroom 1	0.80	Pass	13	Pass
01-C3-03-DUP-Double Bedroom 2	0.60	Pass	12	Pass
01-C3-03-DUP-Single Bedroom	0.70	Pass	11	Pass
02-C3-01-3B5P-Double Bedroom 1	0.50	Pass	13	Pass
02-C3-01-3B5P-Double Bedroom 2	0.60	Pass	14	Pass
02-C3-01-3B5P-KLR	1.00	Pass	N/A	-
02-C3-01-3B5P-Single Bedroom	0.50	Pass	10	Pass
02-C3-02-2B3P-Double Bedroom	0.60	Pass	11	Pass
02-C3-02-2B3P-KLR	1.30	Pass	N/A	-
02-C3-02-2B3P-Single Bedroom	0.60	Pass	11	Pass
02-C3-03-2B3P-Double Bedroom	0.50	Pass	13	Pass
02-C3-03-2B3P-KLR	0.70	Pass	N/A	-
02-C3-03-2B3P-Single Bedroom	0.50	Pass	9	Pass
02-C3-04-2B3P-Double Bedroom	0.50	Pass	10	Pass

Scenario 1 DSY1 CIBSE TM59 Results				
Room Names	**Criteria a % Hours >26°C**	**Pass/Fail?**	**Criteria b Total Hours >26°C (22:00 - 07:00) (Bedrooms Only)**	**Pass/Fail?**
02-C3-04-2B3P-KLR	1.10	Pass	N/A	-
02-C3-04-2B3P-Single Bedroom	0.70	Pass	10	Pass
02-C3-05-3B4P-Double Bedroom	0.50	Pass	10	Pass
02-C3-05-3B4P-KLR	1.30	Pass	N/A	-
02-C3-05-3B4P-Single Bedroom	0.80	Pass	10	Pass
02-C3-05-3B4P-Single Bedroom	0.70	Pass	10	Pass
02-PBSA-01-Studio-N	0.50	Pass	20	Pass
02-PBSA-02-Studio-N	0.50	Pass	21	Pass
02-PBSA-03-Studio-N	0.50	Pass	21	Pass
02-PBSA-04-Studio-N	0.50	Pass	21	Pass
02-PBSA-05-Studio-N	0.50	Pass	20	Pass
02-PBSA-06-Premium Studio-N	0.40	Pass	20	Pass
02-PBSA-07-Premium Studio-N	0.40	Pass	20	Pass
02-PBSA-08-Premium Studio-N	0.40	Pass	20	Pass
02-PBSA-09-Acc Studio-N	0.40	Pass	20	Pass
02-PBSA-10-Acc Studio-N	0.40	Pass	19	Pass
02-PBSA-11-Studio-S	0.60	Pass	28	Pass
02-PBSA-12-Studio-S	0.60	Pass	29	Pass
02-PBSA-13-Studio-S	0.60	Pass	29	Pass
02-PBSA-14-Studio-S	0.60	Pass	29	Pass
02-PBSA-15-Studio-S	0.60	Pass	28	Pass
02-PBSA-16-Studio-S	0.50	Pass	28	Pass
02-PBSA-17-Studio-S	0.50	Pass	28	Pass
02-PBSA-18-Studio-S	0.50	Pass	28	Pass
02-PBSA-19-Premium Studio-S	0.40	Pass	22	Pass
02-PBSA-20-Premium Studio-W	0.40	Pass	22	Pass
02-PBSA-21-Studio-W	0.50	Pass	23	Pass
02-PBSA-22-Studio-NW	0.50	Pass	23	Pass
02-PBSA-23-Studio-NW	0.50	Pass	25	Pass
02-PBSA-24-Studio-NW	0.60	Pass	25	Pass
02-PBSA-25-Studio-NW	0.60	Pass	26	Pass
02-PBSA-26-Studio-NW	0.70	Pass	25	Pass
02-PBSA-27-Studio-SE	0.60	Pass	26	Pass
02-PBSA-28-Studio-SE	0.60	Pass	26	Pass
02-PBSA-29-Studio-SE	0.60	Pass	26	Pass
02-PBSA-30-Studio-SE	0.50	Pass	26	Pass
02-PBSA-31-Premium Studio-SE	0.50	Pass	22	Pass
02-PBSA-32-Acc Studio-SE	0.40	Pass	22	Pass
05-C3-01-3B5P-Double Bedroom 1	0.60	Pass	14	Pass
05-C3-01-3B5P-Double Bedroom 2	0.60	Pass	14	Pass

Scenario 1 DSY1 CIBSE TM59 Results				
Room Names	**Criteria a % Hours >26°C**	**Pass/Fail?**	**Criteria b Total Hours >26°C (22:00 - 07:00) (Bedrooms Only)**	**Pass/Fail?**
05-C3-01-3B5P-KLR	1.10	Pass	N/A	-
05-C3-01-3B5P-Single Bedroom	0.50	Pass	11	Pass
05-C3-02-2B3P-Double Bedroom	0.70	Pass	12	Pass
05-C3-02-2B3P-KLR	1.40	Pass	N/A	-
05-C3-02-2B3P-Single Bedroom	0.70	Pass	12	Pass
05-C3-03-2B3P-Double Bedroom	0.50	Pass	14	Pass
05-C3-03-2B3P-KLR	0.90	Pass	N/A	-
05-C3-03-2B3P-Single Bedroom	0.50	Pass	9	Pass
05-C3-04-2B3P-Double Bedroom	0.70	Pass	10	Pass
05-C3-04-2B3P-KLR	1.30	Pass	N/A	-
05-C3-04-2B3P-Single Bedroom	0.80	Pass	11	Pass
05-C3-05-3B4P-Double Bedroom	0.70	Pass	10	Pass
05-C3-05-3B4P-KLR	1.40	Pass	N/A	-
05-C3-05-3B4P-Single Bedroom	0.80	Pass	10	Pass
05-C3-05-3B4P-Single Bedroom	0.80	Pass	10	Pass
06-PBSA-01-Studio-N	0.60	Pass	22	Pass
06-PBSA-02-Studio-N	0.50	Pass	22	Pass
06-PBSA-03-Studio-N	0.50	Pass	22	Pass
06-PBSA-04-Studio-N	0.50	Pass	22	Pass
06-PBSA-05-Studio-N	0.50	Pass	23	Pass
06-PBSA-06-Premium Studio-N	0.50	Pass	24	Pass
06-PBSA-07-Premium Studio-N	0.50	Pass	24	Pass
06-PBSA-08-Premium Studio-N	0.50	Pass	24	Pass
06-PBSA-09-Acc Studio-N	0.50	Pass	23	Pass
06-PBSA-10-Acc Studio-N	0.50	Pass	23	Pass
06-PBSA-11-Studio-S	0.70	Pass	31	Pass
06-PBSA-12-Studio-S	0.70	Pass	31	Pass
06-PBSA-13-Studio-S	0.70	Pass	32	Pass
06-PBSA-14-Studio-S	0.70	Pass	32	Pass
06-PBSA-15-Studio-S	0.70	Pass	31	Pass
06-PBSA-16-Studio-S	0.60	Pass	31	Pass
06-PBSA-17-Studio-S	0.70	Pass	31	Pass
06-PBSA-18-Studio-S	0.70	Pass	30	Pass
06-PBSA-19-Premium Studio-S	0.40	Pass	26	Pass
06-PBSA-20-Premium Studio-W	0.50	Pass	26	Pass
06-PBSA-21-Studio-W	0.50	Pass	26	Pass
06-PBSA-22-Studio-NW	0.60	Pass	25	Pass
06-PBSA-31-Premium Studio-SE	0.50	Pass	25	Pass
06-PBSA-32-Acc Studio-SE	0.50	Pass	25	Pass

