CGP | MEP

14 Blackburn Road

Energy & Overheating Strategy

CG15060-CGP-XX-XX-RP-1001

April 2025

DOCUMENT DETAILS

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DOCUMENT CONTENT

A.1 Executive Summary

This report is prepared on behalf of Hampstead Asset Management Ltd ('the Applicant') and their delivery partner Fifth State who will be delivering the regeneration sought by the London Borough of Camden and proposed in the application. CGP | MEP Ltd have been commissioned by Hampstead Asset Management Ltd ('the applicant') and their delivery partner Fifth State Ltd to produce an energy and overheating report that demonstrates the improvements to the proposed development over the 3 main stages of the energy hierarchy, how it meets the London Plan, the Camden Local Plan and all relevant planning guidance and achieves compliance with Building Regulations Part L and Part O - Overheating. This is demonstrated by using Dynamic Simulation Modelling (DSM) for the proposed development of 14 Blackburn Road, located in Hampstead.

The design of the new development is subject to the requirements of the London Plan, which aims to limit the carbon emissions of new buildings through passive and clean energy methods.

This report highlights the energy savings made through the BE LEAN, BE CLEAN, BE GREEN criteria of the London Plan and identifies the offset payment required to meet net zero emissions.

The results demonstrate that the proposed passive measures and green measures achieve an energy reduction and CO_2 emissions reduction against the Baseline Building, which demonstrates compliance with the London and Camden Local Plan policies. This report accounts for all relevant design features and includes for anticipated building usage.

In addition to the satisfying energy and carbon emission targets, the development demonstrates compliance with Building Regulations Part O – Overheating.

SECTION B – ENERGY INTRODUCTION

B.1 Introduction

B.1.1 Purpose of Energy Report

CGP|MEP Ltd have been commissioned to produce an energy and overheating report that demonstrates the improvements to the development over the 3 main stages of the energy hierarchy.

The proposed redevelopment of 14 Blackburn Road, London, involves the transformation of 0.24-hectare site into a mixed-use development. This project consists of two interconnected buildings made up of a 10 storey Purpose Built Student Accommodation (PBSA) with 192 rooms and a 4-7 storey affordable residential building with 35 homes. Additionally, 1,619 sqm of flexible commercial and business space will be provided, including retail, showrooms, offices, and a café. The development is car-free, with cycle parking and on-site servicing facilities with communal and amenity spaces, including roof terraces and internal shared areas.

With the current emphasis placed on energy conservation and the deployment of green technologies, the applicant is keen to deliver an environmentally responsible building. To this end, the proposed design will incorporate passive design and best-practice measures, so as to exceed the requirements of the current (2021 Edition) Part L Building Regulations and meet the London Plan and local planning requirements.

The development is aiming for at least 35% carbon reduction betterment over the baseline model and as close to net zero as possible, with the intension of providing carbon offset payments to make up for any shortfall.

This study covers:

1. Site location
2. Site weather
3. Microclimate
4. Building layout
5. Building orientation
6. Building form
7. Building fabric
8. Thermal mass or other fabric thermal storage
9. Building occupancy type
10. Daylighting strategy
11. Ventilation strategy
12. Adaptation to climate change

C.1 Energy Planning Policies

There are a number of national policies and regulations related to energy; those most relevant to the energy assessment of new developments are detailed below.

C.1.1 National Planning Policies Framework – NPPF

The National Planning Policy Framework (NPPF) was published in March 2019, July 2021 and most recently revised in February 2025.

At the heart of the National Planning Policy Framework is a presumption in favour of sustainable development. The three dimensions of sustainable development can be defined as the economic, social and environmental.

There are twelve core planning principles in the NPPF. Within these, there is a strong support for the transition to a low carbon future in a climate change context, taking full account of a number of different factors. There is also an aim to contribute to conserving and enhancing the natural environment and reducing pollution.

The NPPF aims to strengthen local decision making, with the use of decision-taking in a positive way, as a means of fostering the delivery of sustainable development.

However, the NPPF also highlights that pursuing sustainable development requires careful attention to the viability and costs in plan-making and decision-taking. Plans should be deliverable. Therefore, the sites and the scale of development identified in the plan should not be subject to such a scale of obligations and policy burdens, that their ability to be developed viably is threatened.

C.1.2 Climate Change Act 2008

The Government has introduced legislation and a number of policies during recent years focusing on the reduction of CO2 emissions. The Climate Change Act (2008) sets a legally binding target for the reduction in UK carbon dioxide emissions. Upon ratification of the Kyoto Protocol, the UK committed to a reduction in its CO2 emissions by 80% compared to 1990 levels (by 2050). In addition, under the Climate Change Act an interim target of a 34% reduction by 2020 was set.

In order to enforce these targets, the Government is using the Building Regulations: Part L 2021 – (Conservation of fuel and power) which set the standards to which all new and existing buildings must comply.

C.1.3 Building Regulations Part L 2021

Building Regulations are statutory instruments that seek to ensure that the policies set out within any relevant UK legislation are carried out. Building Regulations approval is required for the majority of building work carried out in the United Kingdom.

Part L of these regulations covers the requirements with respect to the conservation of fuel and power in all building types. It controls the insulation values of building fabric elements and openings, the air permeability of the structure, the heating efficiency of heating, ventilation and air conditioning systems together with hot water storage and lighting efficiency. It also sets out the requirements for calculating the carbon dioxide emissions and the Carbon Emission Targets for each building type.

Part L is split into two sections:

- L1 New Dwellings
- L2 New Buildings other than Dwellings

C.2 Regional Level Policies

C.2.1 The London Plan

Part L of the 2021 Building Regulations confirms that all major developments must continue to meet the London Plan net zero carbon target by following the energy hierarchy (Policy SI2, Figure 1), the cooling hierarchy (Policy SI3, Figure 2) and by maximising on site carbon reductions.

Applicants for planning permission will be expected to demonstrate that at each stage of the energy hierarchy they have maximised opportunities for carbon reduction to achieve as close to zero as possible, and as a minimum the development must achieve a 35% reduction. Furthermore 10% of the 35% betterment is required to be met in the Be Lean stage via passive design measures. In addition, the London Plan in terms of overheating and cooling states that major developments should reduce the potential of overheating and reliance on conditioning systems and that this must be demonstrated through a dynamic model.

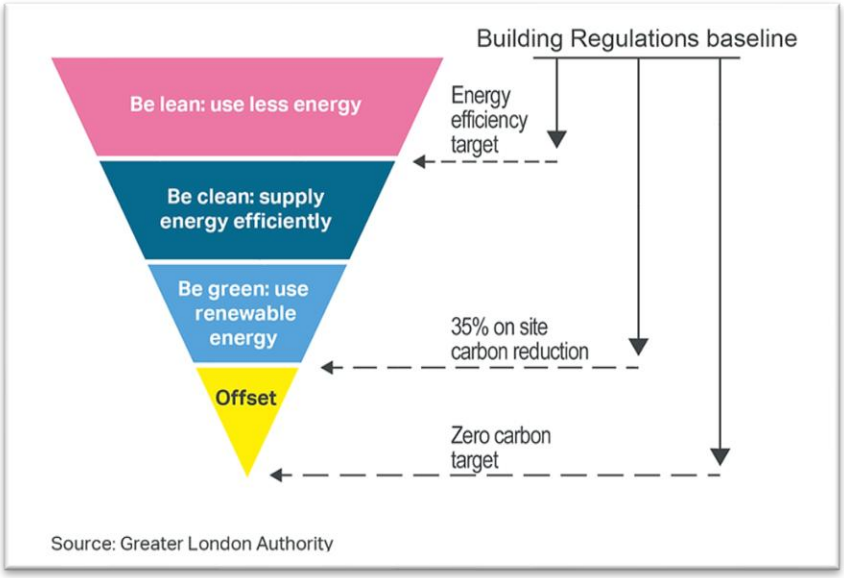

Figure 1: The GLA Energy Hierarchy

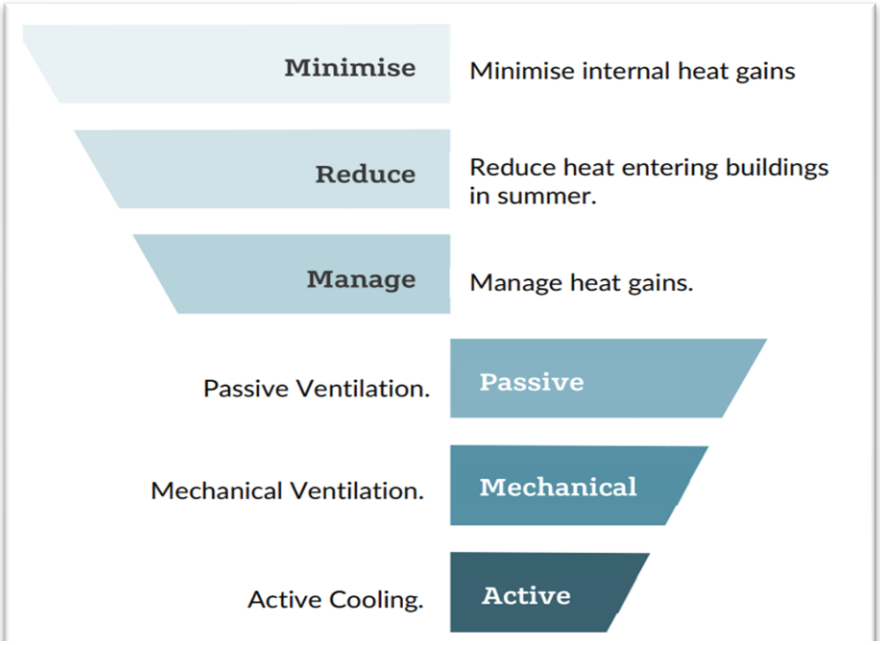

Figure 2: The Cooling Hierarchy

C.2.2 The Camden Local Plan 2017

Policy CC1 – Climate Change Mitigation is a planning policy created by the Camden Council and requires all development to minimize the effects of climate change and encourage all developments to meet the highest feasible environmental standards that are financially viable during construction and occupation. They will:

- Promote zero carbon development and require developments to reduce carbon dioxide emissions through following the steps in the energy hierarchy;
- Require all major developments to demonstrate how London Plan targets for carbon dioxide emissions have been met;
- Ensure that the location of development and mix of land uses minimize the need to travel by car and help to support decentralized energy networks;
- Support and encourage sensitive energy efficiency improvements to existing buildings;
- Require all proposals that involve substantial demolition to demonstrate that it is not possible to retain and improve the existing building;
- Expect all developments to optimize resource efficiency
- 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

Policy CC2 – Adapting to climate change and requires The Camden Council to have development to be resilient to Climate Change. All developments should adopt appropriate climate change adaption measures such as:

- The protection of existing green spaces and promoting new appropriate green infrastructure
- Not increasing, and wherever possible reducing, surface water runoff through increasing permeable surfaces and use of Sustainable Drainage Systems;
- Incorporating bio-diverse roofs, combination green and blue roofs and green walls where appropriate;
- Measures to reduce the impact of urban and dwelling overheating, including application of the cooling hierarchy
- Any development involving 5 or more residential units or 500 sqm or more of any additional floorspace is required to demonstrate the above in a Sustainability Statement.

Sustainable design and construction measures: The Camden Council will promote and measure sustainable design and construction by:

- Ensuring development schemes demonstrate how adaptation measures and sustainable development principles have been incorporated into the design and proposed implementation;
- Encourage new build residential development to use the Home Quality Mark and Passivhaus design standards;
- Encouraging conversions and extensions of 500 sqm of residential floorspace or above or five or more dwellings to achieve “excellent” in BREEAM domestic refurbishment;
- Expecting non-domestic developments of 500 sqm of floorspace or above to achieve “excellent” in BREEAM assessments and encouraging zero carbon in new development from 2019.

SECTION D – ENERGY HIERARCHY

D.1 Energy Hierarchy – Be Lean, Be Clean, Be Green

The recognised energy hierarchy is the "Be lean, be clean, be green" model. This is demonstrated in the image below:

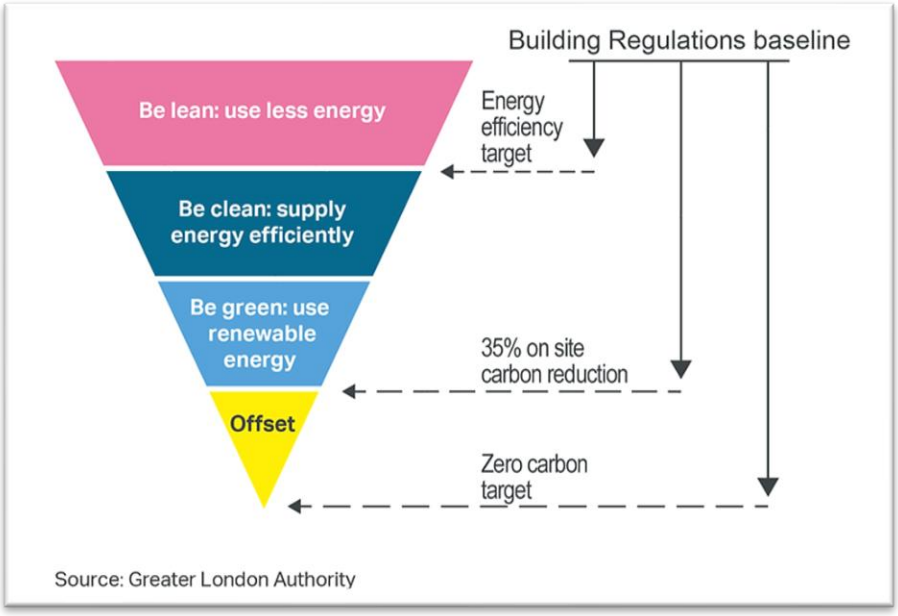

Figure 3: Energy Hierarchy

The reasoning behind this is to ensure the design of a building utilises "passive measures" i.e., the be lean section of the energy hierarchy prior to moving onto more energy consumption solutions like mechanical plant.

D.2 Be Lean

As part of the Be Lean approach, passive design measures have been considered throughout the pre-planning stage to reduce initial energy demand.

Solar Gain Control and Daylight

Solar gains are a passive form of heating from the sun's radiation and are beneficial to a building during winter months as they provide an effective source of heat and reduce internal heating requirements. However, during summer months they must be controlled in order to mitigate the risk of overheating. They can be controlled through glazing and shading design in order to allow low level winter sun to enter the building and to limit access to high level summer sun.

The glazing strategy design has carefully considered orientation and window size in order to maximise daylight while controlling excessive solar gains. Glazing will incorporate low emissivity coatings to limit overheating without compromising light transmittance.

Overheating

An overheating study has been undertaken to assess and minimise overheating risks, this is detailed later in this report.

Building Fabric

Designing an efficient thermal envelope will greatly reduce the need for space heating and cooling as heat transmittance through the thermal elements is reduced.

Low air permeability rates will also reduce heating and cooling energy demand by reducing the volume of air that can penetrate the building.

As part of a 'fabric first' approach, the building fabric has been carefully considered and specified to meet or exceed current Building Regulations minimum requirements and Greater London Authority (GLA) requirements, as detailed in Table 1 below. A number of different fabric combinations were also modelled for the overheating assessment before selecting the values listed in Table 1.

Fabric Component	U-Values (W/m²K)
External Walls	0.14
Roof	0.12
Ground/ Exposed Floor	0.13
Windows	0.80 (0.35 G-Value)
Air Tightness	3 m³/m²/h @ 50Pa

Table 1: Proposed Building Fabric Measures

With regards to party walls, to reach the required standards, these must be fully filled. Partially filled cavities will not comply.

Building Services

Services have been specified to maximise efficiency therefore reducing energy used to deliver services.

Services Component	Development			Efficiencies
	Residential Development	Commercial Showrooms	PBSA & Cafe Development	
Space Heating and Hot Water	Heating and domestic hot water provided by Heat Interface Units	VRF Heating and Domestic hot water provided by ASHP	Central ASHP providing heating and domestic hot water	GLA Baseline Efficiencies: ASHP: SCOP (Hot Water) = 2.86 SCOP (Heating) = 2.64
Cooling	-	VRF to serve the commercial spaces	VRF to serve the cafe and amenity spaces	VRF SEER = 6
Heating Controls	Local controls within each apartment	Local controls	Local controls within each apartment	-
Ventilation	Hybrid MVHR within each apartment	Hybrid MVHR	MVHR within each studio	SFP = 0.6 W/l/s (MVHR)
Lighting and Controls	Local controls within all rooms	Local controls within all rooms	Local controls within all rooms	-
Metering	To meet Building regulation standards	To meet Building regulation standards	To meet Building regulation standards	-
Electrical Power Factor	0.9 - 0.95	0.9 - 0.95	0.9 - 0.95	-

Table 2: Building Services Overview

D.3 Be Clean

Decentralised Energy

Connection to a decentralised energy network and the use of combined heat and power is a recognised method of generating energy more efficiently. Within The London Plan the 'Decentralised Energy in development proposals' requires development proposals to explore the opportunities to link into an existing or planned decentralised energy network using the London Heat Map tool. Where an existing decentralised energy network is not present, an assessment of the feasibility of establishing a decentralised energy system for the proposed development should be undertaken; including an assessment of the feasibility of a Combined Heat and Power (CHP) communal heating system.

To comply with London Plan Policy SI 3, developments in Heat Network Priority Areas (HNPAs) (i.e. areas in London where the heat density is sufficient for heat networks to provide a competitive solution for supplying heat to buildings and consumers) should have a communal low-temperature heating system and should select a heat source in accordance with the following heating hierarchy:

- connect to local existing or planned heat networks
- use zero-emission or local secondary heat sources (in conjunction with heat pump, if required)
- use low-emission combined heat and power (only where there is a case for CHP to enable the delivery of an area-wide heat network, meet the development's electricity demand and provide demand response to the local electricity network)

- use ultra-low NOx gas boilers (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 London Plan Policy SI 1 Improving air quality)

Consideration has been given to the possible connection to an existing or proposed area wide decentralised energy network. The UK CHP Development Map is an interactive tool, using an interactive GIS system, which allows users to identify opportunities for decentralised energy projects in the UK. This tool details the existing heat loads and supplies within the UK as well as existing heat distribution networks.

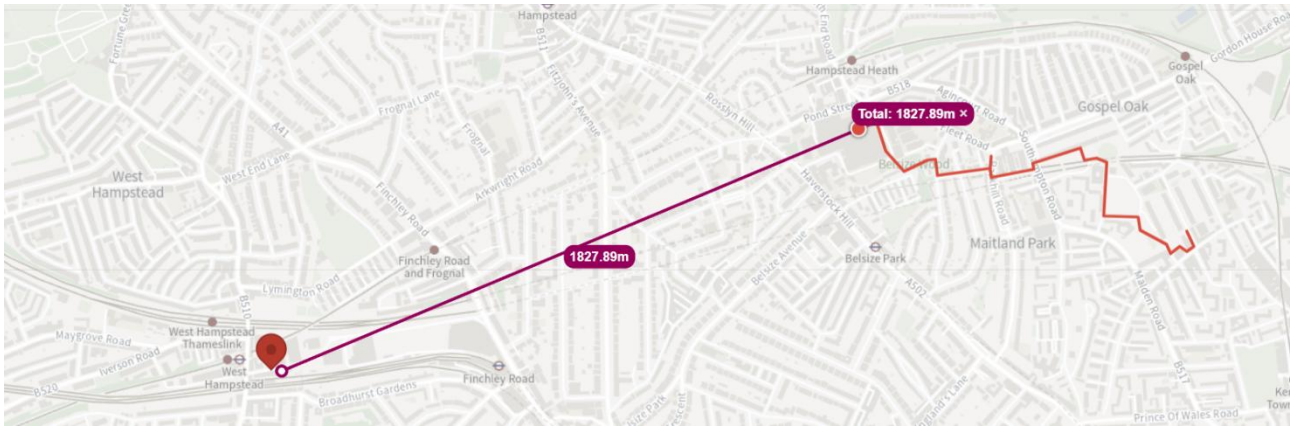

Figure 4: London District Heat Map

Figure 4 shows the London District Heat Map with the site located at the pin, with red lines are existing sites. As shown, there is no heat networks located near the site, therefore this project will not be connected to a DHN and will not be designed for a connection. Instead, 14 Blackburn Road will use ASHP. Also, no 'Be Clean' design changes are proposed, the 'Be Clean' model is the same as the 'Be Lean' model.

D.4 Be Green

Low and Zero Carbon Technologies

This section discusses the feasibility of using low and zero carbon (LZC) technologies for the proposed scheme.

In order to address the local planning requirement for the integration of LZC technologies on site, the installation of the technologies mentioned below have been investigated. A final selection of PV and ASHP has been deemed the most suitable technologies for the site.

Biomass Boiler – Not Adopted

A biomass system designed for this development would be fuelled by wood pellets due to their high energy content. Wood pellets also require less volume of storage than other biomass fuels, require less maintenance and produce considerably less ash residue.

A biomass system would not be an appropriate low-carbon technology for the site for the following reasons:

- The burning of wood pellets releases substantial amount of NOx emissions. This would significantly reduce the air quality of the site which is located in an urban environment and within an Air Quality Management Area and Air Quality Focus Area
- Storage and delivery of wood pellets would be difficult due to the site constraints and the lack of local biomass suppliers. Pellets would have to be transported from elsewhere in the UK

Wind Energy – Not Adopted

Due to the limited space on site, building-integrated turbines would be most suited to the development, as opposed to stand alone turbines.

Based on the current design of the development, any roof-mounted wind turbine would need to be located above the highest residential studios. Therefore, only one turbine could be installed on site. This results in very low CO2 savings. In addition, a roof-mounted wind turbine would have a significant visual impact.

In urban areas the efficiency of wind turbines is limited due to reduced wind speeds (less than 5m/s), thereby reducing the ability of the wind turbines to operate efficiently.

For these reasons, wind turbines would not be feasible for this project.

Ground Source Heat Pumps – Not Adopted

A ground source heat pump system for the site would include a closed ground loop where a liquid passes through the system, absorbing heat from the ground and relaying this heat via an electrically run heat pump within the building.

A ground source heat pump system would deliver space heating through a low temperature efficient distribution network such as underfloor heating. The installation of ground source loops significantly increases the construction time and adds to the capital cost of the project.

The site is constrained with little room for a shallow ground source heat pump. Deep bore hole ground source heat pumps require a long-term balance of heating and cooling to avoid a long-term altering of the ground temperature and a resulting long-term decline in system efficiency. As the development is predominantly domestic, the demand for heating and cooling are not balanced. Demand for space heating and water heating is predicted to be an order of magnitude higher than demand for cooling.

A GSHP system on this site would not deliver substantial carbon savings per unit of cost in comparison to other renewable strategies, such as ASHP.

For this reason, GSHPs would not be feasible for this development.

Decentralised Energy – Not Adopted

Connection to a decentralised energy network and the use of combined heat and power is a recognised method of generating energy more efficiently. The London Plan encourages development proposals to explore the opportunities to link into an existing or planned decentralised energy network. Although no decentralised network is currently available for connection, there is a proposal for a new connection to pass by the site. The design will incorporate provision for future DHN connection through the provision of 2No. incoming ducts to the plant room that will enable any future DHN connection pipes to access. However, at present the design will not be connecting to any existing network.

For this reason, decentralised energy would not be feasible for this development at this stage.

Combined Heat and Power (CHP) was for a long period of time a viable option for energy provision. However, with decarbonisation targets, CHP (typically gas powered) are being avoided due to the non-renewable, fossil fuel nature of the gas required as fuel. For this reason, CHP is also being discounted from the development.

Air Source Heat Pumps – Adopted

Air source heat pumps (ASHPs) employ the same technology as ground source heat pump (GSHPs). However, instead of using heat exchangers buried in the ground, heat is extracted from the external ambient air. The pumps use fuel efficiently compared to the gas-powered systems and have a relatively low capital cost. Additionally, this type of system is beneficial for this type of development as this technology can provide both heating and hot water via heat interface units.

Photovoltaic Panels – Adopted

Four types of solar cells are available at present; these are mono-crystalline, poly-crystalline, thin film and hybrid panels. Although mono-crystalline and hybrid cells are the most expensive, they are also the most efficient with an efficiency rate of 12-20%. Poly-crystalline cells are cheaper but they are less efficient (9-15%). Thin film cells are only 5-8% efficient but can be produced as thin and flexible sheets. Available grants are subject to criteria and eligibility. On the both the residential and PBSA roof, we have maximised the amount of roof space assigned to PV panels. For the residential roof, 205 square metres of the roof has been used for PV giving 77 panels providing a peak power array of 34.65kW. For the PBSA roof, 364 square metres of roof space has been used providing 138 panels and a peak power array of 29.25kW. The feasibility study has identified solar PV and ASHP as the most appropriate technology for the development.

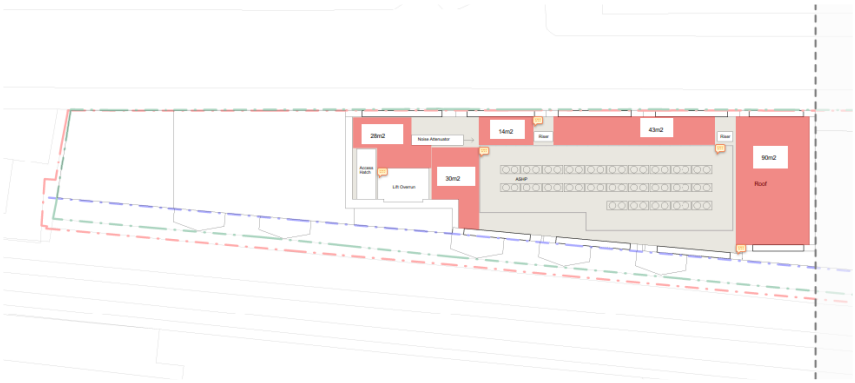

Figure 5: Residential PV Roof Array

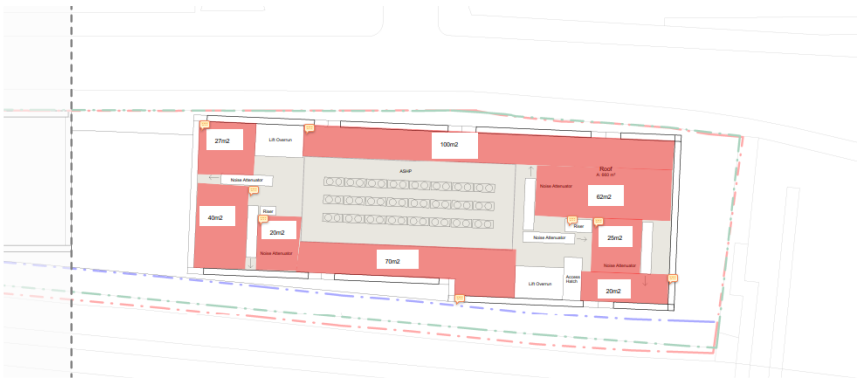

Figure 6: PBSA PV Roof Array

Building Services Overview

Services have been specified to maximise efficiency therefore reducing energy used to deliver services.

Services Component	Development			Efficiencies
	Residential Development	Commercial Showrooms	PBSA & Commercial Development	
Space Heating and Hot Water	Heating and domestic hot water provided by Heat Interface Units	VRF Heating and Domestic hot water provided by ASHP	Central ASHP providing heating and domestic hot water	GLA Baseline Efficiencies: ASHP: SCOP (Hot Water) =3.3 SCOP (Heating) = 3.3
Cooling	-	VRF to serve the commercial spaces	VRF to serve the commercial and amenity spaces	VRF SEER = 6
Heating Controls	Local controls within each apartment	Local controls	Local controls within each apartment	-
Ventilation	Hybrid MVHR within each apartment	Hybrid MVHR	MVHR within each studio	SFP = 0.6 W/l/s (MVHR)
Lighting and Controls	Local controls within all rooms	Local controls within all rooms	Local controls within all rooms	-
Metering	To meet Building regulation standards	To meet Building regulation standards	To meet Building regulation standards	-
Electrical Power Factor	0.9 - 0.95	0.9 - 0.95	0.9 - 0.95	-

Table 3: Building Services Overview

D.5 Be Seen

As a further enhancement to the energy hierarchy there is a Be Seen section which aims to monitor, verify, and report on energy performance. For 14 Blackburn Road, this will be achieved through the means of metering the services to monitor how much energy they are using.

This is to ensure that the building is operated at how it was envisaged at design stage.

This is beneficial for energy savings as an engineer can quickly notice if a service is using more energy than usual and create a solution to solve this.

The GLA Be Seen reporting spreadsheet will be completed as part of this submission with estimates being provided as to each of the performance indicators required. These performance indicators are listed below:

- Site Adress
- Site Plan
- GIA and Usage types
- Target dates for reporting stages
- Electricity consumption (kWh)
- Gas consumption (kWh)
- Carbon Emissions estimates (TCO_2)
- Carbon Shortfall (TCO_2)

Energy Monitoring, Recording and Reporting

The services within the new building will be metered fully in accordance with Building Regulations Part L.

The metering shall all be in accordance with TM39 Building Energy Monitoring 2009.

The services to be metered include:

- Main electrical incomer with submetering to:
  - PV generation
  - Electrical distribution boards (split by zones and service i.e. lighting or power)
  - Lift electrical supply
  - Sprinkler electrical supply
  - Mechanical services electrical supply
- Heating
  - Residential - individual metering for apartments
  - Separate metering for landlord spaces
  - PBSA - central metering with check meters in studios
  - Individual metering for commercial areas
- Water service to the building with submetering to:
  - Incoming mains water meter at boundary
  - Sprinkler water supply
  - CAT5 water tank
  - Boosted cold water supplies

SECTION E – PASSIVE DESIGN ANALYSIS

E.1 Fundamentals

In order to deliver an environmentally responsible building, an exemplar approach is being proposed based on low energy design principles. In summary, this approach involves energy demand minimisation through effective building form and orientation, good envelope design and proficient use of services; such that the building itself is being used as the primary environmental modifier.

Long term energy benefits are best realised by reducing the inherent energy demand of the building in the first instance. These benefits are described and quantified below.

E.1.1 Building Location

The location of a building has a significant effect on energy consumption. Buildings located at higher altitudes for example, will be subject to colder external temperatures. Typically, the temperature drops 0.65ºC for every 100ft increase in altitude. Subsequently these buildings will have a greater heating demand than those closer to sea level.

Equally, the urban heat island effect means the ambient air temperature in built-up areas is greater than in more rural spaces. Buildings located in cities will have a lower heating demand in winter, but could require extra cooling in summer, as the effects of night purging are reduced.

E.1.2 Weather and Microclimate

The local weather and any microclimate will also influence energy usage. A development on the coast may have a maritime climate, experiencing milder winters and cooler summers than those further inlands, particularly on the west coast where they are subject to the jet stream influence. Inland buildings will have a continental climate, suffering more extremes in temperature and therefore more likely to require heating and cooling.

A building in the south of the UK will also use more cooling than those further north, as the average temperatures in the south will be higher due to warm winds blowing from the tropics. The south coast of England is on average, 4ºC warmer than the north of Scotland. Those in the north then, will have a greater heating demand as they are subject to cold arctic air blowing in. These northern areas may also have a greater lighting demand, experiencing roughly 750 fewer daylight hours per year than the south coast.

For the proposed building, the model used the closest DSY (Design Summer Year) weather data. This data is provided by CIBSE to IES for use in calculations.

E.1.3 Building use and Occupancy Type

Occupants, lighting, equipment and machinery within a building will emit sensible and latent heat. This excess heat can lead to an increase in the temperature and humidity within the space and can have a marked effect on the heating and cooling demands within a building. CIBSE TM59 and Building Regulations Part O provide guidance on occupancy profiles and internal gains.

Latent heat results in an instantaneous addition of moisture to the air, so there is no cooling load factor associated with it. Sensible heat however, is absorbed by the surrounding surfaces and radiated more slowly into the building.

The internal heat gains will vary depending on a room or building's use. There will be a greater heat gain from occupants participating in exercise at a gym, for example, than those in an office, sat working on a computer. However, the computers and associated equipment will be adding additional heat to the office which would not be present at the gym. Equally, the lighting requirements will be different in each building, and the heat gains will be dependent upon the lamp, luminaire, and location of the fitting. Subsequently, internal heat gains need to be considered as a whole.

Residential apartments in the development will consist of bedrooms, living/kitchen/dining rooms, bathrooms and corridors. The PBSA aspect of the development consists of 1 studio apartments.

The bedrooms will likely have the greatest occupancy in the evenings and overnight, whilst the kitchen will have specific periods of high occupancy around meal times. The amenity spaces will have a more constant occupancy throughout the day with the internal conditions remaining relatively stable.

E.1.4 Building layout, Orientation and Form

Building layout, orientation and form can influence many key features of the development. The design should provide for an effective use of space and appealing layout, with opportunities to benefit from natural daylight balanced with achieving solar gain without overheating. In general, a higher thermal performance can be achieved by limiting the surface area to volume ratio as this minimises heat loss through the wall area.

By orientating the building, so that the long sides of the building face north and south, glare arising from the low early morning and evening sun is designed out. It should be noted that where the building footprint is extremely tight, for example in a city centre location, then the building form and orientation may have to be dictated by the available space and not by implementation of best practice measures in relation to energy. Invariably, planning constraints and/or the functional relationships of specific areas will result in some measure of deep planning, thus reducing the opportunity for natural ventilation.

Solar heating or solar gain is often welcome in winter months, helping to heat up the building. However, careful design and attention to building orientation is essential to avoid summertime overheating, as on a clear day in summer an unshaded window in the UK can admit 3kWhr of energy per m^2 of glass. Overheating is likely to be more of a problem if the windows face the southern half of the sky (east or west facing windows can also be a problem in some types of building), there are horizontal or near-horizontal rooflights, the building has high internal heat gains or the building needs to be kept cooler than normal.

Planning the internal layout of buildings and rooms to maximise the benefits of solar gain and minimise the disadvantages is essential. Spaces where overheating would be critical can be placed on the north side of the building or overhangs used to protect from excessive solar gain.

E.2 Building Envelope

E.2.1 Building Fabric Thermal Performance

The use of building materials with high grade thermal performance (low U-values) is vital to reducing the energy consumption and CO_2 emissions within any development.

Figure 7: Schematic of Typical Building Elements

The insulation of the building envelope will need to be better than the limiting values required under the current (2021 Edition) Part L Building Regulations. The limiting values, prescribed within the regulations, are the minimum acceptable levels of insulation for each element of the construction.

The benefit of any U-value reduction, in terms of energy/CO_2 saving, can quickly be ascertained using dynamic modelling software. This tool can also be used to help determine the optimum selection of materials against cost.

For 14 Blackburn Road, improvements on the minimum values are proposed to minimise operational energy demand and further exceed Part L requirements (see table below). It should be noted that high grade (low U-value) materials tend to attract a cost premium.

The following table describes the proposed minimum building envelope thermal performance criteria. It should be noted that these values represent an improvement over and above the 2021 Part L Building Regulations.

Element	Part L 2021 Building Regs "Notional building"	U-Values (W/m²K)
Roof 'U' Value	0.11 W/m²K	0.12
Floor	0.13 W/m²K	0.13
External Wall 'U' Value	0.18 W/m²K	0.14
External Glazing 'U' Value	1.2 W/m²K	0.8 (G-Value 0.35)
Air-permeability	5m³/hour/m² @ 50Pa	3.0 m³/m²/h @ 50Pa

Table 4: Proposed Building Fabric Measures

E.2.2 Air Permeability

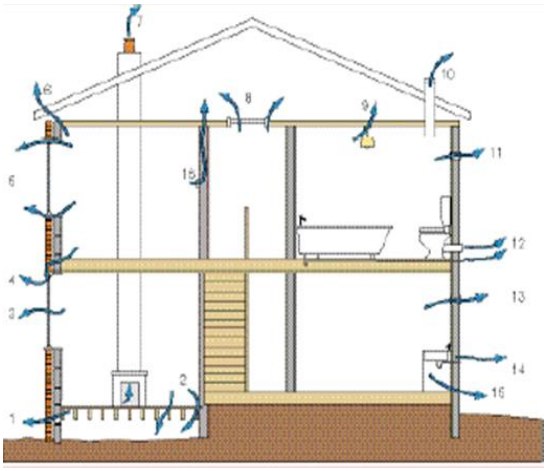

Figure 8: Air Infiltration Natural Paths

The air tightness of a building impacts on its energy consumption and hence the CO2 emissions. The more air tight the building, the less energy is required to heat the building in winter. Part L2 of the current (2021 Edition) Building Regulations states that air permeability must be less than 8m3/hr per m2 @ 50Pa. Experience working with the new regulations has shown that it is usually necessary to make significant improvements on the statutory limit to achieve CO2 emission compliance. A new build development should target a value of 3m3/hr per m2 @ 50Pa.

In accordance with the requirements of a low energy building, the air tightness characteristics will be addressed for the 14 Blackburn Road. With robust design, the target proposed for the building is 3m3/m2/hr @ 50Pa.

E.2.3 Heavyweight Structure (Thermal Mass)

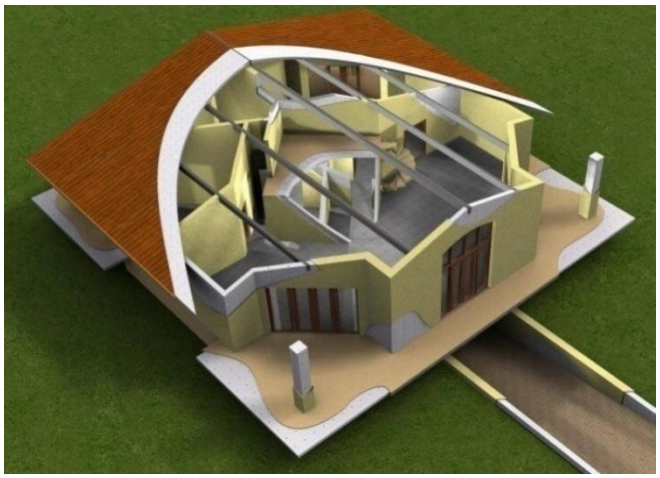

Figure 9: Cut-away of Heavyweight Structure (Thermal Mass)

The use of heavyweight building materials in determined areas of a construction can provide thermal mass and inertia which will help regulate the internal temperature and reduce the risk of overheating. Heavyweight roof structure and block walls are elements where thermal mass can be concentrated. Exposed concrete, for example, has a high density and specific heat capacity and can absorb heat generated by occupants, equipment, lighting and through solar gain during the day. At night, the exposed concrete can be cooled through a combination of natural and/or mechanical means. This night purging facilitates the storing of 'coolth' (setting with MVHR) by the heavyweight fabric which can be released the following day. Research has shown that a heavyweight building can maintain room temperatures circa 2ºC-4ºC below outside temperatures, whereas lightweight buildings are typically 2ºC -4ºC above outside temperatures.

It should be noted that there are aesthetic issues associated with exposing the thermal mass and services but the main concerns are with acoustic performance. Hard surfaces promote the reflection of noise through a building, reducing privacy. Acoustically absorbent tiles, strategically suspended below part of the exposed concrete ceiling, can be used to overcome this problem.

The thermal mass and air permeability techniques are to be implemented at the development of 14 Blackburn Road, to ensure the development is as thermally efficient as possible.

E.2.4 Daylight and Glazing

E.2.4.1 Daylight

Figure 9: Daylight

Hotel lobbies and restaurants require a lighting level from 200 300Lux, for the office spaces, a typical working/learning environment should be illuminated to a light level of 300 - 500 lux, and for approximately 70% of the working year, 10,000 lux is available externally from an overcast diffuse sky. Therefore, through effective window and façade design, as well as strategically located atria and light wells, light can be brought into a building, and artificial lighting within rooms can be dimmed or switched off, saving energy.

Increasing daylight factors is achieved through careful design and consideration of the window size and position. Rooms with high window head heights enable daylight to penetrate deeper into the room, whereas full height windows to the floor encourage very high daylight factors adjacent to them, spoiling the uniformity across the room. Too much or badly positioned glazing can also cause excessive glare and result in building users closing the blinds and turning on the artificial lights.

Rooflights and sun pipes can be used to channel daylight into central areas and corridors, and rooms with inner walls facing into an atrium can have secondary daylight brought in through internal windows, improving the uniformity of illumination.

E.2.4.2 Glazing

The choice of glazing affects the daylight, heat loss and, importantly, the solar heat gain through a window.

The optimum glazing area for saving energy is around 30% - 50% (varying with orientation and type of glazing), as overheating is a risk with areas greater than 50%.

A wide variety of solar control glazing is available to combat overheating, including absorbing glass which is body tinted, reflective glass which has a special coating, and prismatic glass which can reflect and refract incoming sunlight.

Figure 10: Solar Glazing

Glazing should be specified following careful consideration of the Solar Energy (g-value) and light transmittance values. Higher g-values will be welcome in winter, in order to benefit from as much solar heat gain as possible, but could lead to overheating in summer, especially when the U-Values are low.

Good light transmittance is required all year round so as to minimise the use of artificial light. However, as the g-value decreases, so does the light transmittance. It is possible to achieve low g-values whilst maintaining high light transmittance, but this can get expensive. Therefore, a compromise is needed between the two values.

Encouraging the correct quality and quantity of daylight to penetrate the building is key to reducing the amount of light required from artificial sources and hence energy requirements.

The development is targeting 0.8 W/m^{2}K U-values (0.35 W/m^{2}K G-value) for the PBSA, commercial and the residential element. Additionally, window cills have been raised to reduce the amount of glazing per apartment.

E.2.5 Solar Shading

Façade engineering or solar shading can be a highly effective way of controlling overheating and help reduce glare. Techniques may include external, internal or mid-pane shading devices, or solar control glazing.

Figure 11: An example of Solar Shading

External shading is generally the most effective of these, as it intercepts the solar radiation before it enters the building such that very little solar gain is transmitted to the occupied rooms. (Overhangs and other projections are similarly effective).

Horizontal shades are more effective on south facing facades that receive the most sunlight, but vertical shades are better for those that face east and west when the sun is low in the sky. North facing windows receive sunlight only in the early morning or evening in summer so shading is generally not required.

It should be noted that all shading devices will block some daylight and affect the occupants view out, so some sort of compromise is needed.

The proposed development of 14 Blackburn Road utilises the benefits of projecting bay windows within the residential element of the scheme and perforated panels on the PBSA south façade.

E.3 Mechanical and Electrical Services

E.3.1 Ventilation Strategy

Adopting the correct ventilation principle is critical to the success of the project. The provision of mechanical ventilation is a significant consumer of electrical energy, however is attractive when aiming to ensure internal thermal comfort. The significant build quality of the project means that mechanical ventilation will be implemented.

Carefully designed ventilation systems combined with high thermal mass construction, can significantly reduce summertime temperatures and prevent overheating.

E.3.1.1 Natural Ventilation

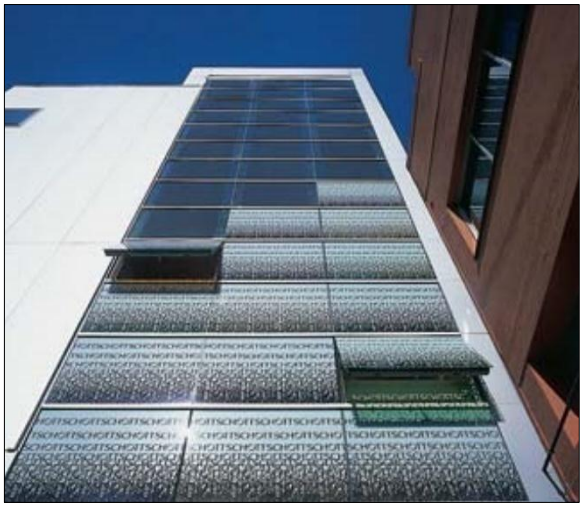

Figure 12: Openable Windows

Adopting natural ventilation systems (openable windows, atria, ventilation stacks) will reduce the dependence on mechanical air handling systems as well as providing a pleasant working environment. In general, low occupancy areas (e.g., office space with 1 person per $10m^2$ - $12m^2$) lend themselves to a natural ventilation strategy with room depths of up to circa 7.0m. It should be noted however, that the performance of natural ventilation is highly dependent on the forces of nature.

There are two forces driving natural ventilation. Tall rooms and atria can take advantage of the "Stack Effect", whereby warm air rises within the building and exits via high level windows or rooflights. This draws in, and is replaced by cooler air entering at lower-level windows or doors.

Double sided and shallow plan rooms can take advantage of wind forces, applying cross ventilation from window to window. This is the most effective arrangement for providing ventilation (in winter) and cooling in summer.

Single sided room ventilation can also prove effective up to depths of circa 2.5 times the height of the room – giving a maximum depth of 7.5m for a 3.0m high space. This is particularly advantageous in areas which would be exposed to external noise levels e.g., traffic noise, through the opening of windows.

Information provided by Quantum Acoustics in their Acoustic report states that the window opening strategy and profile will vary depending upon façade location and height. Purge ventilation will be possible via openable windows at all locations however due to acoustic restraints found in the report, this will not be modelled. All affordable homes are dual aspect which means cross ventilation can be provided when the windows are open for purge.

E.3.1.2 Mechanical Ventilation

As natural ventilation is not a viable option at 14 Blackburn Road, the whole development will be mechanically ventilated.

Each individual apartment in the residential block will be served by an independent Hybrid MVHR located within the utility cupboard that is able to provide tempered air to the space in order to mitigate overheating.

Each studio within in the PBSA block will be served by an independent heat recovery unit found in the ceiling void that provides external air to the space in order to mitigate overheating. The heat recovery units will have an additional purge boost fan to provide boosted air rate to assist with cooling the spaces.

An MVHR unit passes the warm outgoing 'exhaust' air stream through a heat exchanger (generally thermal wheel, plate heat exchanger or run-around coil) where some of the thermal energy is transferred to the cold incoming 'supply'

air. This reduces the amount of heat needed to be added to the supply air, often to the point where no additional heat is required.

These units are highly efficient due to their heat recovery technology and are small and compact enough to fit within the ceiling void.

E.3.2 High Efficiency Motors

Fan and pump motor loads should always be minimised by good system design prior to motor selection. High-efficiency inverter-controlled fan and pump motors should be employed to facilitate accurate commissioning and reduced energy consumption at part load conditions. This will ensure that plant output characteristics match system pressure drops. Direct drives rather than belt drives will be utilised at 14 Blackburn Road. The use of Variable Speed Drives (VSDs) will also be utilised for efficient system regulation and variable flow control. Systems will be carefully designed to minimise pressure loss and hence reduce energy consumption.

E.3.3 Artificial Lighting

Electric artificial lighting is often the single largest end-use of energy within buildings and can account for over 40% of the total electricity costs. When artificial lighting is used, it not only consumes electrical energy but adds to the internal heat gains, which can give rise to a situation where additional electrical energy is required to cool certain spaces. It is imperative then, that the lighting design philosophy provides the correct quality of lighting with minimum energy input and hence reduces internal heat gains.

To this end, the first key approach is not necessarily reducing the quantity of installed products but ensuring that systems are used less, and emit as much artificial light as possible, when operational, to minimise energy consumption. This can be achieved by using highly efficient dimmable luminaires. Simple advancements in optical systems within luminaires, such as louvre material and design have increased product output performance.

Output performance or Light Output Ratios (LORs) is the percentage of the light produced by the lamp which actually exits the luminaire as useful light. Dimmable luminaires which offer high LORs (>85%) should be considered, as these can reduce energy consumption even further. Choosing lamps that have high outputs compared to energy used is also important here. Artificial lighting should be designed to an average initial efficacy of not less than 85 luminaire-lumens/circuit Watt as averaged over the whole area in the building. LED light sources can typically produce over 100lm/w, and this efficiency will only improve over the coming years.

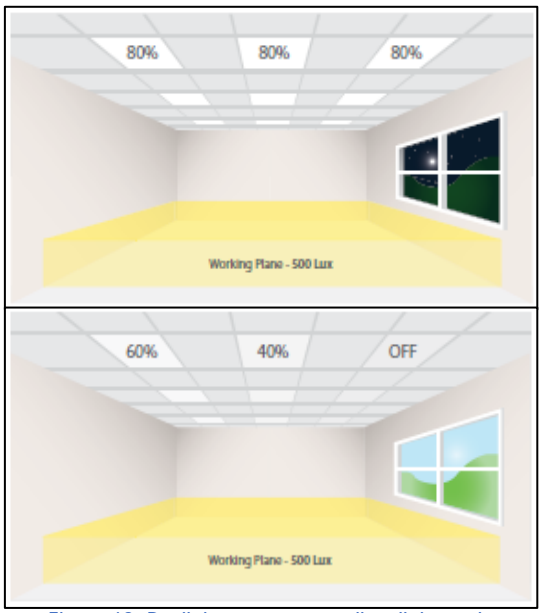

Figure 13: Daylight sensors can allow lights to be dimmed by certain percentages depending on available

Lighting control should adopt a daylight sensing approach combined with occupancy detection, where applicable. With the correct amount of daylight entering a space, it is possible to ensure that the luminaires are used as infrequently as possible. Sensors to dim lighting systems should be employed such that an installed system can be dimmed to a set level. Sensors incorporating photocell technology will allow dimming control of carefully selected luminaires where daylight contribution could facilitate energy savings.

Occupancy or absence detection is an energy saving strategy that controls the lighting status depending on whether a room has been vacant for a set period of time. The function of the room and occupancy profile should be carefully considered in terms of frequency of switching. Certain lamp types will fail early if switched too frequently (>8 switching per day).

Artificial lighting strategies involve various mounting types such as recessed, pendant, wall etc. It is important that the lighting strategy provides the functional lighting quality and quantity to enable a user to perform the required task. At the same time, the illumination of other room surfaces is important to create an environment that is not depressive and one that stimulates the working environment. For 14 Blackburn Road, external lightning has been proposed to help illuminate the street.

Suspended pendant luminaires offer the advantage of providing additional light upwards onto the ceiling and in providing a continuous system where cabling and accessories are concealed. These systems tend to work best with exposed soffit ceilings and due to their ability to conceal wiring and services on the ceiling.

It is imperative that the lighting design philosophy for the 14 Blackburn Road development provides the correct quality of lighting with minimum energy input and hence reduce internal heat gains. High light output luminaires combined with low energy lamps, will be used throughout the project to ensure minimum energy input is required and reducing internal height gains. Lighting control systems will include daylight sensing and absence detection to ensure that the electrical energy and associated carbon emissions of the building lighting installation are kept to a minimum. Output performance or Light Output Ratios (LORs) will exceed 80%.

E.3.4 Heating

Heating can be delivered in a variety of different ways, using gas boilers was previously a common means of generation of low temperature hot water. However, the associated carbon emissions are high for this means this is an inappropriate solution for a development aiming for reduced carbon usage. Similarly, electric panel heaters are often used for space heating but have an efficiency of 1.00 as they convert electrical energy directly to heat energy. Greater efficiencies can be achieved by alternative technologies such as air source heat pumps, which can also run on electricity.

Low temperature hot water generation via an air source heat pump (ASHP) has been proposed for use at the development at 14 Blackburn Road. ASHPs use refrigerant to generate hot water, that is then pumped around the development to where it is required to heat spaces via radiators or underfloor heating. Heat is extracted from the air by the refrigerant, with this heat then being transferred through a heat exchanger into the water. The associated carbon emissions are very low, with the highest efficiency ASHP being recommended to reduce energy demand further.

Variable speed pump control using pressure sensors has been recommended for usage in the development. These offer great improvement over constant speed pump, which were once commonplace. Use of pressure sensors mean a near constant pressure can be maintained, providing considerable gains in efficiency over basic constant speed pumps.

E.3.5 Domestic Hot Water

Domestic Hot water can be generated in a variety of different ways, using gas boilers is a previously common means of hot water generation. However, the associated carbon emissions are high for this means. The suggested alternative for use at the development of 14 Blackburn Road is domestic hot water generation via an air source heat pump (ASHP). An ASHP uses refrigerant to generate hot water, that is then pumped around the development to where it is required. Heat is extracted from the air by the refrigerant, with this heat then being transferred through a heat exchanger into the water. The associated carbon emissions are very low, with the highest efficiency ASHP being recommended to reduce energy demand further.