Scenario 2 DSY1 Overheating Results

Scenario 2 DSY1 CIBSE TM59 Results				
Room Names	**Criteria a % Hours >26°C**	**Pass/Fail?**	**Criteria b Total Hours >26°C (22:00 - 07:00) (Bedrooms Only)**	**Pass/Fail?**
00-C3-01-DUP-KLR	1.50	Pass	N/A	-
00-C3-02-DUP-KLR	1.70	Pass	N/A	-
00-C3-03-2B3P-Double Bedroom	1.00	Pass	23	Pass
00-C3-03-2B3P-KLR	1.30	Pass	N/A	-
00-C3-03-2B3P-Single Bedroom	1.10	Pass	55	Fail
00-C3-03-DUP-KLR	1.80	Pass	N/A	-
00-PBSA-22-Studio-NW	2.30	Pass	84	Fail
00-PBSA-23-Studio-NW	2.20	Pass	193	Fail
00-PBSA-24-Studio-NW	2.10	Pass	193	Fail
00-PBSA-25-Studio-NW	2.10	Pass	193	Fail
00-PBSA-26-Studio-NW	2.30	Pass	185	Fail
00-PBSA-27-Studio-SE	2.80	Pass	91	Fail
00-PBSA-28-Studio-SE	2.50	Pass	91	Fail
00-PBSA-29-Studio-SE	2.50	Pass	92	Fail
00-PBSA-30-Studio-SE	2.30	Pass	92	Fail
00-PBSA-31-Premium Studio-SE	2.00	Pass	177	Fail
00-PBSA-32-Acc Studio-SE	1.70	Pass	170	Fail
01-C3-01-DUP-Double Bedroom 1	0.70	Pass	134	Fail
01-C3-01-DUP-Double Bedroom 2	0.60	Pass	136	Fail
01-C3-01-DUP-Single Bedroom	0.70	Pass	51	Fail
01-C3-02-DUP-Double Bedroom 1	0.70	Pass	51	Fail
01-C3-02-DUP-Double Bedroom 2	0.70	Pass	54	Fail
01-C3-02-DUP-Single Bedroom	0.70	Pass	51	Fail
01-C3-03-DUP-Double Bedroom 1	1.00	Pass	124	Fail
01-C3-03-DUP-Double Bedroom 2	0.70	Pass	48	Fail
01-C3-03-DUP-Single Bedroom	0.70	Pass	41	Fail
01-PBSA-22-Studio-NW	1.20	Pass	73	Fail
01-PBSA-23-Studio-NW	1.50	Pass	75	Fail
01-PBSA-24-Studio-NW	1.40	Pass	75	Fail
01-PBSA-25-Studio-NW	1.40	Pass	74	Fail
01-PBSA-26-Studio-NW	1.60	Pass	75	Fail
01-PBSA-27-Studio-SE	1.50	Pass	77	Fail
01-PBSA-28-Studio-SE	1.30	Pass	77	Fail
01-PBSA-29-Studio-SE	1.20	Pass	77	Fail
01-PBSA-30-Studio-SE	1.00	Pass	73	Fail
01-PBSA-31-Premium Studio-SE	0.80	Pass	44	Fail
01-PBSA-32-Acc Studio-SE	0.70	Pass	69	Fail
02-C3-01-3B5P-Double Bedroom 1	0.80	Pass	29	Pass
02-C3-01-3B5P-Double Bedroom 2	0.80	Pass	26	Pass

Scenario 2 DSY1 CIBSE TM59 Results				
Room Names	Criteria a % Hours >26°C	Pass/Fail?	Criteria b Total Hours >26°C (22:00 - 07:00) (Bedrooms Only)	Pass/Fail?
02-C3-01-3B5P-KLR	1.20	Pass	N/A	-
02-C3-01-3B5P-Single Bedroom	0.50	Pass	58	Fail
02-C3-02-2B3P-Double Bedroom	0.80	Pass	97	Fail
02-C3-02-2B3P-KLR	1.30	Pass	N/A	-
02-C3-02-2B3P-Single Bedroom	0.70	Pass	13	Pass
02-C3-03-2B3P-Double Bedroom	0.50	Pass	15	Pass
02-C3-03-2B3P-KLR	1.00	Pass	N/A	-
02-C3-03-2B3P-Single Bedroom	0.50	Pass	37	Fail
02-C3-04-2B3P-Double Bedroom	0.70	Pass	49	Fail
02-C3-04-2B3P-KLR	1.20	Pass	N/A	-
02-C3-04-2B3P-Single Bedroom	0.70	Pass	16	Pass
02-C3-05-3B4P-Double Bedroom	0.70	Pass	18	Pass
02-C3-05-3B4P-KLR	1.40	Pass	N/A	-
02-C3-05-3B4P-Single Bedroom	0.90	Pass	64	Fail
02-C3-05-3B4P-Single Bedroom	0.70	Pass	56	Fail
02-PBSA-01-Studio-N	1.60	Pass	215	Fail
02-PBSA-02-Studio-N	1.60	Pass	107	Fail
02-PBSA-03-Studio-N	1.60	Pass	216	Fail
02-PBSA-04-Studio-N	1.60	Pass	216	Fail
02-PBSA-05-Studio-N	1.40	Pass	215	Fail
02-PBSA-06-Premium Studio-N	1.10	Pass	210	Fail
02-PBSA-07-Premium Studio-N	1.10	Pass	102	Fail
02-PBSA-08-Premium Studio-N	1.00	Pass	101	Fail
02-PBSA-09-Acc Studio-N	1.00	Pass	100	Fail
02-PBSA-10-Acc Studio-N	0.90	Pass	99	Fail
02-PBSA-11-Studio-S	1.40	Pass	185	Fail
02-PBSA-12-Studio-S	1.40	Pass	187	Fail
02-PBSA-13-Studio-S	1.40	Pass	185	Fail
02-PBSA-14-Studio-S	1.40	Pass	184	Fail
02-PBSA-15-Studio-S	1.20	Pass	95	Fail
02-PBSA-16-Studio-S	1.00	Pass	92	Fail
02-PBSA-17-Studio-S	1.10	Pass	92	Fail
02-PBSA-18-Studio-S	1.10	Pass	99	Fail
02-PBSA-19-Premium Studio-S	0.60	Pass	169	Fail
02-PBSA-20-Premium Studio-W	0.80	Pass	81	Fail
02-PBSA-21-Studio-W	1.10	Pass	89	Fail
02-PBSA-22-Studio-NW	1.40	Pass	83	Fail
02-PBSA-23-Studio-NW	1.50	Pass	50	Fail
02-PBSA-24-Studio-NW	1.80	Pass	79	Fail
02-PBSA-25-Studio-NW	1.80	Pass	51	Fail