E.3.6 Building Management System (BMS)

A Building Management System (BMS) is a computer based centralised system that helps manage, control and monitor engineering services and equipment installed in a building. This equipment can include heating, ventilation, cooling, security, and lighting. The BMS has evolved from being a simple supervisory controller, to a totally integrated computerised control and monitoring system. BMS installations can include energy monitoring facilities that will allow the performance of the building, and its associated energy use, to be monitored accurately and consistently.

For the development at 14 Blackburn Road, as well as being used to control services, the BMS could be utilised to collate metering data and identify irregularities in energy consumption (effectively a Building Energy Management

System [BEMS]). This information could then be used to provide a meaningful input for the purposes of energy management for energy/CO_2 savings.

Individual meters are to be used for each apartment in the residential block, with landlord spaces served by their own meter for the use of the landlord. PBSA spaces will be centrally metered with individual check meters in the studios. Individual meters for the commercial units will also be provided.

To promote the energy efficient operation of the development, and to demonstrate the building's 'green credentials', the energy consumption could be relayed to an LCD/plasma screen, perhaps in the Entrance/lobby areas, to ensure occupants are conscious of the positive impact that the passive design solutions and renewable technologies make on the CO_2 footprint of the development.

E.3.7 Adaption to Climate Change

Since the 1970s, average temperatures for Central England have risen by nearly 1°C, and the last decade was the warmest on record. It is likely that the climate will continue to change with higher temperatures, changing rainfall patterns, rising sea levels and more unpredictable extreme weather ranging from floods, droughts and freezing winters. The UK Climate Change Risk Assessment: Government Report (2012) outlines the risks faced to businesses, buildings, and health and wellbeing in the future.

Risks noted within this report include the likelihood of increased external temperatures, which could lead to a loss of staff hours, and damage to equipment due to high internal building temperatures. Increased external temperatures would also lead to increased energy demand for cooling, which would not only further increase atmospheric carbon emissions, but also put strain on the energy infrastructure. Energy infrastructure itself would also be at risk of disruption, meaning that there will be less energy available on the grid.

UK 2012 | Climate Change Risk Assessment

Passive design features mean that the building is well adapted to these risks. Firstly, the energy demand has been reduced, thus the building will be less affected by the decreased availability of energy. Secondly, it will also have a lower carbon footprint, helping to stop the effects of climate change from increasing further.

A combination of the expected increase in external temperatures could mean future overheating problems.

Efficient lighting and mechanical systems will keep the internal heat gains to a minimum. Building Regulations surpassing u-values and designed out thermal bridges will retain heat within the building. This means that heat cannot enter the building through the fabric. High thermal mass will absorb much of the heat that is present within rooms during occupied times, keeping the room below external temperatures.

These features will mean that there will be a reduced demand for cooling, keeping the building's energy demand low.

This combination of passive design measures will act to stabilise the temperatures within the building and enable it to adapt to the likely extremes of both heat and cold.

SECTION F – MODEL RESULTS

F.1 Model Results

F.1.1 Residential Development

In order to assess the benefits of a passive design there has to be a comparison against a baseline building that represents notional building regulation performance. The baseline building will have notional values for building fabric, building services efficiencies etc.

The baseline building is then compared against the be lean model and the be green model to determine what percentage betterment there is.

The Be Lean model includes improvement to the building fabric and passive building services for example the lighting efficiencies.

The final be green model includes the improved efficiency of the ASHP and PV that has been proposed for the project. Please note to achieve the figures below the PV array has been proportionally split between all apartments to create a realistic output.

The changes made to each model are outlined below in table 5.

Model	
Baseline	In line with Part L requirements
Be Lean	Improved fabric as outlined in section D.2 Improved ventilation SFPs (0.6W/l/s MVHR) Improved lighting efficacy (120 lm/W)
Be Clean	Same as 'Be Lean'
Be Green	Improved ASHP efficiencies 333% PV Panels (34.65 kW peak power array)

Table 5: Model Changes

A selection of apartments has been modelled, a list of these is shown below in Table 6. For the final tabular results, the number of units in the whole building have been accounted for.

Shown is Appendix 4

Apartment
0301_2B4P
0302_1B2P
0305_3B5P
0306_3B6P
0307_2B3P

Table 6: Apartments Modelled

The results from the SAP analysis are shown in summary Tables 7-9 below:

Be Lean

Apartment	DER (kgCO2/yr/m2)	TER (kgCO2/yr/m2)	DPER (kWh/m2/yr)	TPER (kWh/m2/yr)	SAP Rating
0301_2B4P	2.93	12.79	31.27	68.61	86B
0302_1B2P	3.12	13.47	33.48	77.63	86B
0305_3B5P	2.40	10.40	25.76	55.72	88B
0306_3B6P	2.40	10.34	25.72	55.31	88B
0307_2B3P	2.86	12.76	30.55	68.38	87B

Table 7: Be Lean SAP Results

Be Clean

Apartment	DER (kgCO2/yr/m2)	TER (kgCO2/yr/m2)	DPER (kWh/m2/yr)	TPER (kWh/m2/yr)	SAP Rating
0301_2B4P	2.93	12.79	31.27	68.61	86B
0302_1B2P	3.12	13.47	33.48	77.63	86B
0305_3B5P	2.40	10.40	25.76	55.72	88B
0306_3B6P	2.40	10.34	25.72	55.31	88B
0307_2B3P	2.86	12.76	30.55	68.38	87B

Table 8: Be Clean SAP Results

Be Green

Apartment	DER (kgCO2/yr/m2)	TER (kgCO2/yr/m2)	DPER (kWh/m2/yr)	TPER (kWh/m2/yr)	SAP Rating
0301_2B4P	1.59	12.79	16.56	68.61	90B
0302_1B2P	1.57	13.47	16.44	77.63	90B
0305_3B5P	1.40	10.40	14.62	55.72	91B
0306_3B6P	1.37	10.34	14.33	55.31	91B
0307_2B3P	1.61	12.76	16.82	68.38	90B

Table 9: Be Green SAP Results

Figures 14 and 15 below show results from the GLA calculator. An average result across all the analysed apartments has been used to generate an indication of how the buildings energy demand and carbon emissions perform compared against the Building Regulations Part L Baseline.

The SAP summary page results can be found in Appendix 1.

	Regulated residential carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Be lean: savings from energy demand reduction	27.5	85%
Be clean: savings from heat network	0.2	0%
Be green: savings from renewable energy	0.6	2%
Cumulative on site savings	**28.3**	**87%**
Annual savings from off-set payment	4.1	-
	(Tonnes CO_2)	
Cumulative savings for off-set payment	**124**	-
Cash in-lieu contribution (£)	**11,735**	

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

*Figure 14: GLA Calculator Output Regulated CO_2 Savings for Residential Development*Subject to rounding by the GLA calculating*

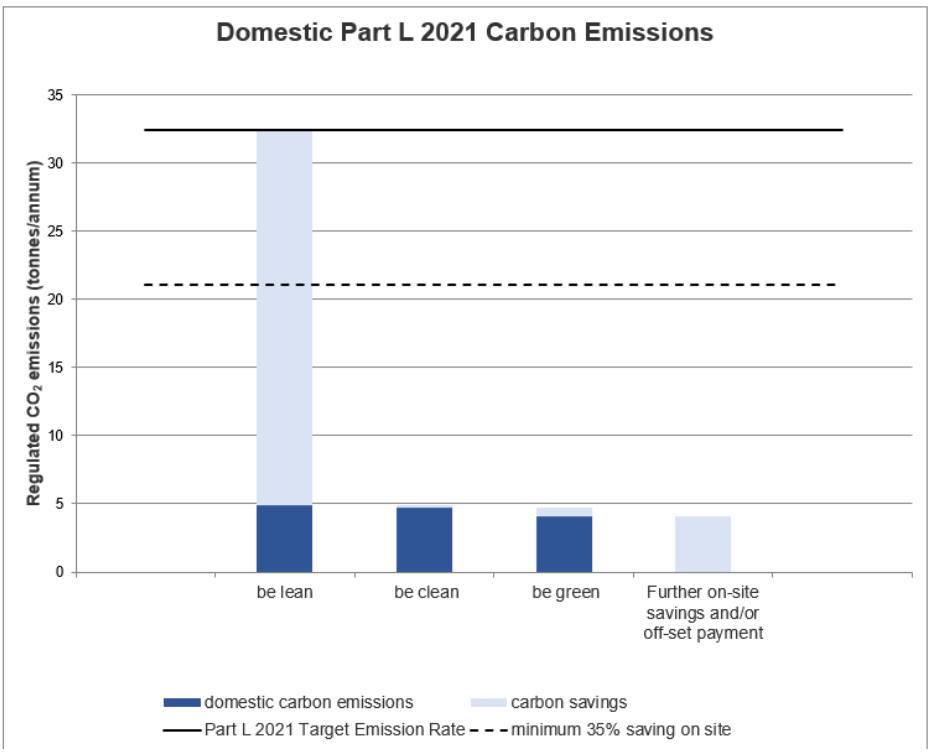

Figure 15: GLA Calculator Carbon Emissions Output for Residential Development

F.1.2 Commercial Showrooms

In order to assess the benefits of a passive design there has to be a comparison against a baseline building that represents notional building regulation performance. The baseline building will have notional values for building fabric, building services efficiencies etc.

The baseline building is then compared against the be lean model and the be green model to determine what percentage betterment there is.

The Be Lean model includes improvement to the building fabric and passive building services for example the lighting efficiencies.

The final Be Green model includes the improved efficiency of the ASHP that has been proposed for the project.

The changes made to each model are outlined below in table 10.

Model	
Baseline	In line with Part L requirements
Be Lean	Improved fabric as outlined in section D.2 Improved ventilation SFPs (0.6W/l/s MVHR) Improved lighting efficacy (120 lm/W) Improved ASHP and VRF efficiencies
Be Clean	Same as 'Be Lean'
Be Green	Improved ASHP Hot water efficiency (3.3)

Table 10: Model Changes

Building Regulations UK Part L (BRUKL) calculations have been carried out for the PBSA block. Results for these are shown below in Tables 11-13. BRUKL cover pages can be found in Appendix 2.

Be Lean

BLOCK	BER (kgCO2/yr/m2)	TER (kgCO2/yr/m2)	BPER (kWh/m2/yr)	TPER (kWh/m2/yr)	Improvement Over Baseline (%)
Commercial	2.63	4.41	28.61	46.13	40.36

Table 11: Be Lean BRUKL Results

Be Clean

BLOCK	BER (kgCO2/yr/m2)	TER (kgCO2/yr/m2)	BPER (kWh/m2/yr)	TPER (kWh/m2/yr)	Improvement Over Baseline (%)
Commercial	2.63	4.41	28.61	46.13	40.36

Table 12: Be Clean BRUKL Results

Be Green

BLOCK	BER (kgCO2/yr/m2)	TER (kgCO2/yr/m2)	BPER (kWh/m2/yr)	TPER (kWh/m2/yr)	Improvement Over Baseline (%)
Commercial	2.58	4.41	28.16	46.13	41.50

Table 13: Be Green BRUKL Results

Figures 16 and 17 below show the results from the GLA calculator.

	Regulated non-residential carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Be lean: savings from energy demand reduction	2.0	40%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	0.1	1%
Total Cumulative Savings	**2.1**	**41%**
Annual savings from off-set payment	3.0	-
	(Tonnes CO_2)	
Cumulative savings for off-set payment	**89**	-
Cash in-lieu contribution (£)	**8,415**	

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

Figure 17: GLA Calculator Carbon Emissions Output for Commercial Development

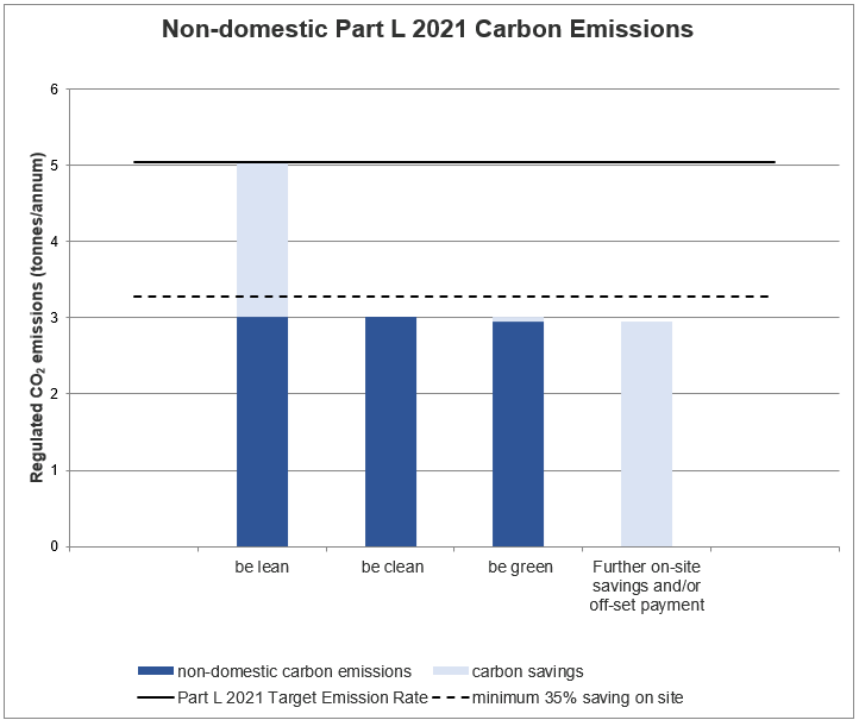

*Figure 16: GLA Calculator Output Regulated CO_2 Savings for Commercial Development*Subject to rounding by the GLA calculating*

F.1.3 PBSA & Cafe Development

In order to assess the benefits of a passive design there has to be a comparison against a baseline building that represents notional building regulation performance. The baseline building will have notional values for building fabric, building services efficiencies etc.

The baseline building is then compared against the be lean model and the be green model to determine what percentage betterment there is.

The Be Lean model includes improvement to the building fabric and passive building services for example the lighting efficiencies.

The final Be Green model includes the improved efficiency of the ASHP, the VRF and PV that has been proposed for the project. Please note to achieve the figures below the PV array has been proportionally split between all apartments to create a realistic output.

The changes made to each model are outlined below in table 10.

Model	
Baseline	In line with Part L requirements
Be Lean	Improved fabric as outlined in section D.2 Improved ventilation SFPs (0.6W/l/s MVHR) Improved lighting efficacy (120 lm/W) Improved ASHP and VRF efficiencies
Be Clean	Same as 'Be Lean'
Be Green	Maximised PV on Roof (62.1 kW Peak Power Array)

Table 14: Model Changes

Building Regulations UK Part L (BRUKL) calculations have been carried out for the PBSA block. Results for these are shown below in Tables 15-17. BRUKL cover pages can be found in Appendix 2.

Be Lean

BLOCK	BER (kgCO2/yr/m2)	TER (kgCO2/yr/m2)	BPER (kWh/m2/yr)	TPER (kWh/m2/yr)	Improvement Over Baseline (%)
PBSA & Cafe	2.53	3.47	27.31	37.12	27.09

Table 15: Be Lean BRUKL Results

Be Clean

BLOCK	BER (kgCO2/yr/m2)	TER (kgCO2/yr/m2)	BPER (kWh/m2/yr)	TPER (kWh/m2/yr)	Improvement Over Baseline (%)
PBSA & Cafe	2.53	3.47	27.31	37.12	27.09

Table 16: Be Clean BRUKL Results

Be Green

BLOCK	BER (kgCO2/yr/m2)	TER (kgCO2/yr/m2)	BPER (kWh/m2/yr)	TPER (kWh/m2/yr)	Improvement Over Baseline (%)
PBSA & Cafe	1.15	3.47	11.51	37.12	66.85

Table 17: Be Green BRUKL Results

Figures 18 and 19 below show the results from the GLA calculator.

	Regulated non-residential carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Be lean: savings from energy demand reduction	4.3	27%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	6.3	40%
Total Cumulative Savings	**10.7**	**67%**
Annual savings from off-set payment	5.3	-
	(Tonnes CO_2)	
Cumulative savings for off-set payment	**158**	-
Cash in-lieu contribution (£)	**15,053**	

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

Figure 18: GLA Calculator Output Regulated CO_2 Savings for PBSA & Commercial Development

**Subject to rounding by GLA Calculator*

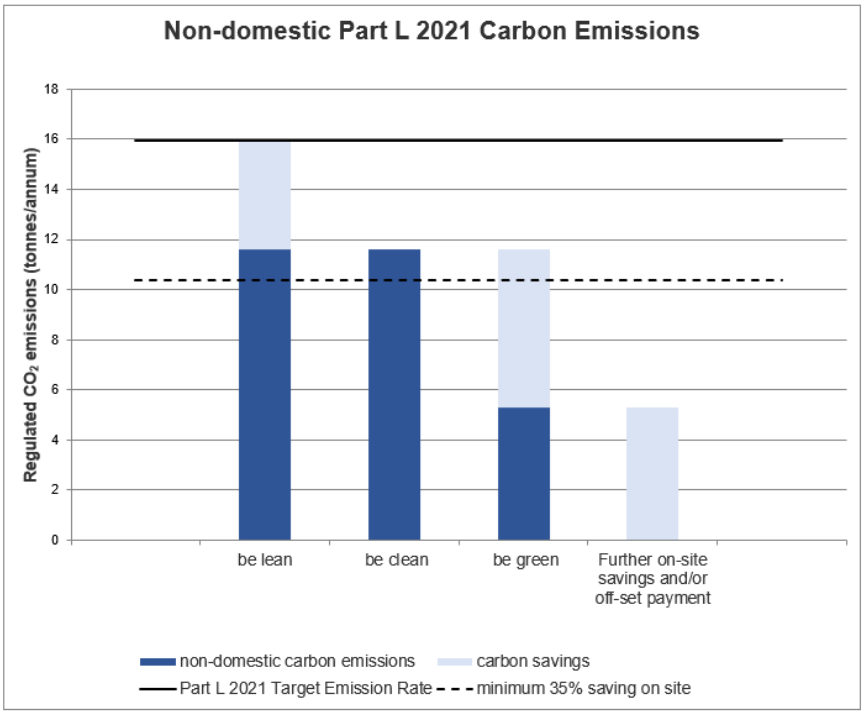

Figure 19: GLA Calculator Carbon Emissions Output for PBSA & Commercial Development

F.2 Unregulated Energy Use

F.1.1 Introduction

The Building Regulations Part L calculation looks at the energy consumption of regulated, fixed building services namely:

- Heating systems
- Cooling systems
- Domestic hot water generation
- Ventilation
- Pumps and fans
- Internal lighting

A large portion of the energy consumption for a building, however, comprises of unregulated energy consumption. By definition the unregulated energy is a system or process that consumes energy by the development but which does not have a requirement or control imposed on it by Building Regulations. This therefore makes it exempt from the Part L calculation.

The unregulated energy use is typically determined late in the process of the development once further detail is established through the design and client engagement process in terms of the final selection of equipment and the occupancy use and hours of occupancy. At this stage of the development, the anticipated systems and the preliminary energy values are undefined and as such estimates are used for the initial analysis.

The following table provides the estimated unregulated annual energy consumption for the named systems and processes.

UNREGULATED ENERGY SYSTEM/PROCESS	ESTIMATED ANNUAL ENERGY CONSUMTION (kWh/m2.annum)
Lifts	41,908
External Lighting	10,263
Small Power	190,969
Catering	47,755
Servers	87,360
Fire Alarm Panel	874
Security Alarm Panel	1,747
CCTV Cameras	87
Accessible WC Alarm	87
Refuge Alarm Panel	1,310

Table 18: Unregulated Energy Consumption

SECTION G - OVERHEATING

G.1 Overheating

CGP MEP have carried out a thermal assessment of the proposed development of the 14 Blackburn Road development to determine whether the it achieves compliance with Building Regulations Part O Overheating Criteria. All “occupied” residential rooms form part of the analysis and the simulation is progressed with all services as per the design.

G.1.1 Building Regulations Part O Assessment Criteria

The Part O requirements were addressed through dynamic thermal modelling, whereby the approach should follow that outlined in the CIBSE TM59 guidelines. Exceptions to this are outlined in the Part O documentation and include examples such as updated window control strategies.

The CIBSE TM59 document defines the limits of thermal comfort to avoiding overheating in European buildings.

The methodology defined is based on the theory of adaptive comfort. This states that the acceptable temperature for occupants in a space “track” the mean indoor temperature over a preceding period. Due to the correlation between indoor and outdoor temperature in free-running buildings, this means that comfort temperature also varies with outdoor temperature.

In predominantly mechanically ventilated buildings, the required TM59 criteria is detailed as below:

- All occupied rooms should not exceed an operative temperature of 26°C for more than 3% of the annual occupied hours. The calculation is conducted separately for each room.

SECTION H: OVERHEATING MITIGATION

H.1 Overheating Reduction Measures – Cooling Hierarchy

Policy SI 4 (Managing Heat Risk) of the London Plan 2021 require major developments to assess the risk of summer overheating by applying the following cooling hierarchy:

- Minimise internal heat generation through energy efficient design
- Reduce the amount of heat entering a building in summer through orientation, shading, albedo, fenestration, insulation and green roofs and walls
- Manage the heat within the building through exposed internal thermal mass and high ceilings
- Application of passive ventilation
- Subsequent application of mechanical ventilation
- Application of active cooling systems (ensuring they are the lowest carbon options)

H.1.1 Minimise Internal Heat Generation

Internal Heat generation will be minimised throughout the development. This will be achieved by implementing the following:

- The use of energy efficient lighting (such as LED or CFL) with low heat outputs
- The use of energy efficient equipment with low heat output to reduce unnecessary internal heat gain
- Pipework on the centralised hot water system (via ASHP) will be fully insulated to minimise heat loss and prevent heat build-up in corridors and risers

H.1.2 Reduce the Amount of Heat Entering the Building

As the development will benefit from little solar shading from surrounding buildings due to its height. Low G Values of 0.35 will aid in mitigating adverse solar gain. Window cills have also been raised which reduces the amount of glazing, leading to less solar gain occurring.

The development will have insulated external walls, which minimise any heat gain through conduction.

H.1.3 Manage the Heat within the Building

The development will have a heavyweight thermal mass. This provides a damping effect, allowing the development to buffer itself from extremely high temperatures outside. However, it can also cause heat accumulation.

H.1.4 Ventilation Systems

Within the PBSA block all studios will be served by individual MVHR units providing mechanical ventilation, with an additional boost fan supplementing airflow at peak temperatures. Windows have been modelled as openable for the purpose of purge ventilation. With windows at high risk of noise closed at night. Due to acoustic constraints from the nearby railway, the windows have not been modelled to open during the night for further assistance with purge ventilation.

Within the residential block, an MVHR will be located within each apartment to provide mechanical ventilation to all required spaces. For some rooms that were failing, a Hybrid MVHR with heat/coolth recovery unit was added instead to assist in reducing overheating. All the affordable homes are also dual aspect providing cross ventilation, assisting even further with the purge.

H.1.5 Active Cooling

No cooling is to be used in the residential or living spaces in the development.

H.1.6 Openings

On the residential side of the development, windows have been modelled to be openable fully, to assist with overheating risk for the apartments. On the PBSA side, all north facing windows are restricted to only be openable 100mm and for the south facing windows, all windows that do not have the perforated panel in front of it are also restricted to 10mm. If the window has a perforated panel (added to some to provide shading), then it is fully openable from behind to help mitigate overheating. All windows are modelled to only be openable during the day due to noise risks in the night mentioned in the acoustic report, as the site is situated next to a railway station. Figure 20 shows the openable panes.

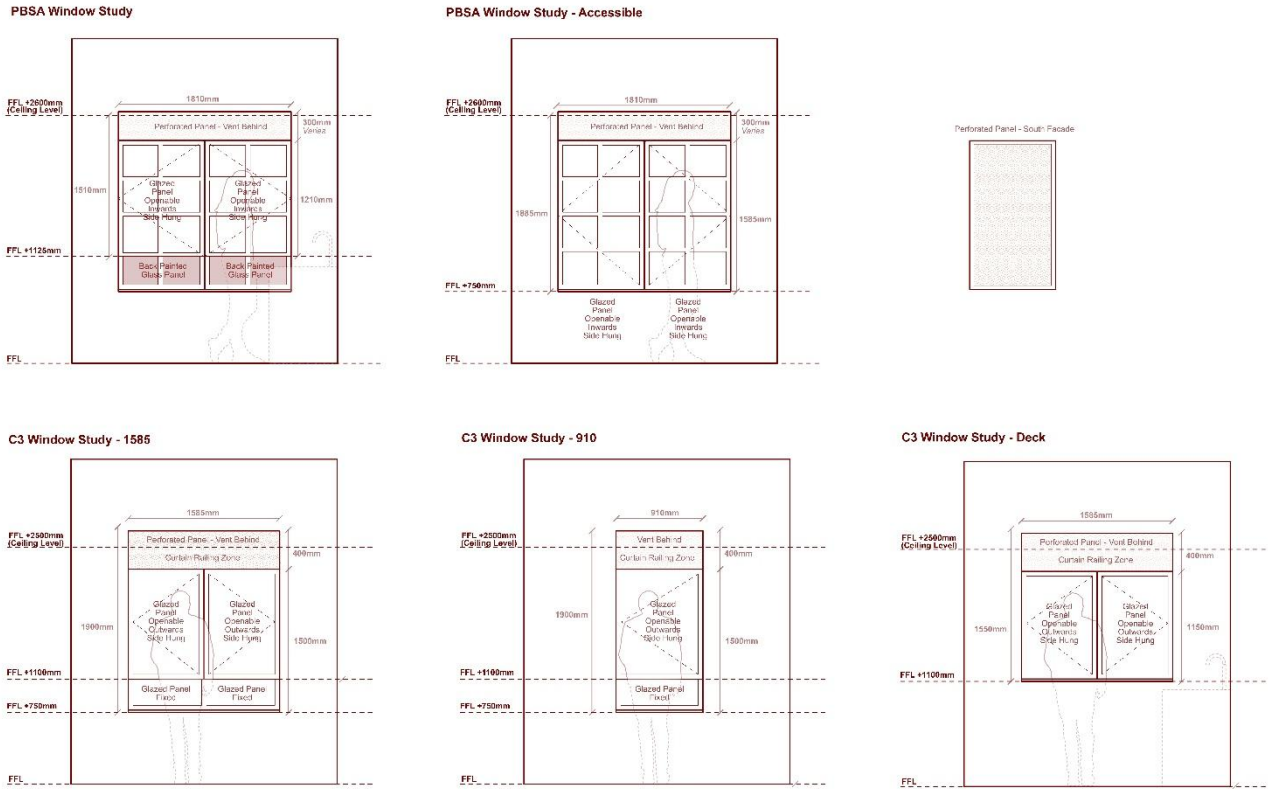

Figure 20: Openable Panes

SECTION I: ASSESSMENT INPUT DATA

I.1 Criteria

I.1.1 Rooms Assessed

All occupied areas of the building have been assessed.

I.1.2 Weather File

The development location falls under London Heathrow airport weather data.

DSY1_2020High50 has been employed to give an accurate depiction of current weather conditions at the site to ensure accurate simulations.

I.1.3 Construction Values

The U-Values used in this assessment are as per the details below:

Fabric Component	U-Values (W/m²K)
External Walls	0.14
Roof	0.12
Ground/ Exposed Floor	0.13
Windows	0.8 (G-value 0.35)
Air Tightness	3.0 m³/m²/h @ 50Pa

Table 19: Proposed Building Fabric

I.1.4 Occupants

The following occupancy levels have been input into the model. The bedrooms have been assigned using the CIBSE TM59 templates.

Room	No. Occupants	Occupant Gain (Sensible / Latent)
Double Bedrooms	2	75 / 55
Single Bedrooms	1	75 / 55
1 Bed Kitchen/Living/Dining	1	75 / 55
2 Bed Kitchen/Living/Dining	2	75 / 55
3 Bed Kitchen/Living/Dining	3	75 / 55
Studios	1	75 / 55

Table 20: Space Occupancies

I.1.5 Internal Gains

The following internal gains have been allowed within the assessment / calculation.

Room	Lighting (w/m²)	Equipment (W unless stated)	Ventilation (l/s)
Bedrooms	2	80	9
Kitchen/Living/Dining	2	450	38-47
PBSA Studios	2	450	20
Bathrooms	-	1.75 W/m²	-

Table 21: Internal Gains

I.2 IES Model Images

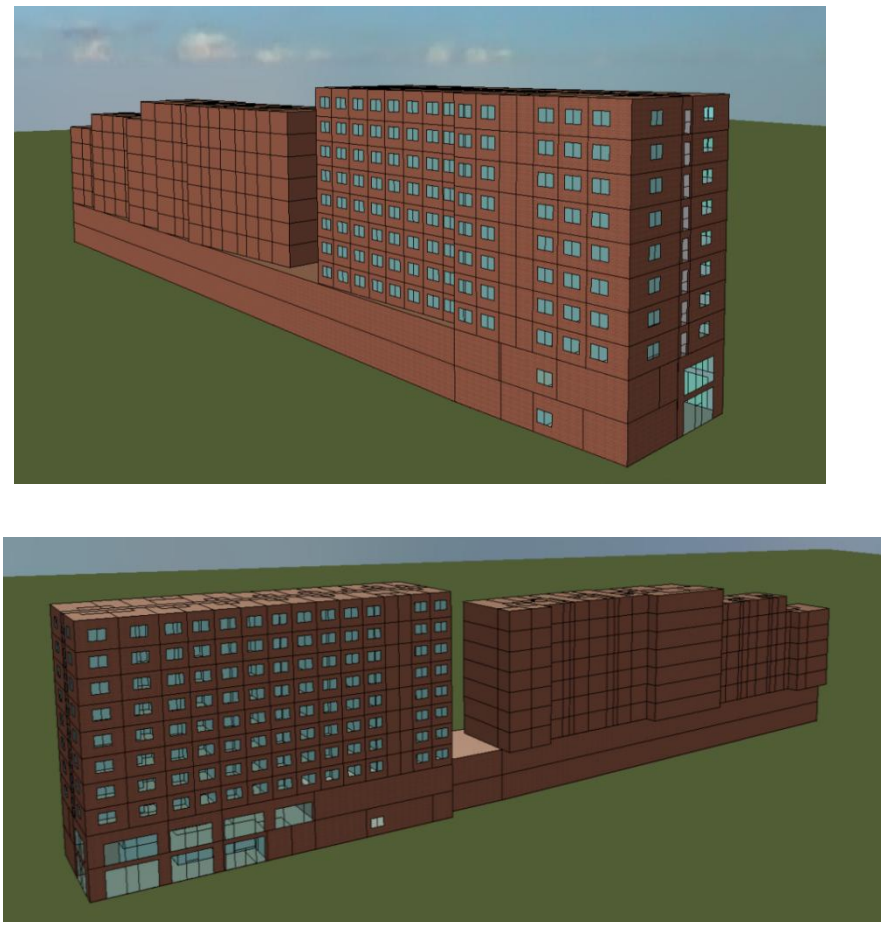

Figure 21: IES VE BRUKL Model Screenshots

SECTION J – Compliance Results

J.1 Part O Overheating Results – Residential Development:

TM59 results for the residential development are shown below in Table 22.

Compliance Forms

IES INTEGRATED ENVIRONMENTAL SOLUTIONS

CG15060 Blackburn Road Page 10 of 61

Mechanically ventilated rooms

CIBSE TM59 overheating methodology for predominantly mech. vent. rooms states the operative temperature of all rooms shall not exceed 26°C for more than 3% of annual occupied hours.

Room name	No. hours > 26°C	% Annual hours > 26°C	Mechanically ventilated check
01 - A1 B1	195	2.2	Pass
01 - A1 B2	200	2.3	Pass
01 - A1 LDK	138	2.9	Pass
01 - A2 LDK	104	2.2	Pass
01 - A2 B1	177	2.0	Pass
01 - A3 B1	169	1.9	Pass
01 - A3 LDK	124	2.6	Pass
01 - A4 LDK	124	2.6	Pass
01 - A4 B1	182	2.1	Pass
01 - A5 LDK	140	3.0	Pass
01 - A5 B1	181	2.1	Pass
01 - A5 B2	181	2.1	Pass
01 - A6 LDK	139	2.9	Pass
01 - A6 B1	213	2.4	Pass
01 - A6 B2	190	2.2	Pass
01 - A6 B3	173	2.0	Pass
01 - A7 B3	151	1.7	Pass
01 - A7 B2	186	2.1	Pass
01 - A7 B1	202	2.3	Pass
01 - A7 LDK	65	1.4	Pass
01 - A8 LDK	93	2.0	Pass
01 - A8 B1	175	2.0	Pass
01 - A8 B2	167	1.9	Pass
01 - Studio2	204	2.3	Pass
01 - Studio3	212	2.4	Pass
01 - Studio4	195	2.2	Pass
01 - Studio5	168	1.9	Pass
01 - Studio6	220	2.5	Pass
01 - Studio7	195	2.2	Pass
01 - Studio8	220	2.5	Pass
01 - Studio9	197	2.2	Pass
01 - Studio10	220	2.5	Pass
01 - Studio11	200	2.3	Pass
01 - Studio12	175	2.0	Pass
01 - Studio13	172	2.0	Pass
01 - Studio30	215	2.5	Pass
01 - Studio29	220	2.5	Pass

Integrated Environmental Solutions

Table 22: Residential Development TM59 Overheating Results

The TM59 Result Report can be found In Appendix 3.

SECTION K - Conclusion

K.1 Energy

In conclusion, this report shows that the design measures incorporated into the development at 14 Blackburn Road by means of passive measures have decreased the residential block, commercial areas and PBSA block's primary energy rate by 85%, 41% and 27% respectively from the baseline model analysis. Be Green measures alongside the passive measures for the residential block, commercial areas and PBSA block has managed to achieve a further 2%, 1% and 40% betterment respectively, resulting in a total improvement of 87%, 41% and 67%.

These reductions in energy meet the target 35% reduction required by the London Plan.

There is a required offset payment of £11,735, £8,415 and £15,053 for the residential, commercial and PBSA & café blocks respectively in order to make up the remaining reductions in carbon emissions in order to achieve net zero carbon.

This can be seen in the table below.

Development	Carbon Offset Payment
Residential	£11,735
Commercial Showrooms	£8,415
PBSA & Cafes	£15,053
Total	£35,203

Table 23: Carbon Offset Payment for Whole Development

The buildings have achieved this by passive measures, high efficiency ASHPs, high efficiency VRFs and PV arrays located on the roofs.

K.2 Building Regulations Part O - Overheating

Overheating poses a significant risk in modern buildings, with Building Regulations Part O being designed to ensure appropriate mitigation measures are taken to prevent against overheating.

Following Building Regulations Part O and CIBSE TM59 CGP MEP have carried out dynamic simulation modelling to assess the development against the overheating criteria.

Utilising the buildings efficient fabric performance, and MVHR's serving habitable rooms, the development passes the Part O criteria.

Appendix 1 – SAP's

Full SAP Calculation Printout

Property Reference	Be Lean	**Issued on Date**	08/04/2025
Assessment Reference	0301_2B4P_BL	**Prop Type Ref**	
Property			

SAP Rating	86 B	**DER**	2.93	**TER**	12.79
Environmental	98 A	**% DER < TER**			77.09
CO_2 Emissions (t/year)	0.22	**DFEE**	26.10	**TFEE**	33.03
Compliance Check	See BREL	**% DFEE < TFEE**			20.99
% DPER < TPER	54.42	**DPER**	31.27	**TPER**	68.61

Assessor Details	Alfie Gamble-Thornton	**Assessor ID**	CM02-0001
Client	Fifth State, Fifth State		

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)	
Main dwelling						
Ground floor	82.0000	(1b)	x 3.1500	(2b) =	258.3000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.0000					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	258.3000	(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		0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1500 (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	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762	(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	0.2862	0.2825	0.2787	0.2600	0.2562	0.2375	0.2375	0.2337	0.2450	0.2562	0.2637	0.2712	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Glazing			14.8000	0.7752	11.4729			(27)
External Wall North	34.6500	7.4000	27.2500	0.1400	3.8150	70.0000	1907.5000	(29a)
External Wall West	27.7200		27.7200	0.1400	3.8808	70.0000	1940.4000	(29a)
External Wall South	37.8000	7.4000	30.4000	0.1400	4.2560	70.0000	2128.0000	(29a)
Total net area of external elements Aum(A, m2)			100.1700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	23.4247			(33)
Main dwelling								
Party Wall 1 East			30.5600	0.0000	0.0000	45.0000	1375.2000	(32)
Party Floor 1			82.0000			30.0000	2460.0000	(32d)
Party Ceiling 1			82.0000			20.0000	1640.0000	(32b)
Internal Wall 1			104.6100			9.0000	941.4900	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12392.5900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		151.1291 (35)
List of Thermal Bridges		

K1 Element									Length	Psi-value	Total		
E7 Party floor between dwellings (in blocks of flats)									41.5000	0.0300	1.2450		
E18 Party wall between dwellings									12.6000	0.0300	0.3780		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												1.6230	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss											(33) + (36) + (36a) =	25.0477	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	24.3997	24.0800	23.7604	22.1621	21.8425	20.2443	20.2443	19.9246	20.8836	21.8425	22.4818	23.1211	(38)
Heat transfer coeff	49.4473	49.1277	48.8080	47.2098	46.8902	45.2919	45.2919	44.9723	45.9312	46.8902	47.5295	48.1687	(39)
Average = Sum(39)m / 12 =												47.1299	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6030	0.5991	0.5952	0.5757	0.5718	0.5523	0.5523	0.5484	0.5601	0.5718	0.5796	0.5874	(40)
HLP (average)												0.5748	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4997	(42)
Hot water usage for mixer showers	72.5185	71.4083	69.7721	67.2550	64.9998	61.8448	59.3493	62.2666	63.7339	66.8588	70.1132	72.4531	(42a)
Hot water usage for baths	27.9253	27.5038	26.9041	26.0060	25.1966	24.0824	23.2371	24.2707	24.8132	25.9172	27.0651	27.9032	(42b)
Hot water usage for other uses	40.2296	38.7667	37.3038	35.8409	34.3780	32.9151	32.9151	34.3780	35.8409	37.3038	38.7667	40.2296	(42c)
Average daily hot water use (litres/day)												129.3222	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	140.6734	137.6787	133.9799	129.1019	124.5744	118.8423	115.5015	120.9154	124.3880	130.0799	135.9449	140.5859	(44)
Energy conte	207.0955	182.1768	191.4545	168.6393	160.5267	137.4371	127.6326	142.3196	144.2839	167.6210	183.7340	206.4606	(45)
Energy content (annual)										Total = Sum(45)m =		2019.3818	
Distribution loss (46)m = 0.15 x (45)m	31.0643	27.3265	28.7182	25.2959	24.0790	20.6156	19.1449	21.3479	21.6426	25.1432	27.5601	30.9691	(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	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	(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	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	(64)
										Total per year (kWh/year) = Sum(64)m =		2670.2216	(64)
12Total per year (kWh/year)												2670	(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	113.0807	100.5157	107.8801	98.8675	97.5966	88.4928	86.6593	91.5427	90.7693	99.9554	103.8865	112.8696	(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	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	112.8185	124.9061	112.8185	116.5791	112.8185	116.5791	112.8185	112.8185	116.5791	112.8185	116.5791	112.8185	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	223.5697	225.8896	220.0434	207.5975	191.8868	177.1210	167.2565	164.9365	170.7828	183.2286	198.9393	213.7052	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	(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)	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	(71)
Water heating gains (Table 5)	151.9902	149.5770	145.0001	137.3160	131.1782	122.9066	116.4775	123.0413	126.0685	134.3487	144.2868	151.7065	(72)
Total internal gains	548.8740	560.8684	538.3577	521.9883	496.3792	477.1024	457.0482	461.2920	473.9261	490.8915	520.3009	538.7258	(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	7.4000	10.6334	0.3500	0.8500	0.7700	16.2227	(74)
South	7.4000	46.7521	0.3500	0.8500	0.7700	71.3268	(78)

Solar gains	87.5495	147.8174	201.4822	252.7968	289.2411	290.6849	278.7168	250.4198	218.7800	162.9002	104.5594	75.1570	(83)
Total gains	636.4235	708.6858	739.8399	774.7851	785.6203	767.7874	735.7650	711.7118	692.7061	653.7917	624.8603	613.8828	(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	69.6172	70.0702	70.5291	72.9168	73.4138	76.0044	76.0044	76.5446	74.9465	73.4138	72.4264	71.4651	
alpha	5.6411	5.6713	5.7019	5.8611	5.8943	6.0670	6.0670	6.1030	5.9964	5.8943	5.8284	5.7643	
util living area	0.9359	0.8926	0.8313	0.7003	0.5473	0.3769	0.2708	0.2906	0.4552	0.7071	0.8762	0.9419	(86)
MIT	20.4880	20.6473	20.7933	20.9356	20.9862	20.9989	20.9999	20.9998	20.9964	20.9430	20.7465	20.4837	(87)
Th 2	20.4273	20.4308	20.4343	20.4519	20.4554	20.4731	20.4731	20.4766	20.4660	20.4554	20.4484	20.4413	(88)
util rest of house	0.9271	0.8796	0.8128	0.6746	0.5171	0.3461	0.2384	0.2575	0.4207	0.6773	0.8600	0.9340	(89)
MIT 2	19.8353	20.0318	20.2088	20.3867	20.4430	20.4723	20.4730	20.4765	20.4632	20.3998	20.1693	19.8420	(90)
Living area fraction										fLA = Living area / (4) =		0.2439	(91)
MIT	19.9945	20.1819	20.3514	20.5206	20.5755	20.6007	20.6015	20.6042	20.5933	20.5323	20.3101	19.9985	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9945	20.1819	20.3514	20.5206	20.5755	20.6007	20.6015	20.6042	20.5933	20.5323	20.3101	19.9985	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9197	0.8735	0.8099	0.6779	0.5238	0.3536	0.2463	0.2656	0.4290	0.6816	0.8556	0.9269	(94)
Useful gains	585.3404	619.0277	599.1956	525.2423	411.4874	271.4615	181.2088	189.0280	297.1560	445.6462	534.6266	568.9834	(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	776.0525	750.7651	676.0594	548.6045	416.1714	271.7840	181.2366	189.0706	298.2441	465.7274	627.8665	760.9941	(97)
Space heating kWh	141.8898	88.5276	57.1867	16.8208	3.4849	0.0000	0.0000	0.0000	0.0000	14.9405	67.1328	142.8560	(98a)
Space heating requirement - total per year (kWh/year)												532.8389	
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	141.8898	88.5276	57.1867	16.8208	3.4849	0.0000	0.0000	0.0000	0.0000	14.9405	67.1328	142.8560	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												532.8389	
Space heating per m2										(98c) / (4) =		6.4980	(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												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.0000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	141.8898	88.5276	57.1867	16.8208	3.4849	0.0000	0.0000	0.0000	0.0000	14.9405	67.1328	142.8560	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00													
307a	141.8898	88.5276	57.1867	16.8208	3.4849	0.0000	0.0000	0.0000	0.0000	14.9405	67.1328	142.8560	
Space heating requirement	141.8898	88.5276	57.1867	16.8208	3.4849	0.0000	0.0000	0.0000	0.0000	14.9405	67.1328	142.8560	(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	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00													
310a	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	
Water heating fuel	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	(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	18.7349	16.9218	18.7349	18.1305	18.7349	18.1305	18.7349	18.7349	18.1305	18.7349	18.1305	18.7349	(331)
Lighting	24.9564	20.0209	18.0266	13.2071	10.2015	8.3347	9.3062	12.0965	15.7122	20.6152	23.2849	25.6500	(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												532.8389	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												2670.2216	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												5.3284	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7000)													
mechanical ventilation fans (SFP = 0.7000)												220.5882	(330a)
Total electricity for the above, kWh/year												220.5882	(331)
Electricity for lighting (calculated in Appendix L)												201.4122	(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												3625.0609	(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			262.0000	(367)
Space and Water heating from Heat pump	1222.5422	0.1583	32.1992	(367)
Electrical energy for heat distribution (space & water)	5.3284	0.0000	4.6054	(372)
Overall CO2 factor for heat network			0.0563	(386)
Total CO2 associated with community systems			180.3837	(373)
Space and water heating			180.3837	(376)
Pumps, fans and electric keep-hot	220.5882	0.1387	30.5983	(378)
Energy for lighting	201.4122	0.1443	29.0700	(379)
Total CO2, kg/year			240.0520	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.9300	(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			262.0000	(467a)
Space and Water heating from Heat pump	1222.5422	1.5861	322.5659	(467)
Electrical energy for heat distribution (space & water)	5.3284	0.0000	49.0631	(472)
Overall CO2 factor for heat network			0.6000	(486)
Total CO2 associated with community systems			1921.6990	(473)
Space and water heating			1921.6990	(476)
Pumps, fans and electric keep-hot	220.5882	1.5128	333.7058	(478)
Energy for lighting	201.4122	1.5338	308.9328	(479)
Total Primary energy kWh/year			2564.3376	(483)
Dwelling Primary energy Rate (DPER)			31.2700	(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)	
Main dwelling							
Ground floor		82.0000	(1b) x	3.1500	(2b) =	258.3000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.0000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		258.3000	(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) =	0.1161	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3661	(18)
Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3661	(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	0.4668	0.4577	0.4485	0.4028	0.3936	0.3478	0.3478	0.3387	0.3661	0.3936	0.4119	0.4302	(22b)
Effective ac	0.6090	0.6047	0.6006	0.5811	0.5775	0.5605	0.5605	0.5574	0.5670	0.5775	0.5848	0.5925	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opening Type			14.8000	1.1450	16.9466			(27)
External Wall North	34.6500	7.4000	27.2500	0.1800	4.9050			(29a)
External Wall West	27.7200		27.7200	0.1800	4.9896			(29a)
External Wall South	37.8000	7.4000	30.4000	0.1800	5.4720			(29a)
Total net area of external elements Aum(A, m2)			100.1700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.3132			(33)
Main dwelling								

Party Wall 1 East												30.5600	0.0000	0.0000	(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K													161.1291		(35)
List of Thermal Bridges															
K1 Element												Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)												41.5000	0.0700	2.9050	
E18 Party wall between dwellings												12.6000	0.0600	0.7560	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)														3.6610	(36)
Point Thermal bridges													(36a) =	0.0000	
Total fabric heat loss												(33) + (36) + (36a) =		35.9742	(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	51.9077	51.5470	51.1935	49.5330	49.2223	47.7761	47.7761	47.5082	48.3331	49.2223	49.8508	50.5079	(38)
Heat transfer coeff	87.8819	87.5212	87.1677	85.5072	85.1965	83.7502	83.7502	83.4824	84.3073	85.1965	85.8250	86.4820	(39)
Average = Sum(39)m / 12 =												85.5057	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0717	1.0673	1.0630	1.0428	1.0390	1.0213	1.0213	1.0181	1.0281	1.0390	1.0466	1.0547	(40)
HLP (average)												1.0428	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4997	(42)
Hot water usage for mixer showers	66.1317	65.1379	63.6897	60.9188	58.8739	56.5936	55.2974	56.7346	58.3101	60.7586	63.5890	65.8783	(42a)
Hot water usage for baths	28.5620	28.1378	27.5405	26.4391	25.6144	24.6999	24.2060	24.7991	25.4450	26.4235	27.5476	28.4655	(42b)
Hot water usage for other uses	40.2296	38.7667	37.3038	35.8409	34.3780	32.9151	32.9151	34.3780	35.8409	37.3038	38.7667	40.2296	(42c)
Average daily hot water use (litres/day)												124.0251	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	134.9233	132.0424	128.5340	123.1988	118.8663	114.2086	112.4185	115.9118	119.5960	124.4859	129.9032	134.5734	(44)
Energy conte	213.6855	188.0266	197.5519	168.6530	160.0169	140.4328	135.9604	143.5230	147.4738	168.9261	185.0710	210.7094	(45)
Energy content (annual)										Total = Sum(45)m =		2060.0305	
Distribution loss (46)m = 0.15 x (45)m	32.0528	28.2040	29.6328	25.2979	24.0025	21.0649	20.3941	21.5284	22.1211	25.3389	27.7606	31.6064	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	260.2804	230.1123	244.1468	213.7448	206.6118	185.5246	182.5553	190.1179	192.5657	215.5210	230.1628	257.3043	(62)
WWHRS	-30.2327	-26.7380	-27.9985	-23.1839	-21.6065	-18.4889	-17.3304	-18.4291	-19.1293	-22.5513	-25.5479	-29.6728	(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	230.0478	203.3743	216.1483	190.5610	185.0053	167.0358	165.2249	171.6888	173.4364	192.9697	204.6149	227.6315	(64)
										Total per year (kWh/year) = Sum(64)m =		2327.7386	(64)
12Total per year (kWh/year)												2328	(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	108.3264	96.1874	102.9619	92.1506	90.4816	82.7674	82.4828	84.9973	85.1085	93.4439	97.6096	107.3368	(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	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	115.1238	127.4585	115.1238	118.9613	115.1238	118.9613	115.1238	115.1238	118.9613	115.1238	118.9613	115.1238	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	223.5697	225.8896	220.0434	207.5975	191.8868	177.1210	167.2565	164.9365	170.7828	183.2286	198.9393	213.7052	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	(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)	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	(71)
Water heating gains (Table 5)	145.6000	143.1361	138.3897	127.9869	121.6150	114.9547	110.8639	114.2437	118.2063	125.5966	135.5688	144.2699	(72)
Total internal gains	547.7892	559.9799	537.0527	518.0415	492.1214	471.5327	453.7400	454.7998	468.4461	487.4448	516.9652	536.5946	(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	7.4000	10.6334	0.6300	0.7000	0.7700	24.0478	(74)
South	7.4000	46.7521	0.6300	0.7000	0.7700	105.7315	(78)