Scenario 2 DSY1 CIBSE TM59 Results				
Room Names	Criteria a % Hours >26°C	Pass/Fail?	Criteria b Total Hours >26°C (22:00 - 07:00) (Bedrooms Only)	Pass/Fail?
02-PBSA-26-Studio-NW	2.10	Pass	49	Fail
02-PBSA-27-Studio-SE	1.50	Pass	50	Fail
02-PBSA-28-Studio-SE	1.20	Pass	101	Fail
02-PBSA-29-Studio-SE	1.20	Pass	124	Fail
02-PBSA-30-Studio-SE	1.10	Pass	114	Fail
02-PBSA-31-Premium Studio-SE	0.80	Pass	45	Fail
02-PBSA-32-Acc Studio-SE	0.70	Pass	45	Fail
05-C3-01-3B5P-Double Bedroom 1	0.80	Pass	25	Pass
05-C3-01-3B5P-Double Bedroom 2	0.80	Pass	57	Fail
05-C3-01-3B5P-KLR	1.20	Pass	N/A	-
05-C3-01-3B5P-Single Bedroom	0.70	Pass	15	Pass
05-C3-02-2B3P-Double Bedroom	0.80	Pass	48	Fail
05-C3-02-2B3P-KLR	1.40	Pass	N/A	-
05-C3-02-2B3P-Single Bedroom	0.80	Pass	41	Fail
05-C3-03-2B3P-Double Bedroom	0.70	Pass	44	Fail
05-C3-03-2B3P-KLR	1.00	Pass	N/A	-
05-C3-03-2B3P-Single Bedroom	0.60	Pass	15	Pass
05-C3-04-2B3P-Double Bedroom	1.00	Pass	52	Fail
05-C3-04-2B3P-KLR	1.30	Pass	N/A	-
05-C3-04-2B3P-Single Bedroom	1.10	Pass	16	Pass
05-C3-05-3B4P-Double Bedroom	0.80	Pass	51	Fail
05-C3-05-3B4P-KLR	1.50	Pass	N/A	-
05-C3-05-3B4P-Single Bedroom	1.00	Pass	19	Pass
05-C3-05-3B4P-Single Bedroom	0.90	Pass	92	Fail
06-PBSA-01-Studio-N	1.90	Pass	126	Fail
06-PBSA-02-Studio-N	1.90	Pass	113	Fail
06-PBSA-03-Studio-N	1.90	Pass	96	Fail
06-PBSA-04-Studio-N	1.90	Pass	95	Fail
06-PBSA-05-Studio-N	1.80	Pass	95	Fail
06-PBSA-06-Premium Studio-N	1.50	Pass	93	Fail
06-PBSA-07-Premium Studio-N	1.60	Pass	92	Fail
06-PBSA-08-Premium Studio-N	1.60	Pass	93	Fail
06-PBSA-09-Acc Studio-N	1.50	Pass	97	Fail
06-PBSA-10-Acc Studio-N	1.50	Pass	96	Fail
06-PBSA-11-Studio-S	1.50	Pass	87	Fail
06-PBSA-12-Studio-S	1.50	Pass	86	Fail
06-PBSA-13-Studio-S	1.50	Pass	83	Fail
06-PBSA-14-Studio-S	1.50	Pass	84	Fail
06-PBSA-15-Studio-S	1.40	Pass	82	Fail
06-PBSA-16-Studio-S	1.20	Pass	82	Fail

Scenario 2 DSY1 CIBSE TM59 Results				
Room Names	**Criteria a % Hours >26°C**	**Pass/Fail?**	**Criteria b Total Hours >26°C (22:00 - 07:00) (Bedrooms Only)**	**Pass/Fail?**
06-PBSA-17-Studio-S	1.40	Pass	82	Fail
06-PBSA-18-Studio-S	1.40	Pass	82	Fail
06-PBSA-19-Premium Studio-S	0.90	Pass	75	Fail
06-PBSA-20-Premium Studio-W	1.50	Pass	79	Fail
06-PBSA-21-Studio-W	2.00	Pass	79	Fail
06-PBSA-22-Studio-NW	2.10	Pass	77	Fail
06-PBSA-31-Premium Studio-SE	1.30	Pass	81	Fail
06-PBSA-32-Acc Studio-SE	1.20	Pass	76	Fail

Scenario 3 DSY1 Overheating Results

Scenario 3 DSY1 CIBSE TM59 Results				
Room Names	**Criteria a % Hours >26°C**	**Pass/Fail?**	**Criteria b Total Hours >26°C (22:00 - 07:00) (Bedrooms Only)**	**Pass/Fail?**
00-C3-01-DUP-KLR	1.40	Pass	N/A	-
00-C3-02-DUP-KLR	1.50	Pass	N/A	-
00-C3-03-2B3P-Double Bedroom	0.80	Pass	19	Pass
00-C3-03-2B3P-KLR	1.20	Pass	N/A	-
00-C3-03-2B3P-Single Bedroom	0.90	Pass	17	Pass
00-C3-03-DUP-KLR	1.60	Pass	N/A	-
00-PBSA-22-Studio-NW	1.00	Pass	30	Pass
00-PBSA-23-Studio-NW	0.90	Pass	31	Pass
00-PBSA-24-Studio-NW	0.90	Pass	31	Pass
00-PBSA-25-Studio-NW	0.90	Pass	31	Pass
00-PBSA-26-Studio-NW	1.00	Pass	29	Pass
00-PBSA-27-Studio-SE	1.10	Pass	31	Pass
00-PBSA-28-Studio-SE	0.90	Pass	31	Pass
00-PBSA-29-Studio-SE	0.90	Pass	31	Pass
00-PBSA-30-Studio-SE	0.90	Pass	31	Pass
00-PBSA-31-Premium Studio-SE	0.80	Pass	31	Pass
00-PBSA-32-Acc Studio-SE	0.70	Pass	29	Pass
01-C3-01-DUP-Double Bedroom 1	0.40	Pass	9	Pass
01-C3-01-DUP-Double Bedroom 2	0.30	Pass	9	Pass
01-C3-01-DUP-Single Bedroom	0.50	Pass	8	Pass
01-C3-02-DUP-Double Bedroom 1	0.40	Pass	9	Pass
01-C3-02-DUP-Double Bedroom 2	0.30	Pass	10	Pass
01-C3-02-DUP-Single Bedroom	0.50	Pass	8	Pass

Scenario 3 DSY1 CIBSE TM59 Results				
Room Names	**Criteria a % Hours >26°C**	**Pass/Fail?**	**Criteria b Total Hours >26°C (22:00 - 07:00) (Bedrooms Only)**	**Pass/Fail?**
01-C3-03-DUP-Double Bedroom 1	0.50	Pass	9	Pass
01-C3-03-DUP-Double Bedroom 2	0.40	Pass	9	Pass
01-C3-03-DUP-Single Bedroom	0.50	Pass	8	Pass
01-PBSA-22-Studio-NW	0.50	Pass	25	Pass
01-PBSA-23-Studio-NW	0.70	Pass	26	Pass
01-PBSA-24-Studio-NW	0.70	Pass	26	Pass
01-PBSA-25-Studio-NW	0.60	Pass	26	Pass
01-PBSA-26-Studio-NW	0.60	Pass	25	Pass
01-PBSA-27-Studio-SE	0.70	Pass	26	Pass
01-PBSA-28-Studio-SE	0.60	Pass	27	Pass
01-PBSA-29-Studio-SE	0.60	Pass	27	Pass
01-PBSA-30-Studio-SE	0.50	Pass	27	Pass
01-PBSA-31-Premium Studio-SE	0.40	Pass	27	Pass
01-PBSA-32-Acc Studio-SE	0.40	Pass	26	Pass
02-C3-01-3B5P-Double Bedroom 1	0.10	Pass	5	Pass
02-C3-01-3B5P-Double Bedroom 2	0.10	Pass	7	Pass
02-C3-01-3B5P-KLR	0.90	Pass	N/A	-
02-C3-01-3B5P-Single Bedroom	0.40	Pass	8	Pass
02-C3-02-2B3P-Double Bedroom	0.50	Pass	7	Pass
02-C3-02-2B3P-KLR	1.20	Pass	N/A	-
02-C3-02-2B3P-Single Bedroom	0.30	Pass	7	Pass
02-C3-03-2B3P-Double Bedroom	0.50	Pass	15	Pass
02-C3-03-2B3P-KLR	0.90	Pass	N/A	-
02-C3-03-2B3P-Single Bedroom	0.50	Pass	14	Pass
02-C3-04-2B3P-Double Bedroom	0.40	Pass	6	Pass
02-C3-04-2B3P-KLR	0.90	Pass	N/A	-
02-C3-04-2B3P-Single Bedroom	0.20	Pass	6	Pass
02-C3-05-3B4P-Double Bedroom	0.50	Pass	7	Pass
02-C3-05-3B4P-KLR	1.20	Pass	N/A	-
02-C3-05-3B4P-Single Bedroom	0.50	Pass	6	Pass
02-C3-05-3B4P-Single Bedroom	0.50	Pass	8	Pass
02-PBSA-01-Studio-N	0.00	Pass	0	Pass
02-PBSA-02-Studio-N	0.00	Pass	0	Pass
02-PBSA-03-Studio-N	0.00	Pass	0	Pass
02-PBSA-04-Studio-N	0.00	Pass	0	Pass
02-PBSA-05-Studio-N	0.00	Pass	0	Pass
02-PBSA-06-Premium Studio-N	0.00	Pass	0	Pass
02-PBSA-07-Premium Studio-N	0.00	Pass	0	Pass
02-PBSA-08-Premium Studio-N	0.00	Pass	0	Pass
02-PBSA-09-Acc Studio-N	0.00	Pass	0	Pass

Scenario 3 DSY1 CIBSE TM59 Results				
Room Names	Criteria a % Hours >26°C	Pass/Fail?	Criteria b Total Hours >26°C (22:00 - 07:00) (Bedrooms Only)	Pass/Fail?
02-PBSA-10-Acc Studio-N	0.00	Pass	0	Pass
02-PBSA-11-Studio-S	0.50	Pass	25	Pass
02-PBSA-12-Studio-S	0.50	Pass	26	Pass
02-PBSA-13-Studio-S	0.50	Pass	26	Pass
02-PBSA-14-Studio-S	0.50	Pass	26	Pass
02-PBSA-15-Studio-S	0.50	Pass	25	Pass
02-PBSA-16-Studio-S	0.40	Pass	24	Pass
02-PBSA-17-Studio-S	0.40	Pass	25	Pass
02-PBSA-18-Studio-S	0.40	Pass	24	Pass
02-PBSA-19-Premium Studio-S	0.20	Pass	20	Pass
02-PBSA-20-Premium Studio-W	0.30	Pass	22	Pass
02-PBSA-21-Studio-W	0.40	Pass	24	Pass
02-PBSA-22-Studio-NW	0.40	Pass	23	Pass
02-PBSA-23-Studio-NW	0.50	Pass	23	Pass
02-PBSA-24-Studio-NW	0.60	Pass	23	Pass
02-PBSA-25-Studio-NW	0.60	Pass	23	Pass
02-PBSA-26-Studio-NW	0.70	Pass	23	Pass
02-PBSA-27-Studio-SE	0.60	Pass	23	Pass
02-PBSA-28-Studio-SE	0.50	Pass	23	Pass
02-PBSA-29-Studio-SE	0.50	Pass	23	Pass
02-PBSA-30-Studio-SE	0.50	Pass	23	Pass
02-PBSA-31-Premium Studio-SE	0.30	Pass	23	Pass
02-PBSA-32-Acc Studio-SE	0.30	Pass	23	Pass
05-C3-01-3B5P-Double Bedroom 1	0.20	Pass	10	Pass
05-C3-01-3B5P-Double Bedroom 2	0.30	Pass	10	Pass
05-C3-01-3B5P-KLR	1.00	Pass	N/A	-
05-C3-01-3B5P-Single Bedroom	0.40	Pass	9	Pass
05-C3-02-2B3P-Double Bedroom	0.50	Pass	7	Pass
05-C3-02-2B3P-KLR	1.20	Pass	N/A	-
05-C3-02-2B3P-Single Bedroom	0.40	Pass	8	Pass
05-C3-03-2B3P-Double Bedroom	0.70	Pass	15	Pass
05-C3-03-2B3P-KLR	1.00	Pass	N/A	-
05-C3-03-2B3P-Single Bedroom	0.60	Pass	15	Pass
05-C3-04-2B3P-Double Bedroom	0.50	Pass	6	Pass
05-C3-04-2B3P-KLR	1.10	Pass	N/A	-
05-C3-04-2B3P-Single Bedroom	0.40	Pass	8	Pass
05-C3-05-3B4P-Double Bedroom	0.50	Pass	10	Pass
05-C3-05-3B4P-KLR	1.30	Pass	N/A	-
05-C3-05-3B4P-Single Bedroom	0.70	Pass	7	Pass
05-C3-05-3B4P-Single Bedroom	0.70	Pass	9	Pass