Solar gains	129.7793	219.1175	298.6678	374.7340	428.7574	430.8977	413.1566	371.2105	324.3092	241.4756	154.9939	111.4092	(83)
Total gains	677.5685	779.0974	835.7204	892.7755	920.8788	902.4304	866.8966	826.0103	792.7553	728.9204	671.9591	648.0038	(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	41.7625	41.9346	42.1046	42.9223	43.0788	43.8227	43.8227	43.9633	43.5332	43.0788	42.7634	42.4384	
alpha	3.7842	3.7956	3.8070	3.8615	3.8719	3.9215	3.9215	3.9309	3.9022	3.8719	3.8509	3.8292	
util living area													
	0.9704	0.9499	0.9187	0.8484	0.7312	0.5601	0.4164	0.4524	0.6590	0.8643	0.9490	0.9743	(86)
MIT	19.4972	19.7575	20.0776	20.4819	20.7774	20.9425	20.9859	20.9805	20.8888	20.5210	19.9632	19.4693	(87)
Th 2	20.0240	20.0276	20.0311	20.0478	20.0510	20.0656	20.0656	20.0683	20.0600	20.0510	20.0446	20.0380	(88)
util rest of house													
	0.9645	0.9403	0.9030	0.8195	0.6822	0.4891	0.3317	0.3660	0.5900	0.8323	0.9375	0.9692	(89)
MIT 2	18.2902	18.6183	19.0176	19.5163	19.8511	20.0262	20.0592	20.0588	19.9763	19.5744	18.8923	18.2648	(90)
Living area fraction										fLA = Living area / (4) =		0.2439	(91)
MIT	18.5846	18.8961	19.2761	19.7518	20.0770	20.2497	20.2852	20.2836	20.1988	19.8053	19.1535	18.5585	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5846	18.8961	19.2761	19.7518	20.0770	20.2497	20.2852	20.2836	20.1988	19.8053	19.1535	18.5585	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9529	0.9262	0.8882	0.8093	0.6836	0.5036	0.3520	0.3864	0.6008	0.8228	0.9241	0.9586	(94)
Useful gains	645.6646	721.6384	742.3113	722.5609	629.5241	454.4909	305.1523	319.1768	476.2796	599.7216	620.9641	621.1660	(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													
	1255.3578	1224.9598	1113.6644	927.9102	713.6896	473.1640	308.6368	324.2137	514.1751	784.2565	1034.4884	1241.7559	(97)
Space heating kWh													
	453.6118	338.2320	276.2867	147.8515	62.6191	0.0000	0.0000	0.0000	0.0000	137.2940	297.7375	461.7189	(98a)
Space heating requirement - total per year (kWh/year)												2175.3513	
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													
	453.6118	338.2320	276.2867	147.8515	62.6191	0.0000	0.0000	0.0000	0.0000	137.2940	297.7375	461.7189	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2175.3513	
Space heating per m2											(98c) / (4) =	26.5287	(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													
	453.6118	338.2320	276.2867	147.8515	62.6191	0.0000	0.0000	0.0000	0.0000	137.2940	297.7375	461.7189	(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)													
	491.4537	366.4485	299.3355	160.1858	67.8430	0.0000	0.0000	0.0000	0.0000	148.7475	322.5758	500.2371	(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													
	230.0478	203.3743	216.1483	190.5610	185.0053	167.0358	165.2249	171.6888	173.4364	192.9697	204.6149	227.6315	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.5532	85.1921	84.6114	83.4973	81.8990	79.8000	79.8000	79.8000	79.8000	83.3101	84.8999	85.6117	(217)
Fuel for water heating, kWh/month													
	268.8944	238.7243	255.4601	228.2242	225.8944	209.3180	207.0488	215.1488	217.3388	231.6283	241.0072	265.8884	(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	23.9205	19.1899	17.2784	12.6589	9.7781	7.9888	8.9199	11.5944	15.0600	19.7595	22.3183	24.5853	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-13.5036	-20.5454	-31.8395	-38.6837	-44.3007	-42.3032	-41.7849	-38.1437	-32.2167	-24.7093	-15.3697	-11.5054	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-3.6484	-7.9325	-16.2639	-25.1830	-34.0602	-34.5113	-34.1107	-28.5315	-20.4576	-11.5895	-4.9471	-2.8666	(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												2356.8270	(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												2804.5757	(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)												193.0518	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-579.0079	(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	4861.4466	(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	2356.8270	0.2100	494.9337	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2804.5757	0.2100	588.9609	(264)
Space and water heating			1083.8946	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	193.0518	0.1443	27.8633	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-354.9056	0.1330	-47.2129	
PV Unit electricity exported	-224.1023	0.1250	-28.0155	
Total			-75.2284	(269)
Total CO2, kg/year			1048.4587	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.7900	(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	2356.8270	1.1300	2663.2145	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2804.5757	1.1300	3169.1706	(278)
Space and water heating			5832.3851	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	193.0518	1.5338	296.1093	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-354.9056	1.4916	-529.3650	
PV Unit electricity exported	-224.1023	0.4588	-102.8264	
Total			-632.1913	(283)
Total Primary energy kWh/year			5626.4039	(286)
Target Primary Energy Rate (TPER)			68.6100	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	82.0000	(1b) x	3.1500	(2b) =	258.3000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	258.3000	(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) =	0.1161	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2661	(18)
Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2661	(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	0.3393	0.3327	0.3260	0.2928	0.2861	0.2528	0.2528	0.2462	0.2661	0.2861	0.2994	0.3127	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5576	0.5553	0.5531	0.5429	0.5409	0.5320	0.5320	0.5303	0.5354	0.5409	0.5448	0.5489	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Glazing			14.8000	0.7752	11.4729			(27)
External Wall North	34.6500	7.4000	27.2500	0.1400	3.8150	70.0000	1907.5000	(29a)
External Wall West	27.7200		27.7200	0.1400	3.8808	70.0000	1940.4000	(29a)
External Wall South	37.8000	7.4000	30.4000	0.1400	4.2560	70.0000	2128.0000	(29a)
Total net area of external elements Aum(A, m2)			100.1700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.4247			(33)
Main dwelling								
Party Wall 1 East			30.5600	0.0000	0.0000	45.0000	1375.2000	(32)
Party Floor 1			82.0000			30.0000	2460.0000	(32d)
Party Ceiling 1			82.0000			30.0000	2460.0000	(32b)
Internal Wall 1			104.6100			9.0000	941.4900	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	13212.5900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		161.1291 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	41.5000	0.0300	1.2450
E18 Party wall between dwellings	12.6000	0.0300	0.3780

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		1.6230 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	25.0477 (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	47.5270	47.3365	47.1497	46.2723	46.1082	45.3440	45.3440	45.2025	45.6384	46.1082	46.4402	46.7874	(38)
Heat transfer coeff	72.5747	72.3841	72.1973	71.3200	71.1558	70.3917	70.3917	70.2502	70.6860	71.1558	71.4879	71.8351	(39)
Average = Sum(39)m / 12 =												71.3192	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8851	0.8827	0.8805	0.8698	0.8678	0.8584	0.8584	0.8567	0.8620	0.8678	0.8718	0.8760	(40)
HLP (average)												0.8697	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.4997 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

27.9253	27.5038	26.9041	26.0060	25.1966	24.0824	23.2371	24.2707	24.8132	25.9172	27.0651	27.9032	(42b)

Hot water usage for other uses

40.2296	38.7667	37.3038	35.8409	34.3780	32.9151	32.9151	34.3780	35.8409	37.3038	38.7667	40.2296	(42c)

Average daily hot water use (litres/day)	62.4657 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.1549	66.2704	64.2078	61.8469	59.5746	56.9975	56.1522	58.6488	60.6541	63.2210	65.8317	68.1327	(44)
Energy conte	100.3358	87.6892	91.7517	80.7875	76.7679	65.9157	62.0498	69.0307	70.3558	81.4667	88.9738	100.0579	(45)
Energy content (annual)										Total = Sum(45)m =		975.1823	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(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	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													
	85.2854	74.5358	77.9889	68.6693	65.2527	56.0284	52.7424	58.6761	59.8024	69.2467	75.6277	85.0492	(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													
	85.2854	74.5358	77.9889	68.6693	65.2527	56.0284	52.7424	58.6761	59.8024	69.2467	75.6277	85.0492	(64)
										Total per year (kWh/year) = Sum(64)m =		828.9050	(64)
12Total per year (kWh/year)												829	(64)
Electric shower(s)													
	52.9605	47.1882	51.5277	49.1723	50.0950	47.7858	49.3786	50.0950	49.1723	51.5277	50.5588	52.9605	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												602.4224	(64a)
Heat gains from water heating, kWh/month													
	34.5615	30.4310	32.3792	29.4604	28.8369	25.9535	25.5302	27.1928	27.2437	30.1936	31.5466	34.5024	(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	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	112.8185	124.9061	112.8185	116.5791	112.8185	116.5791	112.8185	112.8185	116.5791	112.8185	116.5791	112.8185	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	223.5697	225.8896	220.0434	207.5975	191.8868	177.1210	167.2565	164.9365	170.7828	183.2286	198.9393	213.7052	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	(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)													
	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	(71)
Water heating gains (Table 5)													
	46.4536	45.2842	43.5204	40.9172	38.7593	36.0466	34.3148	36.5494	37.8384	40.5828	43.8148	46.3742	(72)
Total internal gains													
	443.3374	456.5757	436.8780	425.5895	403.9603	390.2423	374.8855	374.8001	385.6960	397.1256	419.8289	433.3936	(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	7.4000	10.6334	0.3500	0.8500	0.7700	16.2227	(74)
South	7.4000	46.7521	0.3500	0.8500	0.7700	71.3268	(78)

Solar gains	87.5495	147.8174	201.4822	252.7968	289.2411	290.6849	278.7168	250.4198	218.7800	162.9002	104.5594	75.1570 (83)
Total gains	530.8869	604.3931	638.3602	678.3863	693.2014	680.9273	653.6023	625.2199	604.4760	560.0258	524.3883	508.5505 (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	50.5709	50.7040	50.8352	51.4605	51.5792	52.1392	52.1392	52.2442	51.9221	51.5792	51.3397	51.0915	
alpha	4.3714	4.3803	4.3890	4.4307	4.4386	4.4759	4.4759	4.4829	4.4615	4.4386	4.4226	4.4061	
util living area	0.9846	0.9721	0.9522	0.8990	0.7967	0.6223	0.4649	0.5035	0.7202	0.9095	0.9711	0.9870	(86)
MIT	19.6565	19.8730	20.1432	20.5047	20.7856	20.9474	20.9885	20.9836	20.8972	20.5483	20.0524	19.6228	(87)
Th 2	20.1802	20.1822	20.1841	20.1933	20.1950	20.2030	20.2030	20.2045	20.1999	20.1950	20.1915	20.1879	(88)
util rest of house	0.9815	0.9666	0.9425	0.8784	0.7563	0.5569	0.3846	0.4220	0.6595	0.8869	0.9645	0.9844	(89)
MIT 2	18.9495	19.1642	19.4303	19.7832	20.0379	20.1732	20.1985	20.1977	20.1361	19.8307	19.3502	18.9221	(90)
Living area fraction									fLA = Living area / (4) =			0.2439	(91)
MIT	19.1220	19.3370	19.6042	19.9592	20.2203	20.3620	20.3912	20.3894	20.3218	20.0057	19.5215	19.0930	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1220	19.3370	19.6042	19.9592	20.2203	20.3620	20.3912	20.3894	20.3218	20.0057	19.5215	19.0930	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9764	0.9596	0.9343	0.8716	0.7577	0.5705	0.4039	0.4414	0.6694	0.8807	0.9577	0.9798	(94)
Useful gains	518.3325	579.9549	596.3945	591.2964	525.2130	388.4608	263.9834	275.9673	404.6079	493.2425	502.2121	498.2949	(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	1075.6984	1045.0121	946.0847	788.7387	606.2683	405.5991	266.8703	280.2574	439.7913	669.2700	887.9861	1069.8385	(97)
Space heating kWh	414.6803	312.5185	260.1695	142.1584	60.3051	0.0000	0.0000	0.0000	0.0000	130.9644	277.7573	425.2284	(98a)
Space heating requirement - total per year (kWh/year)												2023.7819	
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	414.6803	312.5185	260.1695	142.1584	60.3051	0.0000	0.0000	0.0000	0.0000	130.9644	277.7573	425.2284	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2023.7819	
Space heating per m2											(98c) / (4) =	24.6803	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	661.6818	520.8984	533.9013	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8658	0.9227	0.9058	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	572.8646	480.6305	483.6012	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	752.5313	722.8827	691.7784	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	129.3600	180.2357	154.8838	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	32.3400	45.0589	38.7210	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												116.1199	(107)
Energy for space heating												24.6803	(99)
Energy for space cooling												1.4161	(108)
Total												26.0964	(109)
Fabric Energy Efficiency (DFEE)												26.1	(109)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	82.0000	(1b)	x 3.1500	(2b) =	258.3000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		258.3000	(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) =	0.1161	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3661	(18)
Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3661	(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	0.4668	0.4577	0.4485	0.4028	0.3936	0.3478	0.3478	0.3387	0.3661	0.3936	0.4119	0.4302	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.6090	0.6047	0.6006	0.5811	0.5775	0.5605	0.5605	0.5574	0.5670	0.5775	0.5848	0.5925	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opening Type			14.8000	1.1450	16.9466			(27)
External Wall North	34.6500	7.4000	27.2500	0.1800	4.9050			(29a)
External Wall West	27.7200		27.7200	0.1800	4.9896			(29a)
External Wall South	37.8000	7.4000	30.4000	0.1800	5.4720			(29a)
Total net area of external elements Aum(A, m2)			100.1700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.3132			(33)
Main dwelling								
Party Wall 1 East			30.5600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 161.1291 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	41.5000	0.0700	2.9050	
E18 Party wall between dwellings	12.6000	0.0600	0.7560	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 3.6610 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 35.9742 (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	51.9077	51.5470	51.1935	49.5330	49.2223	47.7761	47.7761	47.5082	48.3331	49.2223	49.8508	50.5079	(38)
Heat transfer coeff	87.8819	87.5212	87.1677	85.5072	85.1965	83.7502	83.7502	83.4824	84.3073	85.1965	85.8250	86.4820	(39)

Average = Sum(39)m / 12 = 85.5057

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0717	1.0673	1.0630	1.0428	1.0390	1.0213	1.0213	1.0181	1.0281	1.0390	1.0466	1.0547	(40)
HLP (average)												1.0428	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4997 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

28.5620	28.1378	27.5405	26.4391	25.6144	24.6999	24.2060	24.7991	25.4450	26.4235	27.5476	28.4655	(42b)

Hot water usage for other uses

40.2296	38.7667	37.3038	35.8409	34.3780	32.9151	32.9151	34.3780	35.8409	37.3038	38.7667	40.2296	(42c)

Average daily hot water use (litres/day) 63.0538 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.7916	66.9045	64.8443	62.2800	59.9924	57.6150	57.1211	59.1771	61.2859	63.7273	66.3143	68.6950	(44)
Energy conte	108.9491	95.2711	99.6633	85.2582	80.7613	70.8444	69.0830	73.2737	75.5716	86.4773	94.4768	107.5598	(45)

Energy content (annual) Total = Sum(45)m = 1047.1896
Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(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 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

92.6067	80.9805	84.7138	72.4695	68.6471	60.2177	58.7205	62.2826	64.2359	73.5057	80.3053	91.4259	(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

92.6067	80.9805	84.7138	72.4695	68.6471	60.2177	58.7205	62.2826	64.2359	73.5057	80.3053	91.4259	(64)

Total per year (kWh/year) = Sum(64)m = 890.1111 (64)
12Total per year (kWh/year) 890 (64)

Electric shower(s)

	52.9605	47.1882	51.5277	49.1723	50.0950	47.7858	49.3786	50.0950	49.1723	51.5277	50.5588	52.9605 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												602.4224 (64a)
Heat gains from water heating, kWh/month												
	36.3918	32.0422	34.0604	30.4104	29.6855	27.0009	27.0248	28.0944	28.3520	31.2584	32.7160	36.0966 (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	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	115.1238	127.4585	115.1238	118.9613	115.1238	118.9613	115.1238	115.1238	118.9613	115.1238	118.9613	115.1238	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	223.5697	225.8896	220.0434	207.5975	191.8868	177.1210	167.2565	164.9365	170.7828	183.2286	198.9393	213.7052	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	(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)													
	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	(71)
Water heating gains (Table 5)													
	48.9137	47.6818	45.7801	42.2367	39.8999	37.5012	36.3236	37.7613	39.3778	42.0139	45.4389	48.5169	(72)
Total internal gains													
	448.1029	461.5257	441.4430	429.2913	407.4063	394.0792	379.1997	378.3174	389.6176	400.8621	423.8353	437.8416	(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	7.4000	10.6334	0.6300	0.7000	0.7700	24.0478	(74)
South	7.4000	46.7521	0.6300	0.7000	0.7700	105.7315	(78)

Solar gains	129.7793	219.1175	298.6678	374.7340	428.7574	430.8977	413.1566	371.2105	324.3092	241.4756	154.9939	111.4092	(83)
Total gains	577.8822	680.6432	740.1108	804.0253	836.1637	824.9769	792.3564	749.5279	713.9269	642.3378	578.8292	549.2508	(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	41.7625	41.9346	42.1046	42.9223	43.0788	43.8227	43.8227	43.9633	43.5332	43.0788	42.7634	42.4384	
alpha	3.7842	3.7956	3.8070	3.8615	3.8719	3.9215	3.9215	3.9309	3.9022	3.8719	3.8509	3.8292	
util living area													
	0.9820	0.9663	0.9415	0.8809	0.7728	0.6021	0.4524	0.4936	0.7077	0.9000	0.9672	0.9849	(86)
MIT	19.3302	19.6046	19.9456	20.3899	20.7266	20.9261	20.9812	20.9736	20.8565	20.4238	19.8179	19.3008	(87)
Th 2	20.0240	20.0276	20.0311	20.0478	20.0510	20.0656	20.0656	20.0683	20.0600	20.0510	20.0446	20.0380	(88)
util rest of house													
	0.9782	0.9594	0.9293	0.8559	0.7262	0.5289	0.3617	0.4013	0.6394	0.8737	0.9594	0.9817	(89)
MIT 2	18.5092	18.7816	19.1170	19.5524	19.8560	20.0254	20.0588	20.0581	19.9736	19.5945	19.0072	18.4906	(90)
Living area fraction										fLA = Living area / (4) =		0.2439	(91)
MIT	18.7094	18.9823	19.3191	19.7567	20.0683	20.2450	20.2838	20.2814	20.1890	19.7968	19.2049	18.6882	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7094	18.9823	19.3191	19.7567	20.0683	20.2450	20.2838	20.2814	20.1890	19.7968	19.2049	18.6882	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9714	0.9501	0.9184	0.8472	0.7271	0.5436	0.3834	0.4231	0.6495	0.8654	0.9505	0.9757	(94)
Useful gains	561.3560	646.6703	679.6953	681.1300	608.0140	448.4622	303.8082	317.1073	463.6644	555.8628	550.2007	535.8884	(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													
	1266.3287	1232.4999	1117.4087	928.3255	712.9512	472.7740	308.5163	324.0262	513.3438	783.5317	1038.9030	1252.9671	(97)
Space heating kWh													
	524.4997	393.6775	325.6588	177.9808	78.0733	0.0000	0.0000	0.0000	0.0000	169.3857	351.8657	533.5066	(98a)
Space heating requirement - total per year (kWh/year)												2554.6480	
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													
	524.4997	393.6775	325.6588	177.9808	78.0733	0.0000	0.0000	0.0000	0.0000	169.3857	351.8657	533.5066	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2554.6480	
Space heating per m2											(98c) / (4) =	31.1542	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	787.2520	619.7516	634.4662	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8531	0.9096	0.8898	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	671.5804	563.7376	564.5755	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	918.0727	882.2470	834.4575	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	177.4744	236.9710	200.7922	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	44.3686	59.2428	50.1981	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												153.8094	(107)

Energy for space heating	31.1542 (99)
Energy for space cooling	1.8757 (108)
Total	33.0300 (109)
Fabric Energy Efficiency (TFEE)	33.0 (109)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	82.0000 (1b)	x	3.1500 (2b)	=	258.3000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	258.3000	(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		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1500	(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	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762	(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	0.2862	0.2825	0.2787	0.2600	0.2562	0.2375	0.2375	0.2337	0.2450	0.2562	0.2637	0.2712	(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	
Main dwelling								
Glazing			14.8000	0.7752	11.4729			(27)
External Wall North	34.6500	7.4000	27.2500	0.1400	3.8150	70.0000	1907.5000	(29a)
External Wall West	27.7200		27.7200	0.1400	3.8808	70.0000	1940.4000	(29a)
External Wall South	37.8000	7.4000	30.4000	0.1400	4.2560	70.0000	2128.0000	(29a)
Total net area of external elements Aum(A, m2)			100.1700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.4247			(33)
Main dwelling								
Party Wall 1 East			30.5600	0.0000	0.0000	45.0000	1375.2000	(32)
Party Floor 1			82.0000			30.0000	2460.0000	(32d)
Party Ceiling 1			82.0000			30.0000	2460.0000	(32b)
Internal Wall 1			104.6100			9.0000	941.4900	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 13212.5900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	161.1291 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	41.5000	0.0300	1.2450
E18 Party wall between dwellings	12.6000	0.0300	0.3780

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	1.6230 (36)
Point Thermal bridges	(36a) = 0.0000
Total fabric heat loss	(33) + (36) + (36a) = 25.0477 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	24.3997	24.0800	23.7604	22.1621	21.8425	20.2443	20.2443	19.9246	20.8836	21.8425	22.4818	23.1211	(38)
Heat transfer coeff	49.4473	49.1277	48.8080	47.2098	46.8902	45.2919	45.2919	44.9723	45.9312	46.8902	47.5295	48.1687	(39)
Average = Sum(39)m / 12 =												47.1299	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6030	0.5991	0.5952	0.5757	0.5718	0.5523	0.5523	0.5484	0.5601	0.5718	0.5796	0.5874	(40)
HLP (average)												0.5748	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4997	(42)
Hot water usage for mixer showers													
	72.5185	71.4083	69.7721	67.2550	64.9998	61.8448	59.3493	62.2666	63.7339	66.8588	70.1132	72.4531	(42a)
Hot water usage for baths													
	27.9253	27.5038	26.9041	26.0060	25.1966	24.0824	23.2371	24.2707	24.8132	25.9172	27.0651	27.9032	(42b)
Hot water usage for other uses													
	40.2296	38.7667	37.3038	35.8409	34.3780	32.9151	32.9151	34.3780	35.8409	37.3038	38.7667	40.2296	(42c)
Average daily hot water use (litres/day)												129.3222	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	140.6734	137.6787	133.9799	129.1019	124.5744	118.8423	115.5015	120.9154	124.3880	130.0799	135.9449	140.5859	(44)
Energy conte	207.0955	182.1768	191.4545	168.6393	160.5267	137.4371	127.6326	142.3196	144.2839	167.6210	183.7340	206.4606	(45)
Energy content (annual)										Total = Sum(45)m =		2019.3818	
Distribution loss (46)m = 0.15 x (45)m													
	31.0643	27.3265	28.7182	25.2959	24.0790	20.6156	19.1449	21.3479	21.6426	25.1432	27.5601	30.9691	(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													
	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	(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													
	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	(64)
										Total per year (kWh/year) = Sum(64)m =		2670.2216	(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													
	113.0807	100.5157	107.8801	98.8675	97.5966	88.4928	86.6593	91.5427	90.7693	99.9554	103.8865	112.8696	(65)

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

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	28.5120	25.3241	20.5949	15.5917	11.6550	9.8396	10.6321	13.8199	18.5491	23.5523	27.4891	29.3044	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	333.6861	337.1487	328.4230	309.8470	286.3982	264.3597	249.6366	246.1740	254.8996	273.4756	296.9244	318.9629	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	(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)													
	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	(71)
Water heating gains (Table 5)													
	151.9902	149.5770	145.0001	137.3160	131.1782	122.9066	116.4775	123.0413	126.0685	134.3487	144.2868	151.7065	(72)
Total internal gains													
	616.6805	614.5420	596.5103	565.2470	531.7237	499.5982	479.2384	485.5275	502.0096	533.8689	571.1926	602.4661	(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	7.4000	10.6334	0.3500	0.8500	0.7700	16.2227	(74)
South	7.4000	46.7521	0.3500	0.8500	0.7700	71.3268	(78)

Solar gains	87.5495	147.8174	201.4822	252.7968	289.2411	290.6849	278.7168	250.4198	218.7800	162.9002	104.5594	75.1570	(83)
Total gains	704.2300	762.3594	797.9925	818.0438	820.9648	790.2832	757.9552	735.9473	720.7896	696.7691	675.7520	677.6231	(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	74.2237	74.7066	75.1959	77.7416	78.2715	81.0335	81.0335	81.6095	79.9056	78.2715	77.2187	76.1939	
alpha	5.9482	5.9804	6.0131	6.1828	6.2181	6.4022	6.4022	6.4406	6.3270	6.2181	6.1479	6.0796	
util living area													
	0.9147	0.8720	0.8012	0.6735	0.5263	0.3664	0.2629	0.2810	0.4383	0.6752	0.8502	0.9227	(86)
MIT	20.6166	20.7334	20.8554	20.9569	20.9914	20.9994	20.9999	20.9999	20.9979	20.9633	20.8169	20.6099	(87)
Th 2	20.4273	20.4308	20.4343	20.4519	20.4554	20.4731	20.4731	20.4766	20.4660	20.4554	20.4484	20.4413	(88)
util rest of house													
	0.9035	0.8571	0.7808	0.6475	0.4967	0.3364	0.2314	0.2491	0.4049	0.6449	0.8316	0.9125	(89)
MIT 2	19.9908	20.1337	20.2796	20.4091	20.4478	20.4726	20.4731	20.4766	20.4644	20.4205	20.2506	19.9951	(90)
Living area fraction										fLA = Living area / (4) =		0.2439	(91)
MIT	20.1434	20.2799	20.4200	20.5427	20.5804	20.6011	20.6016	20.6042	20.5945	20.5529	20.3887	20.1450	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1434	20.2799	20.4200	20.5427	20.5804	20.6011	20.6016	20.6042	20.5945	20.5529	20.3887	20.1450	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8975	0.8529	0.7803	0.6519	0.5035	0.3437	0.2391	0.2569	0.4129	0.6504	0.8294	0.9065	(94)
Useful gains	632.0305	650.2077	622.6752	533.2787	413.3677	271.6092	181.2239	189.0510	297.6428	453.1952	560.4942	614.2723	(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	783.4156	755.5813	679.4083	549.6504	416.4034	271.8013	181.2384	189.0732	298.3022	466.6931	631.6068	768.0520	(97)
Space heating kWh	112.6305	70.8110	42.2095	11.7876	2.2586	0.0000	0.0000	0.0000	0.0000	10.0424	51.2011	114.4121	(98a)
Space heating requirement - total per year (kWh/year)												415.3528	
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	112.6305	70.8110	42.2095	11.7876	2.2586	0.0000	0.0000	0.0000	0.0000	10.0424	51.2011	114.4121	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												415.3528	
Space heating per m2											(98c) / (4) =	5.0653	(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												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.0000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	112.6305	70.8110	42.2095	11.7876	2.2586	0.0000	0.0000	0.0000	0.0000	10.0424	51.2011	114.4121	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00													
307a	112.6305	70.8110	42.2095	11.7876	2.2586	0.0000	0.0000	0.0000	0.0000	10.0424	51.2011	114.4121	
Space heating requirement	112.6305	70.8110	42.2095	11.7876	2.2586	0.0000	0.0000	0.0000	0.0000	10.0424	51.2011	114.4121	(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	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00													
310a	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	
Water heating fuel	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	(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	18.7349	16.9218	18.7349	18.1305	18.7349	18.1305	18.7349	18.7349	18.1305	18.7349	18.1305	18.7349	(331)
Lighting	24.9564	20.0209	18.0266	13.2071	10.2015	8.3347	9.3062	12.0965	15.7122	20.6152	23.2849	25.6500	(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												415.3528	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												2670.2216	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												4.1535	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7000)													
mechanical ventilation fans (SFP = 0.7000)												220.5882	(330a)
Total electricity for the above, kWh/year												220.5882	(331)
Electricity for lighting (calculated in Appendix L)												201.4122	(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												3507.5748	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	415.3528	4.4400	18.4417	(340a)
Space heating total			18.4417	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2670.2216	4.4400	118.5578	(342a)
Water heating total			118.5578	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	220.5882	16.4900	36.3750	(349)
Energy for lighting	201.4122	16.4900	33.2129	(350)
Additional standing charges			92.0000	(351)
Total energy cost			298.5874	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.8464	(357)
SAP value		86.2800	
SAP rating (Section 12)		86	(358)
SAP band		B	