Scenario 3 DSY1 CIBSE TM59 Results				
Room Names	Criteria a % Hours >26°C	Pass/Fail?	Criteria b Total Hours >26°C (22:00 - 07:00) (Bedrooms Only)	Pass/Fail?
06-PBSA-01-Studio-N	0.00	Pass	0	Pass
06-PBSA-02-Studio-N	0.00	Pass	0	Pass
06-PBSA-03-Studio-N	0.00	Pass	0	Pass
06-PBSA-04-Studio-N	0.00	Pass	0	Pass
06-PBSA-05-Studio-N	0.00	Pass	0	Pass
06-PBSA-06-Premium Studio-N	0.00	Pass	0	Pass
06-PBSA-07-Premium Studio-N	0.00	Pass	0	Pass
06-PBSA-08-Premium Studio-N	0.00	Pass	0	Pass
06-PBSA-09-Acc Studio-N	0.00	Pass	0	Pass
06-PBSA-10-Acc Studio-N	0.00	Pass	0	Pass
06-PBSA-11-Studio-S	0.50	Pass	28	Pass
06-PBSA-12-Studio-S	0.50	Pass	28	Pass
06-PBSA-13-Studio-S	0.50	Pass	28	Pass
06-PBSA-14-Studio-S	0.50	Pass	28	Pass
06-PBSA-15-Studio-S	0.50	Pass	27	Pass
06-PBSA-16-Studio-S	0.50	Pass	27	Pass
06-PBSA-17-Studio-S	0.50	Pass	27	Pass
06-PBSA-18-Studio-S	0.50	Pass	27	Pass
06-PBSA-19-Premium Studio-S	0.20	Pass	24	Pass
06-PBSA-20-Premium Studio-W	0.40	Pass	24	Pass
06-PBSA-21-Studio-W	0.50	Pass	25	Pass
06-PBSA-22-Studio-NW	0.70	Pass	26	Pass
06-PBSA-31-Premium Studio-SE	0.50	Pass	27	Pass
06-PBSA-32-Acc Studio-SE	0.40	Pass	26	Pass

Scenario 4 DSY2 Overheating Results

Scenario 4 DSY 2 CIBSE TM59 Results				
Room Names	Criteria a % Hours >26°C	Pass/Fail?	Criteria b Total Hours >26°C (22:00 - 07:00) (Bedrooms Only)	Pass/Fail?
00-C3-01-DUP-KLR	3.20	Fail	N/A	-
00-C3-02-DUP-KLR	3.20	Fail	N/A	-
00-C3-03-2B3P-Double Bedroom	2.00	Pass	50	Fail
00-C3-03-2B3P-KLR	3.10	Fail	N/A	-
00-C3-03-2B3P-Single Bedroom	2.10	Pass	46	Fail
00-C3-03-DUP-KLR	3.50	Fail	N/A	-
00-PBSA-22-Studio-NW	2.20	Pass	70	Fail
00-PBSA-23-Studio-NW	2.30	Pass	68	Fail

Scenario 4 DSY 2 CIBSE TM59 Results				
Room Names	Criteria a % Hours >26°C	Pass/Fail?	Criteria b Total Hours >26°C (22:00 - 07:00) (Bedrooms Only)	Pass/Fail?
00-PBSA-24-Studio-NW	2.30	Pass	68	Fail
00-PBSA-25-Studio-NW	2.30	Pass	68	Fail
00-PBSA-26-Studio-NW	2.40	Pass	66	Fail
00-PBSA-27-Studio-SE	2.50	Pass	68	Fail
00-PBSA-28-Studio-SE	2.40	Pass	69	Fail
00-PBSA-29-Studio-SE	2.40	Pass	69	Fail
00-PBSA-30-Studio-SE	2.30	Pass	70	Fail
00-PBSA-31-Premium Studio-SE	2.20	Pass	71	Fail
00-PBSA-32-Acc Studio-SE	2.20	Pass	70	Fail
01-C3-01-DUP-Double Bedroom 1	1.10	Pass	30	Pass
01-C3-01-DUP-Double Bedroom 2	1.00	Pass	43	Fail
01-C3-01-DUP-Single Bedroom	1.30	Pass	23	Pass
01-C3-02-DUP-Double Bedroom 1	1.10	Pass	30	Pass
01-C3-02-DUP-Double Bedroom 2	1.00	Pass	42	Fail
01-C3-02-DUP-Single Bedroom	1.30	Pass	24	Pass
01-C3-03-DUP-Double Bedroom 1	1.40	Pass	28	Pass
01-C3-03-DUP-Double Bedroom 2	1.10	Pass	38	Fail
01-C3-03-DUP-Single Bedroom	1.30	Pass	24	Pass
01-PBSA-22-Studio-NW	1.60	Pass	68	Fail
01-PBSA-23-Studio-NW	1.80	Pass	69	Fail
01-PBSA-24-Studio-NW	1.80	Pass	68	Fail
01-PBSA-25-Studio-NW	1.80	Pass	68	Fail
01-PBSA-26-Studio-NW	1.80	Pass	68	Fail
01-PBSA-27-Studio-SE	1.90	Pass	69	Fail
01-PBSA-28-Studio-SE	1.80	Pass	70	Fail
01-PBSA-29-Studio-SE	1.80	Pass	70	Fail
01-PBSA-30-Studio-SE	1.70	Pass	70	Fail
01-PBSA-31-Premium Studio-SE	1.60	Pass	70	Fail
01-PBSA-32-Acc Studio-SE	1.60	Pass	70	Fail
02-C3-01-3B5P-Double Bedroom 1	0.70	Pass	27	Pass
02-C3-01-3B5P-Double Bedroom 2	0.80	Pass	28	Pass
02-C3-01-3B5P-KLR	2.40	Pass	N/A	-
02-C3-01-3B5P-Single Bedroom	1.40	Pass	27	Pass
02-C3-02-2B3P-Double Bedroom	1.00	Pass	26	Pass
02-C3-02-2B3P-KLR	2.50	Pass	N/A	-
02-C3-02-2B3P-Single Bedroom	0.80	Pass	23	Pass
02-C3-03-2B3P-Double Bedroom	1.40	Pass	38	Fail
02-C3-03-2B3P-KLR	2.50	Pass	N/A	-
02-C3-03-2B3P-Single Bedroom	1.30	Pass	35	Fail
02-C3-04-2B3P-Double Bedroom	1.00	Pass	21	Pass