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			262.0000	(367)
Space and Water heating from Heat pump	1177.7001	0.1586	25.1438	(367)
Electrical energy for heat distribution (space & water)	4.1535	0.0000	4.4205	(372)
Overall CO2 factor for heat network			0.0561	(386)
Total CO2 associated with community systems			173.1434	(373)
Space and water heating			173.1434	(376)
Pumps, fans and electric keep-hot	220.5882	0.1387	30.5983	(378)
Energy for lighting	201.4122	0.1443	29.0700	(379)
Total CO2, kg/year			232.8117	(383)
CO2 emissions per m2			2.8400	(384)
EI value			97.5436	(384a)
EI rating			98	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		82.0000	(1b)	x 3.1500	(2b) =	258.3000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.0000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		258.3000	(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		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1500	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.8000	4.5000	4.4000	3.9000	3.9000	3.6000	3.7000	3.5000	3.7000	4.0000	4.1000	4.4000	(22)
Wind factor	1.2000	1.1250	1.1000	0.9750	0.9750	0.9000	0.9250	0.8750	0.9250	1.0000	1.0250	1.1000	(22a)
Adj infilt rate	0.1800	0.1687	0.1650	0.1462	0.1462	0.1350	0.1388	0.1313	0.1388	0.1500	0.1537	0.1650	(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	0.2750	0.2637	0.2600	0.2412	0.2412	0.2300	0.2337	0.2262	0.2337	0.2450	0.2487	0.2600	(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	
Main dwelling								
Glazing			14.8000	0.7752	11.4729			(27)
External Wall North	34.6500	7.4000	27.2500	0.1400	3.8150	70.0000	1907.5000	(29a)
External Wall West	27.7200		27.7200	0.1400	3.8808	70.0000	1940.4000	(29a)
External Wall South	37.8000	7.4000	30.4000	0.1400	4.2560	70.0000	2128.0000	(29a)
Total net area of external elements Aum(A, m2)			100.1700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.4247			(33)

Main dwelling

Party Wall 1 East	30.5600	0.0000	0.0000	45.0000	1375.2000 (32)
Party Floor 1	82.0000			30.0000	2460.0000 (32d)
Party Ceiling 1	82.0000			30.0000	2460.0000 (32b)
Internal Wall 1	104.6100			9.0000	941.4900 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 13212.5900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 161.1291 (35)
List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element				
E7 Party floor between dwellings (in blocks of flats)	41.5000	0.0300	1.2450	
E18 Party wall between dwellings	12.6000	0.0300	0.3780	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 1.6230 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.0477 (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	23.4407	22.4818	22.1621	20.5639	20.5639	19.6050	19.9246	19.2853	19.9246	20.8836	21.2032	22.1621	(38)
Heat transfer coeff	48.4884	47.5295	47.2098	45.6116	45.6116	44.6526	44.9723	44.3330	44.9723	45.9312	46.2509	47.2098	(39)
Average = Sum(39)m / 12 =												46.0644	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.5913	0.5796	0.5757	0.5562	0.5562	0.5445	0.5484	0.5406	0.5484	0.5601	0.5640	0.5757	(40)
HLP (average)												0.5618	
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 2.4997 (42)
Hot water usage for mixer showers

72.5185	71.4083	69.7721	67.2550	64.9998	61.8448	59.3493	62.2666	63.7339	66.8588	70.1132	72.4531	(42a)

Hot water usage for baths

27.9253	27.5038	26.9041	26.0060	25.1966	24.0824	23.2371	24.2707	24.8132	25.9172	27.0651	27.9032	(42b)

Hot water usage for other uses

40.2296	38.7667	37.3038	35.8409	34.3780	32.9151	32.9151	34.3780	35.8409	37.3038	38.7667	40.2296	(42c)

Average daily hot water use (litres/day) 129.3222 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	140.6734	137.6787	133.9799	129.1019	124.5744	118.8423	115.5015	120.9154	124.3880	130.0799	135.9449	140.5859	(44)
Energy conte	207.0955	182.1768	191.4545	168.6393	160.5267	137.4371	127.6326	142.3196	144.2839	167.6210	183.7340	206.4606	(45)
Energy content (annual)										Total = Sum(45)m =		2019.3818	
Distribution loss (46)m = 0.15 x (45)m	31.0643	27.3265	28.7182	25.2959	24.0790	20.6156	19.1449	21.3479	21.6426	25.1432	27.5601	30.9691	(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

262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	(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

262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	(64)

Total per year (kWh/year) = Sum(64)m = 2670.2216 (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

113.0807	100.5157	107.8801	98.8675	97.5966	88.4928	86.6593	91.5427	90.7693	99.9554	103.8865	112.8696	(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	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.5120	25.3241	20.5949	15.5917	11.6550	9.8396	10.6321	13.8199	18.5491	23.5523	27.4891	29.3044	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	333.6861	337.1487	328.4230	309.8470	286.3982	264.3597	249.6366	246.1740	254.8996	273.4756	296.9244	318.9629	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	(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)	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	(71)
Water heating gains (Table 5)	151.9902	149.5770	145.0001	137.3160	131.1782	122.9066	116.4775	123.0413	126.0685	134.3487	144.2868	151.7065	(72)
Total internal gains	616.6805	614.5420	596.5103	565.2470	531.7237	499.5982	479.2384	485.5275	502.0096	533.8689	571.1926	602.4661	(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	7.4000	12.7054	0.3500	0.8500	0.7700	19.3838	(74)
South	7.4000	53.5774	0.3500	0.8500	0.7700	81.7397	(78)

Solar gains	101.1236	151.9331	207.2974	276.6322	306.7359	330.5462	312.8445	282.0126	241.7787	179.2674	121.9575	83.9595	(83)
Total gains	717.8041	766.4751	803.8077	841.8792	838.4596	830.1444	792.0829	767.5401	743.7883	713.1363	693.1501	686.4256	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.6916	77.2187	77.7416	80.4656	80.4656	82.1937	81.6095	82.7863	81.6095	79.9056	79.3534	77.7416	
alpha	6.0461	6.1479	6.1828	6.3644	6.3644	6.4796	6.4406	6.5191	6.4406	6.3270	6.2902	6.1828	
util living area													
	0.8892	0.8454	0.7606	0.6111	0.4553	0.3011	0.2044	0.2022	0.3624	0.5894	0.7906	0.8939	(86)
MIT	20.7086	20.8014	20.9047	20.9785	20.9969	20.9998	21.0000	21.0000	20.9995	20.9854	20.8961	20.7184	(87)
Th 2	20.4378	20.4484	20.4519	20.4695	20.4695	20.4802	20.4766	20.4837	20.4766	20.4660	20.4625	20.4519	(88)
util rest of house													
	0.8754	0.8287	0.7386	0.5853	0.4270	0.2732	0.1747	0.1723	0.3310	0.5579	0.7678	0.8805	(89)
MIT 2	20.1112	20.2299	20.3518	20.4488	20.4670	20.4801	20.4766	20.4837	20.4763	20.4529	20.3541	20.1361	(90)
Living area fraction									fLA = Living area / (4) =			0.2439	(91)
MIT	20.2569	20.3693	20.4867	20.5780	20.5962	20.6068	20.6043	20.6096	20.6039	20.5828	20.4863	20.2781	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.2569	20.3693	20.4867	20.5780	20.5962	20.6068	20.6043	20.6096	20.6039	20.5828	20.4863	20.2781	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8707	0.8261	0.7400	0.5907	0.4338	0.2800	0.1819	0.1796	0.3386	0.5648	0.7689	0.8759	(94)
Useful gains	624.9806	633.2158	594.8403	497.2569	363.6885	232.4553	144.1013	137.8577	251.8621	402.8093	532.9486	601.2549	(95)
Ext temp.	5.0000	5.4000	7.1000	9.5000	12.6000	15.4000	17.4000	17.5000	15.0000	11.7000	8.1000	5.2000	(96)
Heat loss rate W													
	739.7836	711.4834	631.9812	505.2840	364.7215	232.4991	144.1034	137.8593	252.0187	407.9960	572.8775	711.8361	(97)
Space heating kWh													
	85.4134	52.5958	27.6328	5.7795	0.7686	0.0000	0.0000	0.0000	0.0000	3.8589	28.7488	82.2724	(98a)
Space heating requirement - total per year (kWh/year)												287.0703	
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													
	85.4134	52.5958	27.6328	5.7795	0.7686	0.0000	0.0000	0.0000	0.0000	3.8589	28.7488	82.2724	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												287.0703	
Space heating per m2											(98c) / (4) =	3.5009	(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												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.0000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	85.4134	52.5958	27.6328	5.7795	0.7686	0.0000	0.0000	0.0000	0.0000	3.8589	28.7488	82.2724	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00													
307a	85.4134	52.5958	27.6328	5.7795	0.7686	0.0000	0.0000	0.0000	0.0000	3.8589	28.7488	82.2724	
Space heating requirement													
	85.4134	52.5958	27.6328	5.7795	0.7686	0.0000	0.0000	0.0000	0.0000	3.8589	28.7488	82.2724	(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													
	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00													
310a	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	
Water heating fuel													
	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	(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	18.7349	16.9218	18.7349	18.1305	18.7349	18.1305	18.7349	18.7349	18.1305	18.7349	18.1305	18.7349	(331)
Lighting	24.9564	20.0209	18.0266	13.2071	10.2015	8.3347	9.3062	12.0965	15.7122	20.6152	23.2849	25.6500	(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												287.0703	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												2670.2216	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												2.8707	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7000)													
mechanical ventilation fans (SFP = 0.7000)												220.5882	(330a)
Total electricity for the above, kWh/year												220.5882	(331)
Electricity for lighting (calculated in Appendix L)												201.4122	(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	3379.2922	(338)

10b. Fuel costs - using BEDF prices (568)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	287.0703	5.6000	16.0759	(340a)
Space heating total			16.0759	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2670.2216	5.6000	149.5324	(342a)
Water heating total			149.5324	(342)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(347a)
Pumps, fans and electric keep-hot	220.5882	26.0600	57.4853	(349)
Energy for lighting	201.4122	26.0600	52.4880	(350)
Additional standing charges			99.0000	(351)
Total energy cost			374.5816	(355)

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			262.0000	(367)
Space and Water heating from Heat pump	1128.7373	0.1594	17.4694	(367)
Electrical energy for heat distribution (space & water)	2.8707	0.0000	4.2195	(372)
Overall CO2 factor for heat network			0.0559	(386)
Total CO2 associated with community systems			165.2680	(373)
Space and water heating			165.2680	(376)
Pumps, fans and electric keep-hot	220.5882	0.1387	30.5983	(378)
Energy for lighting	201.4122	0.1443	29.0700	(379)
Total CO2, kg/year			224.9363	(383)

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			262.0000	(467a)
Space and Water heating from Heat pump	1128.7373	1.5902	174.2330	(467)
Electrical energy for heat distribution (space & water)	2.8707	0.0000	45.1767	(472)
Overall CO2 factor for heat network			0.5983	(486)
Total CO2 associated with community systems			1769.4798	(473)
Space and water heating			1769.4798	(476)
Pumps, fans and electric keep-hot	220.5882	1.5128	333.7058	(478)
Energy for lighting	201.4122	1.5338	308.9328	(479)
Total Primary energy kWh/year			2412.1184	(483)

SAP 10 EPC IMPROVEMENTS

0301_2B4P_BL

Current energy efficiency rating: B 86
Current environmental impact rating: A 98

N	Solar water heating	Not applicable
U	Solar photovoltaic panels	Not applicable
V2	Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 86
Potential environmental impact rating: A 98

Fuel prices for cost data on this page from database revision number 568 TEST (31 Mar 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, South East England):

	Current	Potential	Saving
Electricity	£110	£110	£0
Community scheme	£265	£265	£0
Space heating	£173	£173	£0
Water heating	£150	£150	£0
Lighting	£52	£52	£0
Total cost of fuels	£375	£375	£0
Total cost of uses	£375	£375	£0
Delivered energy	41 kWh/m²	41 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.2 tonnes	0.2 tonnes	0.0 tonnes
CO2 emissions per m²	3 kg/m²	3 kg/m²	0 kg/m²
Primary energy	29 kWh/m²	29 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	82.0000	(1b)	x 3.1500	(2b) =	258.3000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	258.3000	(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		0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1500 (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	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762	(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	0.2862	0.2825	0.2787	0.2600	0.2562	0.2375	0.2375	0.2337	0.2450	0.2562	0.2637	0.2712	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Glazing			14.8000	0.7752	11.4729			(27)
External Wall North	34.6500	7.4000	27.2500	0.1400	3.8150	70.0000	1907.5000	(29a)
External Wall West	27.7200		27.7200	0.1400	3.8808	70.0000	1940.4000	(29a)
External Wall South	37.8000	7.4000	30.4000	0.1400	4.2560	70.0000	2128.0000	(29a)
Total net area of external elements Aum(A, m2)			100.1700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.4247			(33)
Main dwelling								
Party Wall 1 East			30.5600	0.0000	0.0000	45.0000	1375.2000	(32)
Party Floor 1			82.0000			30.0000	2460.0000	(32d)
Party Ceiling 1			82.0000			30.0000	2460.0000	(32b)
Internal Wall 1			104.6100			9.0000	941.4900	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	13212.5900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		161.1291 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	41.5000	0.0300	1.2450
E18 Party wall between dwellings	12.6000	0.0300	0.3780

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		1.6230 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	25.0477 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	24.3997	24.0800	23.7604	22.1621	21.8425	20.2443	20.2443	19.9246	20.8836	21.8425	22.4818	23.1211	(38)
Heat transfer coeff	49.4473	49.1277	48.8080	47.2098	46.8902	45.2919	45.2919	44.9723	45.9312	46.8902	47.5295	48.1687	(39)
Average = Sum(39)m / 12 =												47.1299	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6030	0.5991	0.5952	0.5757	0.5718	0.5523	0.5523	0.5484	0.5601	0.5718	0.5796	0.5874	(40)
HLP (average)												0.5748	
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												2.4997	(42)
Hot water usage for mixer showers													
	72.5185	71.4083	69.7721	67.2550	64.9998	61.8448	59.3493	62.2666	63.7339	66.8588	70.1132	72.4531	(42a)
Hot water usage for baths													
	27.9253	27.5038	26.9041	26.0060	25.1966	24.0824	23.2371	24.2707	24.8132	25.9172	27.0651	27.9032	(42b)
Hot water usage for other uses													
	40.2296	38.7667	37.3038	35.8409	34.3780	32.9151	32.9151	34.3780	35.8409	37.3038	38.7667	40.2296	(42c)
Average daily hot water use (litres/day)												129.3222	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	140.6734	137.6787	133.9799	129.1019	124.5744	118.8423	115.5015	120.9154	124.3880	130.0799	135.9449	140.5859	(44)
Energy conte	207.0955	182.1768	191.4545	168.6393	160.5267	137.4371	127.6326	142.3196	144.2839	167.6210	183.7340	206.4606	(45)
Energy content (annual)										Total = Sum(45)m =		2019.3818	
Distribution loss (46)m = 0.15 x (45)m													
	31.0643	27.3265	28.7182	25.2959	24.0790	20.6156	19.1449	21.3479	21.6426	25.1432	27.5601	30.9691	(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													
	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	(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													
	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	(64)
										Total per year (kWh/year) = Sum(64)m =		2670.2216	(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													
	113.0807	100.5157	107.8801	98.8675	97.5966	88.4928	86.6593	91.5427	90.7693	99.9554	103.8865	112.8696	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	28.5120	25.3241	20.5949	15.5917	11.6550	9.8396	10.6321	13.8199	18.5491	23.5523	27.4891	29.3044	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	333.6861	337.1487	328.4230	309.8470	286.3982	264.3597	249.6366	246.1740	254.8996	273.4756	296.9244	318.9629	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	(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)													
	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	(71)
Water heating gains (Table 5)													
	151.9902	149.5770	145.0001	137.3160	131.1782	122.9066	116.4775	123.0413	126.0685	134.3487	144.2868	151.7065	(72)
Total internal gains													
	616.6805	614.5420	596.5103	565.2470	531.7237	499.5982	479.2384	485.5275	502.0096	533.8689	571.1926	602.4661	(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	7.4000	10.6334	0.3500	0.8500	0.7700	16.2227	(74)
South	7.4000	46.7521	0.3500	0.8500	0.7700	71.3268	(78)

Solar gains	87.5495	147.8174	201.4822	252.7968	289.2411	290.6849	278.7168	250.4198	218.7800	162.9002	104.5594	75.1570	(83)
Total gains	704.2300	762.3594	797.9925	818.0438	820.9648	790.2832	757.9552	735.9473	720.7896	696.7691	675.7520	677.6231	(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	74.2237	74.7066	75.1959	77.7416	78.2715	81.0335	81.0335	81.6095	79.9056	78.2715	77.2187	76.1939	
alpha	5.9482	5.9804	6.0131	6.1828	6.2181	6.4022	6.4022	6.4406	6.3270	6.2181	6.1479	6.0796	
util living area													
	0.9147	0.8720	0.8012	0.6735	0.5263	0.3664	0.2629	0.2810	0.4383	0.6752	0.8502	0.9227	(86)
MIT	20.6166	20.7334	20.8554	20.9569	20.9914	20.9994	20.9999	20.9999	20.9979	20.9633	20.8169	20.6099	(87)
Th 2	20.4273	20.4308	20.4343	20.4519	20.4554	20.4731	20.4731	20.4766	20.4660	20.4554	20.4484	20.4413	(88)
util rest of house													
	0.9035	0.8571	0.7808	0.6475	0.4967	0.3364	0.2314	0.2491	0.4049	0.6449	0.8316	0.9125	(89)
MIT 2	19.9908	20.1337	20.2796	20.4091	20.4478	20.4726	20.4731	20.4766	20.4644	20.4205	20.2506	19.9951	(90)
Living area fraction									fLA = Living area / (4) =			0.2439	(91)
MIT	20.1434	20.2799	20.4200	20.5427	20.5804	20.6011	20.6016	20.6042	20.5945	20.5529	20.3887	20.1450	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1434	20.2799	20.4200	20.5427	20.5804	20.6011	20.6016	20.6042	20.5945	20.5529	20.3887	20.1450	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8975	0.8529	0.7803	0.6519	0.5035	0.3437	0.2391	0.2569	0.4129	0.6504	0.8294	0.9065	(94)
Useful gains	632.0305	650.2077	622.6752	533.2787	413.3677	271.6092	181.2239	189.0510	297.6428	453.1952	560.4942	614.2723	(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	783.4156	755.5813	679.4083	549.6504	416.4034	271.8013	181.2384	189.0732	298.3022	466.6931	631.6068	768.0520	(97)
Space heating kWh	112.6305	70.8110	42.2095	11.7876	2.2586	0.0000	0.0000	0.0000	0.0000	10.0424	51.2011	114.4121	(98a)
Space heating requirement - total per year (kWh/year)												415.3528	
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	112.6305	70.8110	42.2095	11.7876	2.2586	0.0000	0.0000	0.0000	0.0000	10.0424	51.2011	114.4121	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												415.3528	
Space heating per m2											(98c) / (4) =	5.0653	(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												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.0000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	112.6305	70.8110	42.2095	11.7876	2.2586	0.0000	0.0000	0.0000	0.0000	10.0424	51.2011	114.4121	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00													
307a	112.6305	70.8110	42.2095	11.7876	2.2586	0.0000	0.0000	0.0000	0.0000	10.0424	51.2011	114.4121	
Space heating requirement	112.6305	70.8110	42.2095	11.7876	2.2586	0.0000	0.0000	0.0000	0.0000	10.0424	51.2011	114.4121	(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	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00													
310a	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	
Water heating fuel	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	(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	18.7349	16.9218	18.7349	18.1305	18.7349	18.1305	18.7349	18.7349	18.1305	18.7349	18.1305	18.7349	(331)
Lighting	24.9564	20.0209	18.0266	13.2071	10.2015	8.3347	9.3062	12.0965	15.7122	20.6152	23.2849	25.6500	(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												415.3528	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												2670.2216	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												4.1535	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7000)													
mechanical ventilation fans (SFP = 0.7000)												220.5882	(330a)
Total electricity for the above, kWh/year												220.5882	(331)
Electricity for lighting (calculated in Appendix L)												201.4122	(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												3507.5748	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	415.3528	4.4400	18.4417	(340a)
Space heating total			18.4417	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2670.2216	4.4400	118.5578	(342a)
Water heating total			118.5578	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	220.5882	16.4900	36.3750	(349)
Energy for lighting	201.4122	16.4900	33.2129	(350)
Additional standing charges			92.0000	(351)
Total energy cost			298.5874	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.8464	(357)
SAP value		86.2800	
SAP rating (Section 12)		86	(358)
SAP band		B	

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			262.0000	(367)
Space and Water heating from Heat pump	1177.7001	0.1586	25.1438	(367)
Electrical energy for heat distribution (space & water)	4.1535	0.0000	4.4205	(372)
Overall CO2 factor for heat network			0.0561	(386)
Total CO2 associated with community systems			173.1434	(373)
Space and water heating			173.1434	(376)
Pumps, fans and electric keep-hot	220.5882	0.1387	30.5983	(378)
Energy for lighting	201.4122	0.1443	29.0700	(379)
Total CO2, kg/year			232.8117	(383)
CO2 emissions per m2			2.8400	(384)
EI value			97.5436	(384a)
EI rating			98	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	82.0000	(1b)	x 3.1500	(2b) =	258.3000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		258.3000	(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		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1500	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.8000	4.5000	4.4000	3.9000	3.9000	3.6000	3.7000	3.5000	3.7000	4.0000	4.1000	4.4000	(22)
Wind factor	1.2000	1.1250	1.1000	0.9750	0.9750	0.9000	0.9250	0.8750	0.9250	1.0000	1.0250	1.1000	(22a)
Adj infilt rate	0.1800	0.1687	0.1650	0.1462	0.1462	0.1350	0.1388	0.1313	0.1388	0.1500	0.1537	0.1650	(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	0.2750	0.2637	0.2600	0.2412	0.2412	0.2300	0.2337	0.2262	0.2337	0.2450	0.2487	0.2600	(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	
Main dwelling								
Glazing			14.8000	0.7752	11.4729			(27)
External Wall North	34.6500	7.4000	27.2500	0.1400	3.8150	70.0000	1907.5000	(29a)
External Wall West	27.7200		27.7200	0.1400	3.8808	70.0000	1940.4000	(29a)
External Wall South	37.8000	7.4000	30.4000	0.1400	4.2560	70.0000	2128.0000	(29a)
Total net area of external elements Aum(A, m2)			100.1700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.4247			(33)
Main dwelling								
Party Wall 1 East			30.5600	0.0000	0.0000	45.0000	1375.2000	(32)
Party Floor 1			82.0000			30.0000	2460.0000	(32d)

Party Ceiling 1	82.0000	30.0000	2460.0000 (32b)
Internal Wall 1	104.6100	9.0000	941.4900 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 13212.5900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 161.1291 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	41.5000	0.0300	1.2450
E18 Party wall between dwellings	12.6000	0.0300	0.3780

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 1.6230 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.0477 (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	23.4407	22.4818	22.1621	20.5639	20.5639	19.6050	19.9246	19.2853	19.9246	20.8836	21.2032	22.1621	(38)
Heat transfer coeff	48.4884	47.5295	47.2098	45.6116	45.6116	44.6526	44.9723	44.3330	44.9723	45.9312	46.2509	47.2098	(39)
Average = Sum(39)m / 12 =												46.0644	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.5913	0.5796	0.5757	0.5562	0.5562	0.5445	0.5484	0.5406	0.5484	0.5601	0.5640	0.5757	(40)
HLP (average)												0.5618	
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 2.4997 (42)
Hot water usage for mixer showers

72.5185	71.4083	69.7721	67.2550	64.9998	61.8448	59.3493	62.2666	63.7339	66.8588	70.1132	72.4531	(42a)

Hot water usage for baths

27.9253	27.5038	26.9041	26.0060	25.1966	24.0824	23.2371	24.2707	24.8132	25.9172	27.0651	27.9032	(42b)

Hot water usage for other uses

40.2296	38.7667	37.3038	35.8409	34.3780	32.9151	32.9151	34.3780	35.8409	37.3038	38.7667	40.2296	(42c)

Average daily hot water use (litres/day) 129.3222 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	140.6734	137.6787	133.9799	129.1019	124.5744	118.8423	115.5015	120.9154	124.3880	130.0799	135.9449	140.5859	(44)
Energy conte	207.0955	182.1768	191.4545	168.6393	160.5267	137.4371	127.6326	142.3196	144.2839	167.6210	183.7340	206.4606	(45)
Energy content (annual)										Total = Sum(45)m =		2019.3818	
Distribution loss (46)m = 0.15 x (45)m	31.0643	27.3265	28.7182	25.2959	24.0790	20.6156	19.1449	21.3479	21.6426	25.1432	27.5601	30.9691	(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

262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	(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

262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	(64)
								Total per year (kWh/year) = Sum(64)m =			2670.2216	(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

113.0807	100.5157	107.8801	98.8675	97.5966	88.4928	86.6593	91.5427	90.7693	99.9554	103.8865	112.8696	(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	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.5120	25.3241	20.5949	15.5917	11.6550	9.8396	10.6321	13.8199	18.5491	23.5523	27.4891	29.3044	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	333.6861	337.1487	328.4230	309.8470	286.3982	264.3597	249.6366	246.1740	254.8996	273.4756	296.9244	318.9629	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	(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)	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	(71)
Water heating gains (Table 5)	151.9902	149.5770	145.0001	137.3160	131.1782	122.9066	116.4775	123.0413	126.0685	134.3487	144.2868	151.7065	(72)
Total internal gains	616.6805	614.5420	596.5103	565.2470	531.7237	499.5982	479.2384	485.5275	502.0096	533.8689	571.1926	602.4661	(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	7.4000	12.7054	0.3500	0.8500	0.7700	19.3838	(74)
South	7.4000	53.5774	0.3500	0.8500	0.7700	81.7397	(78)