Scenario 4 DSY 2 CIBSE TM59 Results				
Room Names	Criteria a % Hours >26°C	Pass/Fail?	Criteria b Total Hours >26°C (22:00 - 07:00) (Bedrooms Only)	Pass/Fail?
02-C3-04-2B3P-KLR	2.30	Pass	N/A	-
02-C3-04-2B3P-Single Bedroom	0.80	Pass	22	Pass
02-C3-05-3B4P-Double Bedroom	1.20	Pass	27	Pass
02-C3-05-3B4P-KLR	2.80	Pass	N/A	-
02-C3-05-3B4P-Single Bedroom	1.40	Pass	21	Pass
02-C3-05-3B4P-Single Bedroom	1.40	Pass	26	Pass
02-PBSA-01-Studio-N	0.30	Pass	4	Pass
02-PBSA-02-Studio-N	0.30	Pass	4	Pass
02-PBSA-03-Studio-N	0.30	Pass	4	Pass
02-PBSA-04-Studio-N	0.30	Pass	4	Pass
02-PBSA-05-Studio-N	0.30	Pass	4	Pass
02-PBSA-06-Premium Studio-N	0.20	Pass	4	Pass
02-PBSA-07-Premium Studio-N	0.20	Pass	4	Pass
02-PBSA-08-Premium Studio-N	0.20	Pass	4	Pass
02-PBSA-09-Acc Studio-N	0.20	Pass	4	Pass
02-PBSA-10-Acc Studio-N	0.20	Pass	4	Pass
02-PBSA-11-Studio-S	1.50	Pass	48	Fail
02-PBSA-12-Studio-S	1.50	Pass	48	Fail
02-PBSA-13-Studio-S	1.50	Pass	48	Fail
02-PBSA-14-Studio-S	1.50	Pass	48	Fail
02-PBSA-15-Studio-S	1.50	Pass	48	Fail
02-PBSA-16-Studio-S	1.40	Pass	49	Fail
02-PBSA-17-Studio-S	1.40	Pass	48	Fail
02-PBSA-18-Studio-S	1.40	Pass	48	Fail
02-PBSA-19-Premium Studio-S	1.00	Pass	45	Fail
02-PBSA-20-Premium Studio-W	1.10	Pass	44	Fail
02-PBSA-21-Studio-W	1.40	Pass	44	Fail
02-PBSA-22-Studio-NW	1.40	Pass	43	Fail
02-PBSA-23-Studio-NW	1.60	Pass	44	Fail
02-PBSA-24-Studio-NW	1.60	Pass	45	Fail
02-PBSA-25-Studio-NW	1.60	Pass	45	Fail
02-PBSA-26-Studio-NW	1.70	Pass	42	Fail
02-PBSA-27-Studio-SE	1.70	Pass	43	Fail
02-PBSA-28-Studio-SE	1.60	Pass	45	Fail
02-PBSA-29-Studio-SE	1.60	Pass	45	Fail
02-PBSA-30-Studio-SE	1.50	Pass	44	Fail
02-PBSA-31-Premium Studio-SE	1.40	Pass	44	Fail
02-PBSA-32-Acc Studio-SE	1.30	Pass	42	Fail
05-C3-01-3B5P-Double Bedroom 1	0.80	Pass	34	Fail
05-C3-01-3B5P-Double Bedroom 2	0.90	Pass	34	Fail

Scenario 4 DSY 2 CIBSE TM59 Results				
Room Names	Criteria a % Hours >26°C	Pass/Fail?	Criteria b Total Hours >26°C (22:00 - 07:00) (Bedrooms Only)	Pass/Fail?
05-C3-01-3B5P-KLR	2.50	Pass	N/A	-
05-C3-01-3B5P-Single Bedroom	1.50	Pass	29	Pass
05-C3-02-2B3P-Double Bedroom	1.10	Pass	27	Pass
05-C3-02-2B3P-KLR	2.80	Pass	N/A	-
05-C3-02-2B3P-Single Bedroom	1.10	Pass	26	Pass
05-C3-03-2B3P-Double Bedroom	1.60	Pass	38	Fail
05-C3-03-2B3P-KLR	2.80	Pass	N/A	-
05-C3-03-2B3P-Single Bedroom	1.50	Pass	35	Fail
05-C3-04-2B3P-Double Bedroom	1.20	Pass	27	Pass
05-C3-04-2B3P-KLR	2.50	Pass	N/A	-
05-C3-04-2B3P-Single Bedroom	1.10	Pass	26	Pass
05-C3-05-3B4P-Double Bedroom	1.40	Pass	34	Fail
05-C3-05-3B4P-KLR	3.30	Fail	N/A	-
05-C3-05-3B4P-Single Bedroom	1.40	Pass	25	Pass
05-C3-05-3B4P-Single Bedroom	1.60	Pass	31	Pass
06-PBSA-01-Studio-N	0.30	Pass	4	Pass
06-PBSA-02-Studio-N	0.30	Pass	4	Pass
06-PBSA-03-Studio-N	0.30	Pass	4	Pass
06-PBSA-04-Studio-N	0.30	Pass	4	Pass
06-PBSA-05-Studio-N	0.30	Pass	4	Pass
06-PBSA-06-Premium Studio-N	0.30	Pass	4	Pass
06-PBSA-07-Premium Studio-N	0.30	Pass	4	Pass
06-PBSA-08-Premium Studio-N	0.30	Pass	4	Pass
06-PBSA-09-Acc Studio-N	0.30	Pass	4	Pass
06-PBSA-10-Acc Studio-N	0.30	Pass	4	Pass
06-PBSA-11-Studio-S	1.70	Pass	50	Fail
06-PBSA-12-Studio-S	1.70	Pass	50	Fail
06-PBSA-13-Studio-S	1.70	Pass	50	Fail
06-PBSA-14-Studio-S	1.70	Pass	50	Fail
06-PBSA-15-Studio-S	1.70	Pass	50	Fail
06-PBSA-16-Studio-S	1.50	Pass	51	Fail
06-PBSA-17-Studio-S	1.70	Pass	50	Fail
06-PBSA-18-Studio-S	1.70	Pass	50	Fail
06-PBSA-19-Premium Studio-S	1.10	Pass	48	Fail
06-PBSA-20-Premium Studio-W	1.30	Pass	46	Fail
06-PBSA-21-Studio-W	1.50	Pass	47	Fail
06-PBSA-22-Studio-NW	1.70	Pass	45	Fail
06-PBSA-31-Premium Studio-SE	1.70	Pass	48	Fail
06-PBSA-32-Acc Studio-SE	1.60	Pass	47	Fail