Solar gains 101.1236	151.9331	207.2974	276.6322	306.7359	330.5462	312.8445	282.0126	241.7787	179.2674	121.9575	83.9595	(83)

Total gains	717.8041	766.4751	803.8077	841.8792	838.4596	830.1444	792.0829	767.5401	743.7883	713.1363	693.1501	686.4256	(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	75.6916	77.2187	77.7416	80.4656	80.4656	82.1937	81.6095	82.7863	81.6095	79.9056	79.3534	77.7416	
alpha	6.0461	6.1479	6.1828	6.3644	6.3644	6.4796	6.4406	6.5191	6.4406	6.3270	6.2902	6.1828	
util living area													
	0.8892	0.8454	0.7606	0.6111	0.4553	0.3011	0.2044	0.2022	0.3624	0.5894	0.7906	0.8939	(86)
MIT	20.7086	20.8014	20.9047	20.9785	20.9969	20.9998	21.0000	21.0000	20.9995	20.9854	20.8961	20.7184	(87)
Th 2	20.4378	20.4484	20.4519	20.4695	20.4695	20.4802	20.4766	20.4837	20.4766	20.4660	20.4625	20.4519	(88)
util rest of house													
	0.8754	0.8287	0.7386	0.5853	0.4270	0.2732	0.1747	0.1723	0.3310	0.5579	0.7678	0.8805	(89)
MIT 2	20.1112	20.2299	20.3518	20.4488	20.4670	20.4801	20.4766	20.4837	20.4763	20.4529	20.3541	20.1361	(90)
Living area fraction										fLA = Living area / (4) =		0.2439	(91)
MIT	20.2569	20.3693	20.4867	20.5780	20.5962	20.6068	20.6043	20.6096	20.6039	20.5828	20.4863	20.2781	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.2569	20.3693	20.4867	20.5780	20.5962	20.6068	20.6043	20.6096	20.6039	20.5828	20.4863	20.2781	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8707	0.8261	0.7400	0.5907	0.4338	0.2800	0.1819	0.1796	0.3386	0.5648	0.7689	0.8759	(94)
Useful gains	624.9806	633.2158	594.8403	497.2569	363.6885	232.4553	144.1013	137.8577	251.8621	402.8093	532.9486	601.2549	(95)
Ext temp.	5.0000	5.4000	7.1000	9.5000	12.6000	15.4000	17.4000	17.5000	15.0000	11.7000	8.1000	5.2000	(96)
Heat loss rate W													
	739.7836	711.4834	631.9812	505.2840	364.7215	232.4991	144.1034	137.8593	252.0187	407.9960	572.8775	711.8361	(97)
Space heating kWh													
	85.4134	52.5958	27.6328	5.7795	0.7686	0.0000	0.0000	0.0000	0.0000	3.8589	28.7488	82.2724	(98a)
Space heating requirement - total per year (kWh/year)												287.0703	
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													
	85.4134	52.5958	27.6328	5.7795	0.7686	0.0000	0.0000	0.0000	0.0000	3.8589	28.7488	82.2724	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												287.0703	
Space heating per m2											(98c) / (4) =	3.5009	(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												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.0000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	85.4134	52.5958	27.6328	5.7795	0.7686	0.0000	0.0000	0.0000	0.0000	3.8589	28.7488	82.2724	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00													
307a	85.4134	52.5958	27.6328	5.7795	0.7686	0.0000	0.0000	0.0000	0.0000	3.8589	28.7488	82.2724	
Space heating requirement													
	85.4134	52.5958	27.6328	5.7795	0.7686	0.0000	0.0000	0.0000	0.0000	3.8589	28.7488	82.2724	(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													
	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00													
310a	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	
Water heating fuel													
	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	(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	18.7349	16.9218	18.7349	18.1305	18.7349	18.1305	18.7349	18.7349	18.1305	18.7349	18.1305	18.7349	(331)
Lighting	24.9564	20.0209	18.0266	13.2071	10.2015	8.3347	9.3062	12.0965	15.7122	20.6152	23.2849	25.6500	(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												287.0703	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												2670.2216	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												2.8707	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7000)													
mechanical ventilation fans (SFP = 0.7000)												220.5882	(330a)
Total electricity for the above, kWh/year												220.5882	(331)
Electricity for lighting (calculated in Appendix L)												201.4122	(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	3379.2922 (338)

10b. Fuel costs - using BEDF prices (568)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	287.0703	5.6000	16.0759	(340a)
Space heating total			16.0759	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2670.2216	5.6000	149.5324	(342a)
Water heating total			149.5324	(342)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(347a)
Pumps, fans and electric keep-hot	220.5882	26.0600	57.4853	(349)
Energy for lighting	201.4122	26.0600	52.4880	(350)
Additional standing charges			99.0000	(351)
Total energy cost			374.5816	(355)

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			262.0000	(367)
Space and Water heating from Heat pump	1128.7373	0.1594	17.4694	(367)
Electrical energy for heat distribution (space & water)	2.8707	0.0000	4.2195	(372)
Overall CO2 factor for heat network			0.0559	(386)
Total CO2 associated with community systems			165.2680	(373)
Space and water heating			165.2680	(376)
Pumps, fans and electric keep-hot	220.5882	0.1387	30.5983	(378)
Energy for lighting	201.4122	0.1443	29.0700	(379)
Total CO2, kg/year			224.9363	(383)

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			262.0000	(467a)
Space and Water heating from Heat pump	1128.7373	1.5902	174.2330	(467)
Electrical energy for heat distribution (space & water)	2.8707	0.0000	45.1767	(472)
Overall CO2 factor for heat network			0.5983	(486)
Total CO2 associated with community systems			1769.4798	(473)
Space and water heating			1769.4798	(476)
Pumps, fans and electric keep-hot	220.5882	1.5128	333.7058	(478)
Energy for lighting	201.4122	1.5338	308.9328	(479)
Total Primary energy kWh/year			2412.1184	(483)

Full SAP Calculation Printout

Property Reference	Be Green	**Issued on Date**	08/04/2025
Assessment Reference	0301_2B4P_BG	**Prop Type Ref**	
Property			

SAP Rating	90 B	**DER**	1.59	**TER**	12.79
Environmental	99 A	**% DER < TER**			87.57
CO_2 Emissions (t/year)	0.11	**DFEE**	26.10	**TFEE**	33.03
Compliance Check	See BREL	**% DFEE < TFEE**			20.99
% DPER < TPER	75.87	**DPER**	16.56	**TPER**	68.61

Assessor Details	Alfie Gamble-Thornton	**Assessor ID**	CM02-0001
Client	Fifth State, Fifth State		

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		Storey height		Volume	
Main dwelling		(m2)		(m)		(m3)	
Ground floor		82.0000	(1b)	x 3.1500	(2b) =	258.3000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.0000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	258.3000	(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		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1500	(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	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762	(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	0.2862	0.2825	0.2787	0.2600	0.2562	0.2375	0.2375	0.2337	0.2450	0.2562	0.2637	0.2712	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Glazing			14.8000	0.7752	11.4729			(27)
External Wall North	34.6500	7.4000	27.2500	0.1400	3.8150	70.0000	1907.5000	(29a)
External Wall West	27.7200		27.7200	0.1400	3.8808	70.0000	1940.4000	(29a)
External Wall South	37.8000	7.4000	30.4000	0.1400	4.2560	70.0000	2128.0000	(29a)
Total net area of external elements Aum(A, m2)			100.1700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.4247			(33)
Main dwelling								
Party Wall 1 East			30.5600	0.0000	0.0000	45.0000	1375.2000	(32)
Party Floor 1			82.0000			30.0000	2460.0000	(32d)
Party Ceiling 1			82.0000			20.0000	1640.0000	(32b)
Internal Wall 1			104.6100			9.0000	941.4900	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12392.5900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		151.1291 (35)
List of Thermal Bridges		

K1 Element										Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)										41.5000	0.0300	1.2450	
E18 Party wall between dwellings										12.6000	0.0300	0.3780	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)													1.6230 (36)
Point Thermal bridges												(36a) =	0.0000
Total fabric heat loss												(33) + (36) + (36a) =	25.0477 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	24.3997	24.0800	23.7604	22.1621	21.8425	20.2443	20.2443	19.9246	20.8836	21.8425	22.4818	23.1211	(38)
Heat transfer coeff	49.4473	49.1277	48.8080	47.2098	46.8902	45.2919	45.2919	44.9723	45.9312	46.8902	47.5295	48.1687	(39)
Average = Sum(39)m / 12 =												47.1299	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6030	0.5991	0.5952	0.5757	0.5718	0.5523	0.5523	0.5484	0.5601	0.5718	0.5796	0.5874	(40)
HLP (average)												0.5748	
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												2.4997	(42)
Hot water usage for mixer showers	72.5185	71.4083	69.7721	67.2550	64.9998	61.8448	59.3493	62.2666	63.7339	66.8588	70.1132	72.4531	(42a)
Hot water usage for baths	27.9253	27.5038	26.9041	26.0060	25.1966	24.0824	23.2371	24.2707	24.8132	25.9172	27.0651	27.9032	(42b)
Hot water usage for other uses	40.2296	38.7667	37.3038	35.8409	34.3780	32.9151	32.9151	34.3780	35.8409	37.3038	38.7667	40.2296	(42c)
Average daily hot water use (litres/day)												129.3222	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	140.6734	137.6787	133.9799	129.1019	124.5744	118.8423	115.5015	120.9154	124.3880	130.0799	135.9449	140.5859	(44)
Energy conte	207.0955	182.1768	191.4545	168.6393	160.5267	137.4371	127.6326	142.3196	144.2839	167.6210	183.7340	206.4606	(45)
Energy content (annual)										Total = Sum(45)m =		2019.3818	
Distribution loss (46)m = 0.15 x (45)m	31.0643	27.3265	28.7182	25.2959	24.0790	20.6156	19.1449	21.3479	21.6426	25.1432	27.5601	30.9691	(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	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	(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	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	(64)
										Total per year (kWh/year) = Sum(64)m =		2670.2216	(64)
12Total per year (kWh/year)												2670	(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	113.0807	100.5157	107.8801	98.8675	97.5966	88.4928	86.6593	91.5427	90.7693	99.9554	103.8865	112.8696	(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	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	112.8185	124.9061	112.8185	116.5791	112.8185	116.5791	112.8185	112.8185	116.5791	112.8185	116.5791	112.8185	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	223.5697	225.8896	220.0434	207.5975	191.8868	177.1210	167.2565	164.9365	170.7828	183.2286	198.9393	213.7052	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	(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)	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	(71)
Water heating gains (Table 5)	151.9902	149.5770	145.0001	137.3160	131.1782	122.9066	116.4775	123.0413	126.0685	134.3487	144.2868	151.7065	(72)
Total internal gains	548.8740	560.8684	538.3577	521.9883	496.3792	477.1024	457.0482	461.2920	473.9261	490.8915	520.3009	538.7258	(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	7.4000	10.6334	0.3500	0.8500	0.7700	16.2227	(74)
South	7.4000	46.7521	0.3500	0.8500	0.7700	71.3268	(78)

Solar gains	87.5495	147.8174	201.4822	252.7968	289.2411	290.6849	278.7168	250.4198	218.7800	162.9002	104.5594	75.1570	(83)
Total gains	636.4235	708.6858	739.8399	774.7851	785.6203	767.7874	735.7650	711.7118	692.7061	653.7917	624.8603	613.8828	(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	69.6172	70.0702	70.5291	72.9168	73.4138	76.0044	76.0044	76.5446	74.9465	73.4138	72.4264	71.4651	
alpha	5.6411	5.6713	5.7019	5.8611	5.8943	6.0670	6.0670	6.1030	5.9964	5.8943	5.8284	5.7643	
util living area													
	0.9359	0.8926	0.8313	0.7003	0.5473	0.3769	0.2708	0.2906	0.4552	0.7071	0.8762	0.9419	(86)
MIT	20.4880	20.6473	20.7933	20.9356	20.9862	20.9989	20.9999	20.9998	20.9964	20.9430	20.7465	20.4837	(87)
Th 2	20.4273	20.4308	20.4343	20.4519	20.4554	20.4731	20.4731	20.4766	20.4660	20.4554	20.4484	20.4413	(88)
util rest of house													
	0.9271	0.8796	0.8128	0.6746	0.5171	0.3461	0.2384	0.2575	0.4207	0.6773	0.8600	0.9340	(89)
MIT 2	19.8353	20.0318	20.2088	20.3867	20.4430	20.4723	20.4730	20.4765	20.4632	20.3998	20.1693	19.8420	(90)
Living area fraction										fLA = Living area / (4) =		0.2439	(91)
MIT	19.9945	20.1819	20.3514	20.5206	20.5755	20.6007	20.6015	20.6042	20.5933	20.5323	20.3101	19.9985	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9945	20.1819	20.3514	20.5206	20.5755	20.6007	20.6015	20.6042	20.5933	20.5323	20.3101	19.9985	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9197	0.8735	0.8099	0.6779	0.5238	0.3536	0.2463	0.2656	0.4290	0.6816	0.8556	0.9269	(94)
Useful gains	585.3404	619.0277	599.1956	525.2423	411.4874	271.4615	181.2088	189.0280	297.1560	445.6462	534.6266	568.9834	(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													
	776.0525	750.7651	676.0594	548.6045	416.1714	271.7840	181.2366	189.0706	298.2441	465.7274	627.8665	760.9941	(97)
Space heating kWh													
	141.8898	88.5276	57.1867	16.8208	3.4849	0.0000	0.0000	0.0000	0.0000	14.9405	67.1328	142.8560	(98a)
Space heating requirement - total per year (kWh/year)												532.8389	
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													
	141.8898	88.5276	57.1867	16.8208	3.4849	0.0000	0.0000	0.0000	0.0000	14.9405	67.1328	142.8560	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												532.8389	
Space heating per m2										(98c) / (4) =		6.4980	(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												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.0000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	141.8898	88.5276	57.1867	16.8208	3.4849	0.0000	0.0000	0.0000	0.0000	14.9405	67.1328	142.8560	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00													
307a	141.8898	88.5276	57.1867	16.8208	3.4849	0.0000	0.0000	0.0000	0.0000	14.9405	67.1328	142.8560	
Space heating requirement													
	141.8898	88.5276	57.1867	16.8208	3.4849	0.0000	0.0000	0.0000	0.0000	14.9405	67.1328	142.8560	(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													
	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00													
310a	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	
Water heating fuel													
	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	(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	18.7349	16.9218	18.7349	18.1305	18.7349	18.1305	18.7349	18.7349	18.1305	18.7349	18.1305	18.7349	(331)
Lighting	20.7264	16.6275	14.9712	10.9685	8.4724	6.9220	7.7288	10.0462	13.0490	17.1210	19.3382	21.3024	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-20.0839	-30.0387	-45.8825	-54.9402	-62.2016	-59.1968	-58.4577	-53.6636	-45.7567	-35.7455	-22.6762	-17.1644	(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												532.8389	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												2670.2216	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												5.3284	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7000)													
mechanical ventilation fans (SFP = 0.7000)												220.5882	(330a)
Total electricity for the above, kWh/year												220.5882	(331)
Electricity for lighting (calculated in Appendix L)												167.2737	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-505.8077	(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												3085.1146	(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			333.0000	(367)
Space and Water heating from Heat pump	961.8800	0.1583	25.3339	(367)
Electrical energy for heat distribution (space & water)	5.3284	0.0000	4.6054	(372)
Overall CO2 factor for heat network			0.0446	(386)
Total CO2 associated with community systems			142.9055	(373)
Space and water heating			142.9055	(376)
Pumps, fans and electric keep-hot	220.5882	0.1387	30.5983	(378)
Energy for lighting	167.2737	0.1443	24.1428	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-505.8077	0.1333	-67.4353	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-67.4353	(380)
Total CO2, kg/year			130.2112	(383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.5900	(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			333.0000	(467a)
Space and Water heating from Heat pump	961.8800	1.5861	253.7906	(467)
Electrical energy for heat distribution (space & water)	5.3284	0.0000	49.0631	(472)
Overall CO2 factor for heat network			0.4753	(486)
Total CO2 associated with community systems			1522.4283	(473)
Space and water heating			1522.4283	(476)
Pumps, fans and electric keep-hot	220.5882	1.5128	333.7058	(478)
Energy for lighting	167.2737	1.5338	256.5699	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-505.8077	1.4927	-755.0005	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-755.0005	(480)
Total Primary energy kWh/year			1357.7035	(483)
Dwelling Primary energy Rate (DPER)			16.5600	(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)	
Main dwelling						
Ground floor	82.0000	(1b)	x 3.1500	(2b) =	258.3000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	258.3000	(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) =	0.1161	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3661	(18)
Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3661	(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	0.4668	0.4577	0.4485	0.4028	0.3936	0.3478	0.3478	0.3387	0.3661	0.3936	0.4119	0.4302	(22b)
Effective ac	0.6090	0.6047	0.6006	0.5811	0.5775	0.5605	0.5605	0.5574	0.5670	0.5775	0.5848	0.5925	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opening Type			14.8000	1.1450	16.9466			(27)
External Wall North	34.6500	7.4000	27.2500	0.1800	4.9050			(29a)
External Wall West	27.7200		27.7200	0.1800	4.9896			(29a)
External Wall South	37.8000	7.4000	30.4000	0.1800	5.4720			(29a)
Total net area of external elements Aum(A, m2)			100.1700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.3132			(33)
Main dwelling								
Party Wall 1 East			30.5600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 161.1291 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	41.5000	0.0700	2.9050	
E18 Party wall between dwellings	12.6000	0.0600	0.7560	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			3.6610	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	35.9742	(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	51.9077	51.5470	51.1935	49.5330	49.2223	47.7761	47.7761	47.5082	48.3331	49.2223	49.8508	50.5079	(38)
Heat transfer coeff	87.8819	87.5212	87.1677	85.5072	85.1965	83.7502	83.7502	83.4824	84.3073	85.1965	85.8250	86.4820	(39)
Average = Sum(39)m / 12 =												85.5057	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0717	1.0673	1.0630	1.0428	1.0390	1.0213	1.0213	1.0181	1.0281	1.0390	1.0466	1.0547	(40)
HLP (average)												1.0428	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4997 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
66.1317	65.1379	63.6897	60.9188	58.8739	56.5936	55.2974	56.7346	58.3101	60.7586	63.5890	65.8783	(42a)

Hot water usage for baths

28.5620	28.1378	27.5405	26.4391	25.6144	24.6999	24.2060	24.7991	25.4450	26.4235	27.5476	28.4655	(42b)

Hot water usage for other uses

40.2296	38.7667	37.3038	35.8409	34.3780	32.9151	32.9151	34.3780	35.8409	37.3038	38.7667	40.2296	(42c)

Average daily hot water use (litres/day) 124.0251 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	134.9233	132.0424	128.5340	123.1988	118.8663	114.2086	112.4185	115.9118	119.5960	124.4859	129.9032	134.5734	(44)
Energy conte	213.6855	188.0266	197.5519	168.6530	160.0169	140.4328	135.9604	143.5230	147.4738	168.9261	185.0710	210.7094	(45)
Energy content (annual)										Total = Sum(45)m =		2060.0305	
Distribution loss (46)m = 0.15 x (45)m	32.0528	28.2040	29.6328	25.2979	24.0025	21.0649	20.3941	21.5284	22.1211	25.3389	27.7606	31.6064	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	260.2804	230.1123	244.1468	213.7448	206.6118	185.5246	182.5553	190.1179	192.5657	215.5210	230.1628	257.3043	(62)
WWHRS	-30.2327	-26.7380	-27.9985	-23.1839	-21.6065	-18.4889	-17.3304	-18.4291	-19.1293	-22.5513	-25.5479	-29.6728	(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	230.0478	203.3743	216.1483	190.5610	185.0053	167.0358	165.2249	171.6888	173.4364	192.9697	204.6149	227.6315	(64)
										Total per year (kWh/year) = Sum(64)m =		2327.7386	(64)
12Total per year (kWh/year)												2328	(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	108.3264	96.1874	102.9619	92.1506	90.4816	82.7674	82.4828	84.9973	85.1085	93.4439	97.6096	107.3368	(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	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	115.1238	127.4585	115.1238	118.9613	115.1238	118.9613	115.1238	115.1238	118.9613	115.1238	118.9613	115.1238	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	223.5697	225.8896	220.0434	207.5975	191.8868	177.1210	167.2565	164.9365	170.7828	183.2286	198.9393	213.7052	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	(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)	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	(71)
Water heating gains (Table 5)	145.6000	143.1361	138.3897	127.9869	121.6150	114.9547	110.8639	114.2437	118.2063	125.5966	135.5688	144.2699	(72)
Total internal gains	547.7892	559.9799	537.0527	518.0415	492.1214	471.5327	453.7400	454.7998	468.4461	487.4448	516.9652	536.5946	(73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
	m2	Table 6a	Specific data	Specific data	factor	W

					W/m2	or Table 6b		or Table 6c		Table 6d			
North					7.4000	10.6334		0.6300	0.7000	0.7700		24.0478	(74)
South					7.4000	46.7521		0.6300	0.7000	0.7700		105.7315	(78)
Solar gains	129.7793	219.1175	298.6678	374.7340	428.7574	430.8977	413.1566	371.2105	324.3092	241.4756	154.9939	111.4092	(83)
Total gains	677.5685	779.0974	835.7204	892.7755	920.8788	902.4304	866.8966	826.0103	792.7553	728.9204	671.9591	648.0038	(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	41.7625	41.9346	42.1046	42.9223	43.0788	43.8227	43.8227	43.9633	43.5332	43.0788	42.7634	42.4384	
alpha	3.7842	3.7956	3.8070	3.8615	3.8719	3.9215	3.9215	3.9309	3.9022	3.8719	3.8509	3.8292	
util living area	0.9704	0.9499	0.9187	0.8484	0.7312	0.5601	0.4164	0.4524	0.6590	0.8643	0.9490	0.9743	(86)
MIT	19.4972	19.7575	20.0776	20.4819	20.7774	20.9425	20.9859	20.9805	20.8888	20.5210	19.9632	19.4693	(87)
Th 2	20.0240	20.0276	20.0311	20.0478	20.0510	20.0656	20.0656	20.0683	20.0600	20.0510	20.0446	20.0380	(88)
util rest of house	0.9645	0.9403	0.9030	0.8195	0.6822	0.4891	0.3317	0.3660	0.5900	0.8323	0.9375	0.9692	(89)
MIT 2	18.2902	18.6183	19.0176	19.5163	19.8511	20.0262	20.0592	20.0588	19.9763	19.5744	18.8923	18.2648	(90)
Living area fraction										fLA = Living area / (4) =		0.2439	(91)
MIT	18.5846	18.8961	19.2761	19.7518	20.0770	20.2497	20.2852	20.2836	20.1988	19.8053	19.1535	18.5585	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.5846	18.8961	19.2761	19.7518	20.0770	20.2497	20.2852	20.2836	20.1988	19.8053	19.1535	18.5585	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9529	0.9262	0.8882	0.8093	0.6836	0.5036	0.3520	0.3864	0.6008	0.8228	0.9241	0.9586	(94)
Useful gains	645.6646	721.6384	742.3113	722.5609	629.5241	454.4909	305.1523	319.1768	476.2796	599.7216	620.9641	621.1660	(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	1255.3578	1224.9598	1113.6644	927.9102	713.6896	473.1640	308.6368	324.2137	514.1751	784.2565	1034.4884	1241.7559	(97)
Space heating kWh	453.6118	338.2320	276.2867	147.8515	62.6191	0.0000	0.0000	0.0000	0.0000	137.2940	297.7375	461.7189	(98a)
Space heating requirement - total per year (kWh/year)												2175.3513	
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	453.6118	338.2320	276.2867	147.8515	62.6191	0.0000	0.0000	0.0000	0.0000	137.2940	297.7375	461.7189	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2175.3513	
Space heating per m2											(98c) / (4) =	26.5287	(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	453.6118	338.2320	276.2867	147.8515	62.6191	0.0000	0.0000	0.0000	0.0000	137.2940	297.7375	461.7189	(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)	491.4537	366.4485	299.3355	160.1858	67.8430	0.0000	0.0000	0.0000	0.0000	148.7475	322.5758	500.2371	(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	230.0478	203.3743	216.1483	190.5610	185.0053	167.0358	165.2249	171.6888	173.4364	192.9697	204.6149	227.6315	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.5532	85.1921	84.6114	83.4973	81.8990	79.8000	79.8000	79.8000	79.8000	83.3101	84.8999	85.6117	(217)
Fuel for water heating, kWh/month	268.8944	238.7243	255.4601	228.2242	225.8944	209.3180	207.0488	215.1488	217.3388	231.6283	241.0072	265.8884	(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	23.9205	19.1899	17.2784	12.6589	9.7781	7.9888	8.9199	11.5944	15.0600	19.7595	22.3183	24.5853	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-13.5036	-20.5454	-31.8395	-38.6837	-44.3007	-42.3032	-41.7849	-38.1437	-32.2167	-24.7093	-15.3697	-11.5054	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-3.6484	-7.9325	-16.2639	-25.1830	-34.0602	-34.5113	-34.1107	-28.5315	-20.4576	-11.5895	-4.9471	-2.8666	(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												2356.8270	(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	2804.5757	(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)	193.0518	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-579.0079	(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	4861.4466	(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	2356.8270	0.2100	494.9337	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2804.5757	0.2100	588.9609	(264)
Space and water heating			1083.8946	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	193.0518	0.1443	27.8633	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-354.9056	0.1330	-47.2129	
PV Unit electricity exported	-224.1023	0.1250	-28.0155	
Total			-75.2284	(269)
Total CO2, kg/year			1048.4587	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.7900	(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	2356.8270	1.1300	2663.2145	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2804.5757	1.1300	3169.1706	(278)
Space and water heating			5832.3851	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	193.0518	1.5338	296.1093	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-354.9056	1.4916	-529.3650	
PV Unit electricity exported	-224.1023	0.4588	-102.8264	
Total			-632.1913	(283)
Total Primary energy kWh/year			5626.4039	(286)
Target Primary Energy Rate (TPER)			68.6100	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	82.0000	(1b) x	3.1500	(2b) =	258.3000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		258.3000	(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) =	0.1161	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.2661	(18)
Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2661	(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	0.3393	0.3327	0.3260	0.2928	0.2861	0.2528	0.2528	0.2462	0.2661	0.2861	0.2994	0.3127	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5576	0.5553	0.5531	0.5429	0.5409	0.5320	0.5320	0.5303	0.5354	0.5409	0.5448	0.5489	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Glazing			14.8000	0.7752	11.4729			(27)
External Wall North	34.6500	7.4000	27.2500	0.1400	3.8150	70.0000	1907.5000	(29a)
External Wall West	27.7200		27.7200	0.1400	3.8808	70.0000	1940.4000	(29a)
External Wall South	37.8000	7.4000	30.4000	0.1400	4.2560	70.0000	2128.0000	(29a)
Total net area of external elements Aum(A, m2)			100.1700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.4247			(33)
Main dwelling								
Party Wall 1 East			30.5600	0.0000	0.0000	45.0000	1375.2000	(32)
Party Floor 1			82.0000			30.0000	2460.0000	(32d)
Party Ceiling 1			82.0000			30.0000	2460.0000	(32b)
Internal Wall 1			104.6100			9.0000	941.4900	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	13212.5900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		161.1291 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	41.5000	0.0300	1.2450
E18 Party wall between dwellings	12.6000	0.0300	0.3780