Scenario 5 DSY3 Overheating Results

Scenario 5 DSY3 CIBSE TM59 Results				
Room Names	Criteria a % Hours >26°C	Pass/Fail?	Criteria b Total Hours >26°C (22:00 - 07:00) (Bedrooms Only)	Pass/Fail?
00-C3-01-DUP-KLR	4.30	Fail	N/A	-
00-C3-02-DUP-KLR	4.40	Fail	N/A	-
00-C3-03-2B3P-Double Bedroom	2.50	Pass	51	Fail
00-C3-03-2B3P-KLR	4.00	Fail	N/A	-
00-C3-03-2B3P-Single Bedroom	2.60	Pass	48	Fail
00-C3-03-DUP-KLR	4.70	Fail	N/A	-
00-PBSA-22-Studio-NW	2.60	Pass	73	Fail
00-PBSA-23-Studio-NW	2.70	Pass	73	Fail
00-PBSA-24-Studio-NW	2.70	Pass	73	Fail
00-PBSA-25-Studio-NW	2.70	Pass	73	Fail
00-PBSA-26-Studio-NW	2.90	Pass	70	Fail
00-PBSA-27-Studio-SE	3.00	Pass	75	Fail
00-PBSA-28-Studio-SE	2.90	Pass	75	Fail
00-PBSA-29-Studio-SE	2.90	Pass	76	Fail
00-PBSA-30-Studio-SE	2.80	Pass	76	Fail
00-PBSA-31-Premium Studio-SE	2.60	Pass	75	Fail
00-PBSA-32-Acc Studio-SE	2.50	Pass	74	Fail
01-C3-01-DUP-Double Bedroom 1	1.50	Pass	26	Pass
01-C3-01-DUP-Double Bedroom 2	1.30	Pass	37	Fail
01-C3-01-DUP-Single Bedroom	1.70	Pass	25	Pass
01-C3-02-DUP-Double Bedroom 1	1.50	Pass	26	Pass
01-C3-02-DUP-Double Bedroom 2	1.40	Pass	37	Fail
01-C3-02-DUP-Single Bedroom	1.70	Pass	25	Pass
01-C3-03-DUP-Double Bedroom 1	1.80	Pass	26	Pass
01-C3-03-DUP-Double Bedroom 2	1.60	Pass	33	Fail
01-C3-03-DUP-Single Bedroom	1.70	Pass	25	Pass
01-PBSA-22-Studio-NW	2.00	Pass	80	Fail
01-PBSA-23-Studio-NW	2.20	Pass	79	Fail
01-PBSA-24-Studio-NW	2.20	Pass	79	Fail
01-PBSA-25-Studio-NW	2.30	Pass	78	Fail
01-PBSA-26-Studio-NW	2.30	Pass	76	Fail
01-PBSA-27-Studio-SE	2.20	Pass	79	Fail
01-PBSA-28-Studio-SE	2.10	Pass	81	Fail
01-PBSA-29-Studio-SE	2.10	Pass	81	Fail
01-PBSA-30-Studio-SE	2.00	Pass	82	Fail
01-PBSA-31-Premium Studio-SE	1.90	Pass	83	Fail
01-PBSA-32-Acc Studio-SE	1.90	Pass	83	Fail
02-C3-01-3B5P-Double Bedroom 1	0.60	Pass	25	Pass

Scenario 5 DSY3 CIBSE TM59 Results				
Room Names	Criteria a % Hours >26°C	Pass/Fail?	Criteria b Total Hours >26°C (22:00 - 07:00) (Bedrooms Only)	Pass/Fail?
02-C3-01-3B5P-Double Bedroom 2	0.90	Pass	26	Pass
02-C3-01-3B5P-KLR	3.00	Pass	N/A	-
02-C3-01-3B5P-Single Bedroom	1.70	Pass	26	Pass
02-C3-02-2B3P-Double Bedroom	1.10	Pass	24	Pass
02-C3-02-2B3P-KLR	3.50	Fail	N/A	-
02-C3-02-2B3P-Single Bedroom	1.30	Pass	23	Pass
02-C3-03-2B3P-Double Bedroom	2.00	Pass	35	Fail
02-C3-03-2B3P-KLR	3.00	Pass	N/A	-
02-C3-03-2B3P-Single Bedroom	1.90	Pass	33	Fail
02-C3-04-2B3P-Double Bedroom	1.60	Pass	20	Pass
02-C3-04-2B3P-KLR	3.00	Pass	N/A	-
02-C3-04-2B3P-Single Bedroom	1.20	Pass	22	Pass
02-C3-05-3B4P-Double Bedroom	1.80	Pass	26	Pass
02-C3-05-3B4P-KLR	3.80	Fail	N/A	-
02-C3-05-3B4P-Single Bedroom	1.80	Pass	22	Pass
02-C3-05-3B4P-Single Bedroom	1.90	Pass	26	Pass
02-PBSA-01-Studio-N	0.10	Pass	3	Pass
02-PBSA-02-Studio-N	0.00	Pass	3	Pass
02-PBSA-03-Studio-N	0.00	Pass	3	Pass
02-PBSA-04-Studio-N	0.00	Pass	3	Pass
02-PBSA-05-Studio-N	0.00	Pass	3	Pass
02-PBSA-06-Premium Studio-N	0.00	Pass	3	Pass
02-PBSA-07-Premium Studio-N	0.00	Pass	3	Pass
02-PBSA-08-Premium Studio-N	0.00	Pass	3	Pass
02-PBSA-09-Acc Studio-N	0.00	Pass	3	Pass
02-PBSA-10-Acc Studio-N	0.00	Pass	3	Pass
02-PBSA-11-Studio-S	1.80	Pass	48	Fail
02-PBSA-12-Studio-S	1.80	Pass	50	Fail
02-PBSA-13-Studio-S	1.80	Pass	51	Fail
02-PBSA-14-Studio-S	1.80	Pass	51	Fail
02-PBSA-15-Studio-S	1.70	Pass	50	Fail
02-PBSA-16-Studio-S	1.60	Pass	51	Fail
02-PBSA-17-Studio-S	1.70	Pass	49	Fail
02-PBSA-18-Studio-S	1.70	Pass	48	Fail
02-PBSA-19-Premium Studio-S	1.20	Pass	41	Fail
02-PBSA-20-Premium Studio-W	1.50	Pass	40	Fail
02-PBSA-21-Studio-W	1.60	Pass	42	Fail
02-PBSA-22-Studio-NW	1.70	Pass	42	Fail
02-PBSA-23-Studio-NW	1.90	Pass	42	Fail
02-PBSA-24-Studio-NW	1.90	Pass	42	Fail

Scenario 5 DSY3 CIBSE TM59 Results				
Room Names	Criteria a % Hours >26°C	Pass/Fail?	Criteria b Total Hours >26°C (22:00 - 07:00) (Bedrooms Only)	Pass/Fail?
02-PBSA-25-Studio-NW	1.90	Pass	42	Fail
02-PBSA-26-Studio-NW	2.10	Pass	41	Fail
02-PBSA-27-Studio-SE	2.00	Pass	42	Fail
02-PBSA-28-Studio-SE	1.90	Pass	42	Fail
02-PBSA-29-Studio-SE	1.90	Pass	42	Fail
02-PBSA-30-Studio-SE	1.80	Pass	42	Fail
02-PBSA-31-Premium Studio-SE	1.70	Pass	41	Fail
02-PBSA-32-Acc Studio-SE	1.60	Pass	40	Fail
05-C3-01-3B5P-Double Bedroom 1	1.00	Pass	33	Fail
05-C3-01-3B5P-Double Bedroom 2	1.10	Pass	32	Pass
05-C3-01-3B5P-KLR	3.20	Fail	N/A	-
05-C3-01-3B5P-Single Bedroom	1.80	Pass	26	Pass
05-C3-02-2B3P-Double Bedroom	1.40	Pass	27	Pass
05-C3-02-2B3P-KLR	4.00	Fail	N/A	-
05-C3-02-2B3P-Single Bedroom	1.40	Pass	24	Pass
05-C3-02-2B3P-KLR	4.00	Fail	N/A	-
05-C3-02-2B3P-Single Bedroom	1.40	Pass	24	Pass
05-C3-03-2B3P-Double Bedroom	2.10	Pass	36	Fail
05-C3-03-2B3P-KLR	3.50	Fail	N/A	-
05-C3-03-2B3P-Single Bedroom	2.00	Pass	33	Fail
05-C3-04-2B3P-Double Bedroom	1.70	Pass	26	Pass
05-C3-04-2B3P-KLR	3.50	Fail	N/A	-
05-C3-04-2B3P-Single Bedroom	1.60	Pass	26	Pass
05-C3-05-3B4P-Double Bedroom	1.90	Pass	30	Pass
05-C3-05-3B4P-KLR	4.30	Fail	N/A	-
05-C3-05-3B4P-Single Bedroom	2.10	Pass	25	Pass
05-C3-05-3B4P-Single Bedroom	2.20	Pass	27	Pass
06-PBSA-01-Studio-N	0.10	Pass	4	Pass
06-PBSA-02-Studio-N	0.10	Pass	4	Pass
06-PBSA-03-Studio-N	0.10	Pass	4	Pass
06-PBSA-04-Studio-N	0.10	Pass	4	Pass
06-PBSA-05-Studio-N	0.10	Pass	4	Pass
06-PBSA-06-Premium Studio-N	0.10	Pass	4	Pass
06-PBSA-07-Premium Studio-N	0.10	Pass	4	Pass
06-PBSA-08-Premium Studio-N	0.10	Pass	4	Pass
06-PBSA-09-Acc Studio-N	0.10	Pass	4	Pass
06-PBSA-10-Acc Studio-N	0.10	Pass	4	Pass
06-PBSA-11-Studio-S	1.90	Pass	50	Fail
06-PBSA-12-Studio-S	1.90	Pass	51	Fail
06-PBSA-13-Studio-S	1.90	Pass	51	Fail
06-PBSA-14-Studio-S	1.90	Pass	50	Fail
06-PBSA-15-Studio-S	1.90	Pass	51	Fail

Scenario 5 DSY3 CIBSE TM59 Results				
Room Names	**Criteria a % Hours >26°C**	**Pass/Fail?**	**Criteria b Total Hours >26°C (22:00 - 07:00) (Bedrooms Only)**	**Pass/Fail?**
06-PBSA-16-Studio-S	1.80	Pass	52	Fail
06-PBSA-17-Studio-S	1.90	Pass	51	Fail
06-PBSA-18-Studio-S	1.90	Pass	50	Fail
06-PBSA-19-Premium Studio-S	1.40	Pass	44	Fail
06-PBSA-20-Premium Studio-W	1.50	Pass	42	Fail
06-PBSA-21-Studio-W	1.80	Pass	44	Fail
06-PBSA-22-Studio-NW	2.00	Pass	44	Fail
06-PBSA-31-Premium Studio-SE	1.90	Pass	44	Fail
06-PBSA-32-Acc Studio-SE	1.80	Pass	43	Fail

Scenario 3 DSY1 Overheating Results (Corridors Only)

Scenario 3 DSY1 CIBSE TM59 Results		
Room Names	**Criteria 4.5 % Hours >28°C**	**Pass/Fail?**
02-C3-Circulation	0.00	Pass
05-C3-Circulation	0.00	Pass

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