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		1.6230 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	25.0477 (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	47.5270	47.3365	47.1497	46.2723	46.1082	45.3440	45.3440	45.2025	45.6384	46.1082	46.4402	46.7874	(38)
Heat transfer coeff	72.5747	72.3841	72.1973	71.3200	71.1558	70.3917	70.3917	70.2502	70.6860	71.1558	71.4879	71.8351	(39)
Average = Sum(39)m / 12 =												71.3192	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8851	0.8827	0.8805	0.8698	0.8678	0.8584	0.8584	0.8567	0.8620	0.8678	0.8718	0.8760	(40)
HLP (average)												0.8697	
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		2.4997 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

27.9253	27.5038	26.9041	26.0060	25.1966	24.0824	23.2371	24.2707	24.8132	25.9172	27.0651	27.9032	(42b)

Hot water usage for other uses

40.2296	38.7667	37.3038	35.8409	34.3780	32.9151	32.9151	34.3780	35.8409	37.3038	38.7667	40.2296	(42c)

Average daily hot water use (litres/day)		62.4657 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.1549	66.2704	64.2078	61.8469	59.5746	56.9975	56.1522	58.6488	60.6541	63.2210	65.8317	68.1327	(44)
Energy conte	100.3358	87.6892	91.7517	80.7875	76.7679	65.9157	62.0498	69.0307	70.3558	81.4667	88.9738	100.0579	(45)
Energy content (annual)										Total = Sum(45)m =		975.1823	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(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	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													
	85.2854	74.5358	77.9889	68.6693	65.2527	56.0284	52.7424	58.6761	59.8024	69.2467	75.6277	85.0492	(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													
	85.2854	74.5358	77.9889	68.6693	65.2527	56.0284	52.7424	58.6761	59.8024	69.2467	75.6277	85.0492	(64)
										Total per year (kWh/year) = Sum(64)m =		828.9050	(64)
12Total per year (kWh/year)												829	(64)
Electric shower(s)													
	52.9605	47.1882	51.5277	49.1723	50.0950	47.7858	49.3786	50.0950	49.1723	51.5277	50.5588	52.9605	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												602.4224	(64a)
Heat gains from water heating, kWh/month													
	34.5615	30.4310	32.3792	29.4604	28.8369	25.9535	25.5302	27.1928	27.2437	30.1936	31.5466	34.5024	(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	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	112.8185	124.9061	112.8185	116.5791	112.8185	116.5791	112.8185	112.8185	116.5791	112.8185	116.5791	112.8185	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	223.5697	225.8896	220.0434	207.5975	191.8868	177.1210	167.2565	164.9365	170.7828	183.2286	198.9393	213.7052	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	(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)													

	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	(71)
Water heating gains (Table 5)												
	46.4536	45.2842	43.5204	40.9172	38.7593	36.0466	34.3148	36.5494	37.8384	40.5828	43.8148	46.3742 (72)
Total internal gains												
	443.3374	456.5757	436.8780	425.5895	403.9603	390.2423	374.8855	374.8001	385.6960	397.1256	419.8289	433.3936 (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	7.4000	10.6334	0.3500	0.8500	0.7700	16.2227	(74)
South	7.4000	46.7521	0.3500	0.8500	0.7700	71.3268	(78)

Solar gains	87.5495	147.8174	201.4822	252.7968	289.2411	290.6849	278.7168	250.4198	218.7800	162.9002	104.5594	75.1570 (83)
Total gains	530.8869	604.3931	638.3602	678.3863	693.2014	680.9273	653.6023	625.2199	604.4760	560.0258	524.3883	508.5505 (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	50.5709	50.7040	50.8352	51.4605	51.5792	52.1392	52.1392	52.2442	51.9221	51.5792	51.3397	51.0915	
alpha	4.3714	4.3803	4.3890	4.4307	4.4386	4.4759	4.4759	4.4829	4.4615	4.4386	4.4226	4.4061	
util living area	0.9846	0.9721	0.9522	0.8990	0.7967	0.6223	0.4649	0.5035	0.7202	0.9095	0.9711	0.9870	(86)
MIT	19.6565	19.8730	20.1432	20.5047	20.7856	20.9474	20.9885	20.9836	20.8972	20.5483	20.0524	19.6228	(87)
Th 2	20.1802	20.1822	20.1841	20.1933	20.1950	20.2030	20.2030	20.2045	20.1999	20.1950	20.1915	20.1879	(88)
util rest of house	0.9815	0.9666	0.9425	0.8784	0.7563	0.5569	0.3846	0.4220	0.6595	0.8869	0.9645	0.9844	(89)
MIT 2	18.9495	19.1642	19.4303	19.7832	20.0379	20.1732	20.1985	20.1977	20.1361	19.8307	19.3502	18.9221	(90)
Living area fraction										fLA = Living area / (4) =		0.2439	(91)
MIT	19.1220	19.3370	19.6042	19.9592	20.2203	20.3620	20.3912	20.3894	20.3218	20.0057	19.5215	19.0930	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1220	19.3370	19.6042	19.9592	20.2203	20.3620	20.3912	20.3894	20.3218	20.0057	19.5215	19.0930	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9764	0.9596	0.9343	0.8716	0.7577	0.5705	0.4039	0.4414	0.6694	0.8807	0.9577	0.9798	(94)
Useful gains	518.3325	579.9549	596.3945	591.2964	525.2130	388.4608	263.9834	275.9673	404.6079	493.2425	502.2121	498.2949	(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	1075.6984	1045.0121	946.0847	788.7387	606.2683	405.5991	266.8703	280.2574	439.7913	669.2700	887.9861	1069.8385	(97)
Space heating kWh	414.6803	312.5185	260.1695	142.1584	60.3051	0.0000	0.0000	0.0000	0.0000	130.9644	277.7573	425.2284	(98a)
Space heating requirement - total per year (kWh/year)												2023.7819	
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	414.6803	312.5185	260.1695	142.1584	60.3051	0.0000	0.0000	0.0000	0.0000	130.9644	277.7573	425.2284	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2023.7819	
Space heating per m2											(98c) / (4) =	24.6803	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	661.6818	520.8984	533.9013	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8658	0.9227	0.9058	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	572.8646	480.6305	483.6012	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	752.5313	722.8827	691.7784	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	129.3600	180.2357	154.8838	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	32.3400	45.0589	38.7210	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												116.1199	(107)
Energy for space heating												24.6803	(99)
Energy for space cooling												1.4161	(108)
Total												26.0964	(109)
Fabric Energy Efficiency (DFEE)												26.1	(109)

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

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	82.0000	(1b)	x 3.1500	(2b) =	258.3000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	258.3000	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1161	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3661	(18)
Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3661	(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	0.4668	0.4577	0.4485	0.4028	0.3936	0.3478	0.3478	0.3387	0.3661	0.3936	0.4119	0.4302	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.6090	0.6047	0.6006	0.5811	0.5775	0.5605	0.5605	0.5574	0.5670	0.5775	0.5848	0.5925	(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	
Main dwelling								
TER Opening Type			14.8000	1.1450	16.9466			(27)
External Wall North	34.6500	7.4000	27.2500	0.1800	4.9050			(29a)
External Wall West	27.7200		27.7200	0.1800	4.9896			(29a)
External Wall South	37.8000	7.4000	30.4000	0.1800	5.4720			(29a)
Total net area of external elements Aum(A, m2)			100.1700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.3132			(33)
Main dwelling								
Party Wall 1 East			30.5600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	161.1291	(35)
List of Thermal Bridges		

	Length	Psi-value	Total	
K1 Element				
E7 Party floor between dwellings (in blocks of flats)	41.5000	0.0700	2.9050	
E18 Party wall between dwellings	12.6000	0.0600	0.7560	

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	3.6610	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	35.9742	(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	51.9077	51.5470	51.1935	49.5330	49.2223	47.7761	47.7761	47.5082	48.3331	49.2223	49.8508	50.5079	(38)
Heat transfer coeff	87.8819	87.5212	87.1677	85.5072	85.1965	83.7502	83.7502	83.4824	84.3073	85.1965	85.8250	86.4820	(39)
Average = Sum(39)m / 12 =												85.5057	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0717	1.0673	1.0630	1.0428	1.0390	1.0213	1.0213	1.0181	1.0281	1.0390	1.0466	1.0547	(40)
HLP (average)												1.0428	
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	2.4997	(42)

Hot water usage for mixer showers

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

	28.5620	28.1378	27.5405	26.4391	25.6144	24.6999	24.2060	24.7991	25.4450	26.4235	27.5476	28.4655	(42b)

Hot water usage for other uses

	40.2296	38.7667	37.3038	35.8409	34.3780	32.9151	32.9151	34.3780	35.8409	37.3038	38.7667	40.2296	(42c)
Average daily hot water use (litres/day)												63.0538	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	68.7916	66.9045	64.8443	62.2800	59.9924	57.6150	57.1211	59.1771	61.2859	63.7273	66.3143	68.6950	(44)
Energy conte	108.9491	95.2711	99.6633	85.2582	80.7613	70.8444	69.0830	73.2737	75.5716	86.4773	94.4768	107.5598	(45)
Energy content (annual)										Total = Sum(45)m =		1047.1896	

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

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(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	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

	92.6067	80.9805	84.7138	72.4695	68.6471	60.2177	58.7205	62.2826	64.2359	73.5057	80.3053	91.4259 (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												
	92.6067	80.9805	84.7138	72.4695	68.6471	60.2177	58.7205	62.2826	64.2359	73.5057	80.3053	91.4259 (64)
										Total per year (kWh/year) = Sum(64)m =		890.1111 (64)
12Total per year (kWh/year)												890 (64)
Electric shower(s)												
	52.9605	47.1882	51.5277	49.1723	50.0950	47.7858	49.3786	50.0950	49.1723	51.5277	50.5588	52.9605 (64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		602.4224 (64a)
Heat gains from water heating, kWh/month												
	36.3918	32.0422	34.0604	30.4104	29.6855	27.0009	27.0248	28.0944	28.3520	31.2584	32.7160	36.0966 (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	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	124.9857	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	115.1238	127.4585	115.1238	118.9613	115.1238	118.9613	115.1238	115.1238	118.9613	115.1238	118.9613	115.1238	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	223.5697	225.8896	220.0434	207.5975	191.8868	177.1210	167.2565	164.9365	170.7828	183.2286	198.9393	213.7052	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	35.4986	(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)													
	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	(71)
Water heating gains (Table 5)													
	48.9137	47.6818	45.7801	42.2367	39.8999	37.5012	36.3236	37.7613	39.3778	42.0139	45.4389	48.5169	(72)
Total internal gains													
	448.1029	461.5257	441.4430	429.2913	407.4063	394.0792	379.1997	378.3174	389.6176	400.8621	423.8353	437.8416	(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	7.4000	10.6334	0.6300	0.7000	0.7700	24.0478	(74)
South	7.4000	46.7521	0.6300	0.7000	0.7700	105.7315	(78)

Solar gains	129.7793	219.1175	298.6678	374.7340	428.7574	430.8977	413.1566	371.2105	324.3092	241.4756	154.9939	111.4092	(83)
Total gains	577.8822	680.6432	740.1108	804.0253	836.1637	824.9769	792.3564	749.5279	713.9269	642.3378	578.8292	549.2508	(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	41.7625	41.9346	42.1046	42.9223	43.0788	43.8227	43.8227	43.9633	43.5332	43.0788	42.7634	42.4384	
alpha	3.7842	3.7956	3.8070	3.8615	3.8719	3.9215	3.9215	3.9309	3.9022	3.8719	3.8509	3.8292	
util living area													
	0.9820	0.9663	0.9415	0.8809	0.7728	0.6021	0.4524	0.4936	0.7077	0.9000	0.9672	0.9849	(86)
MIT	19.3302	19.6046	19.9456	20.3899	20.7266	20.9261	20.9812	20.9736	20.8565	20.4238	19.8179	19.3008	(87)
Th 2	20.0240	20.0276	20.0311	20.0478	20.0510	20.0656	20.0656	20.0683	20.0600	20.0510	20.0446	20.0380	(88)
util rest of house													
	0.9782	0.9594	0.9293	0.8559	0.7262	0.5289	0.3617	0.4013	0.6394	0.8737	0.9594	0.9817	(89)
MIT 2	18.5092	18.7816	19.1170	19.5524	19.8560	20.0254	20.0588	20.0581	19.9736	19.5945	19.0072	18.4906	(90)
Living area fraction									fLA = Living area / (4) =			0.2439	(91)
MIT	18.7094	18.9823	19.3191	19.7567	20.0683	20.2450	20.2838	20.2814	20.1890	19.7968	19.2049	18.6882	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7094	18.9823	19.3191	19.7567	20.0683	20.2450	20.2838	20.2814	20.1890	19.7968	19.2049	18.6882	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9714	0.9501	0.9184	0.8472	0.7271	0.5436	0.3834	0.4231	0.6495	0.8654	0.9505	0.9757	(94)
Useful gains	561.3560	646.6703	679.6953	681.1300	608.0140	448.4622	303.8082	317.1073	463.6644	555.8628	550.2007	535.8884	(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													
	1266.3287	1232.4999	1117.4087	928.3255	712.9512	472.7740	308.5163	324.0262	513.3438	783.5317	1038.9030	1252.9671	(97)
Space heating kWh													
	524.4997	393.6775	325.6588	177.9808	78.0733	0.0000	0.0000	0.0000	0.0000	169.3857	351.8657	533.5066	(98a)
Space heating requirement - total per year (kWh/year)												2554.6480	
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													
	524.4997	393.6775	325.6588	177.9808	78.0733	0.0000	0.0000	0.0000	0.0000	169.3857	351.8657	533.5066	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2554.6480	
Space heating per m2											(98c) / (4) =	31.1542	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	787.2520	619.7516	634.4662	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8531	0.9096	0.8898	0.0000	0.0000	0.0000	0.0000	(101)

Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	671.5804	563.7376	564.5755	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	918.0727	882.2470	834.4575	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	177.4744	236.9710	200.7922	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	44.3686	59.2428	50.1981	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												153.8094	(107)
Energy for space heating												31.1542	(99)
Energy for space cooling												1.8757	(108)
Total												33.0300	(109)
Fabric Energy Efficiency (TFEE)												33.0	(109)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)
Main dwelling					
Ground floor	82.0000 (1b)	x	3.1500 (2b)	=	258.3000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.0000				(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	258.3000 (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		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1500	(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													
	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762	(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	0.2862	0.2825	0.2787	0.2600	0.2562	0.2375	0.2375	0.2337	0.2450	0.2562	0.2637	0.2712	(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	
Main dwelling								
Glazing			14.8000	0.7752	11.4729			(27)
External Wall North	34.6500	7.4000	27.2500	0.1400	3.8150	70.0000	1907.5000	(29a)
External Wall West	27.7200		27.7200	0.1400	3.8808	70.0000	1940.4000	(29a)
External Wall South	37.8000	7.4000	30.4000	0.1400	4.2560	70.0000	2128.0000	(29a)
Total net area of external elements Aum(A, m2)			100.1700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.4247			(33)
Main dwelling								
Party Wall 1 East			30.5600	0.0000	0.0000	45.0000	1375.2000	(32)
Party Floor 1			82.0000			30.0000	2460.0000	(32d)
Party Ceiling 1			82.0000			30.0000	2460.0000	(32b)
Internal Wall 1			104.6100			9.0000	941.4900	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	13212.5900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		161.1291 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	41.5000	0.0300	1.2450
E18 Party wall between dwellings	12.6000	0.0300	0.3780

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		1.6230 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	25.0477 (37)

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

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

(38)m	24.3997	24.0800	23.7604	22.1621	21.8425	20.2443	20.2443	19.9246	20.8836	21.8425	22.4818	23.1211	(38)
Heat transfer coeff													
	49.4473	49.1277	48.8080	47.2098	46.8902	45.2919	45.2919	44.9723	45.9312	46.8902	47.5295	48.1687	(39)
Average = Sum(39)m / 12 =												47.1299	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6030	0.5991	0.5952	0.5757	0.5718	0.5523	0.5523	0.5484	0.5601	0.5718	0.5796	0.5874	(40)
HLP (average)												0.5748	
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												2.4997	(42)
Hot water usage for mixer showers													
	72.5185	71.4083	69.7721	67.2550	64.9998	61.8448	59.3493	62.2666	63.7339	66.8588	70.1132	72.4531	(42a)
Hot water usage for baths													
	27.9253	27.5038	26.9041	26.0060	25.1966	24.0824	23.2371	24.2707	24.8132	25.9172	27.0651	27.9032	(42b)
Hot water usage for other uses													
	40.2296	38.7667	37.3038	35.8409	34.3780	32.9151	32.9151	34.3780	35.8409	37.3038	38.7667	40.2296	(42c)
Average daily hot water use (litres/day)												129.3222	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	140.6734	137.6787	133.9799	129.1019	124.5744	118.8423	115.5015	120.9154	124.3880	130.0799	135.9449	140.5859	(44)
Energy conte	207.0955	182.1768	191.4545	168.6393	160.5267	137.4371	127.6326	142.3196	144.2839	167.6210	183.7340	206.4606	(45)
Energy content (annual)										Total = Sum(45)m =		2019.3818	
Distribution loss (46)m = 0.15 x (45)m													
	31.0643	27.3265	28.7182	25.2959	24.0790	20.6156	19.1449	21.3479	21.6426	25.1432	27.5601	30.9691	(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													
	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	(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													
	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	(64)
										Total per year (kWh/year) = Sum(64)m =		2670.2216	(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													
	113.0807	100.5157	107.8801	98.8675	97.5966	88.4928	86.6593	91.5427	90.7693	99.9554	103.8865	112.8696	(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	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	23.6793	21.0318	17.1042	12.9490	9.6795	8.1718	8.8300	11.4775	15.4051	19.5603	22.8298	24.3374	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	333.6861	337.1487	328.4230	309.8470	286.3982	264.3597	249.6366	246.1740	254.8996	273.4756	296.9244	318.9629	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	(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)													
	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	(71)
Water heating gains (Table 5)													
	151.9902	149.5770	145.0001	137.3160	131.1782	122.9066	116.4775	123.0413	126.0685	134.3487	144.2868	151.7065	(72)
Total internal gains													
	611.8479	610.2497	593.0196	562.6043	529.7482	497.9305	477.4363	483.1850	498.8656	529.8769	566.5333	597.4991	(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	7.4000	10.6334	0.3500	0.8500	0.7700	16.2227	(74)
South	7.4000	46.7521	0.3500	0.8500	0.7700	71.3268	(78)

Solar gains	87.5495	147.8174	201.4822	252.7968	289.2411	290.6849	278.7168	250.4198	218.7800	162.9002	104.5594	75.1570	(83)
Total gains	699.3974	758.0671	794.5018	815.4010	818.9893	788.6154	756.1531	733.6048	717.6456	692.7771	671.0927	672.6561	(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	74.2237	74.7066	75.1959	77.7416	78.2715	81.0335	81.0335	81.6095	79.9056	78.2715	77.2187	76.1939	
alpha	5.9482	5.9804	6.0131	6.1828	6.2181	6.4022	6.4022	6.4406	6.3270	6.2181	6.1479	6.0796	
util living area													
	0.9168	0.8743	0.8034	0.6754	0.5275	0.3672	0.2635	0.2819	0.4402	0.6784	0.8533	0.9248	(86)

MIT	20.6104	20.7291	20.8532	20.9563	20.9913	20.9994	20.9999	20.9999	20.9978	20.9624	20.8129	20.6032	(87)
Th 2	20.4273	20.4308	20.4343	20.4519	20.4554	20.4731	20.4731	20.4766	20.4660	20.4554	20.4484	20.4413	(88)
util rest of house													
	0.9058	0.8595	0.7831	0.6493	0.4978	0.3371	0.2320	0.2499	0.4066	0.6481	0.8348	0.9148	(89)
MIT 2	19.9833	20.1286	20.2771	20.4085	20.4477	20.4726	20.4731	20.4766	20.4644	20.4196	20.2460	19.9870	(90)
Living area fraction										fLA = Living area / (4) =		0.2439	(91)
MIT	20.1362	20.2751	20.4176	20.5421	20.5803	20.6011	20.6016	20.6042	20.5945	20.5520	20.3843	20.1373	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1362	20.2751	20.4176	20.5421	20.5803	20.6011	20.6016	20.6042	20.5945	20.5520	20.3843	20.1373	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8997	0.8552	0.7825	0.6537	0.5047	0.3444	0.2397	0.2577	0.4147	0.6536	0.8326	0.9088	(94)
Useful gains	629.2453	648.2957	621.6933	533.0099	413.3247	271.6065	181.2237	189.0506	297.6245	452.7963	558.7250	611.2887	(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													
	783.0595	755.3428	679.2904	549.6204	416.3988	271.8011	181.2384	189.0732	298.3002	466.6487	631.3947	767.6779	(97)
Space heating kWh													
	114.4378	71.9356	42.8523	11.9595	2.2871	0.0000	0.0000	0.0000	0.0000	10.3062	52.3222	116.3535	(98a)
Space heating requirement - total per year (kWh/year)												422.4542	
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													
	114.4378	71.9356	42.8523	11.9595	2.2871	0.0000	0.0000	0.0000	0.0000	10.3062	52.3222	116.3535	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												422.4542	
Space heating per m2											(98c) / (4) =	5.1519	(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												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.0000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	114.4378	71.9356	42.8523	11.9595	2.2871	0.0000	0.0000	0.0000	0.0000	10.3062	52.3222	116.3535	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00													
307a	114.4378	71.9356	42.8523	11.9595	2.2871	0.0000	0.0000	0.0000	0.0000	10.3062	52.3222	116.3535	
Space heating requirement													
	114.4378	71.9356	42.8523	11.9595	2.2871	0.0000	0.0000	0.0000	0.0000	10.3062	52.3222	116.3535	(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													
	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00													
310a	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	
Water heating fuel													
	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	(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	18.7349	16.9218	18.7349	18.1305	18.7349	18.1305	18.7349	18.7349	18.1305	18.7349	18.1305	18.7349	(331)
Lighting	20.7264	16.6275	14.9712	10.9685	8.4724	6.9220	7.7288	10.0462	13.0490	17.1210	19.3382	21.3024	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-20.0839	-30.0387	-45.8825	-54.9402	-62.2016	-59.1968	-58.4577	-53.6636	-45.7567	-35.7455	-22.6762	-17.1644	(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												422.4542	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												2670.2216	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												4.2245	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7000)													
mechanical ventilation fans (SFP = 0.7000)												220.5882	(330a)
Total electricity for the above, kWh/year												220.5882	(331)
Electricity for lighting (calculated in Appendix L)												167.2737	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-505.8077	(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												2974.7299	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	422.4542	4.4400	18.7570	(340a)
Space heating total			18.7570	(340)

Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2670.2216	4.4400	118.5578	(342a)
Water heating total			118.5578	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	220.5882	16.4900	36.3750	(349)
Energy for lighting	167.2737	16.4900	27.5834	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-505.8077	16.4900	-83.4077	
PV Unit electricity exported	0.0000	5.5900	0.0000	
Total			-83.4077	(352)
Total energy cost			209.8655	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.3600	(356)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.5949	(357)
SAP value		90.3568	
SAP rating (Section 12)		90	(358)
SAP band		B	

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			333.0000	(367)
Space and Water heating from Heat pump	928.7315	0.1586	20.1200	(367)
Electrical energy for heat distribution (space & water)	4.2245	0.0000	4.4318	(372)
Overall CO2 factor for heat network			0.0445	(386)
Total CO2 associated with community systems			137.5179	(373)
Space and water heating			137.5179	(376)
Pumps, fans and electric keep-hot	220.5882	0.1387	30.5983	(378)
Energy for lighting	167.2737	0.1443	24.1428	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-505.8077	0.1333	-67.4353	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-67.4353	(380)
Total CO2, kg/year			124.8237	(383)
CO2 emissions per m2			1.5200	(384)
EI value			98.6830	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	82.0000	(1b)	x 3.1500	(2b) =	258.3000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.0000					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	258.3000	(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		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1500	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.8000	4.5000	4.4000	3.9000	3.9000	3.6000	3.7000	3.5000	3.7000	4.0000	4.1000	4.4000	(22)
Wind factor	1.2000	1.1250	1.1000	0.9750	0.9750	0.9000	0.9250	0.8750	0.9250	1.0000	1.0250	1.1000	(22a)
Adj infilt rate	0.1800	0.1687	0.1650	0.1462	0.1462	0.1350	0.1388	0.1313	0.1388	0.1500	0.1537	0.1650	(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	0.2750	0.2637	0.2600	0.2412	0.2412	0.2300	0.2337	0.2262	0.2337	0.2450	0.2487	0.2600 (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	
Main dwelling								
Glazing			14.8000	0.7752	11.4729			(27)
External Wall North	34.6500	7.4000	27.2500	0.1400	3.8150	70.0000	1907.5000	(29a)
External Wall West	27.7200		27.7200	0.1400	3.8808	70.0000	1940.4000	(29a)
External Wall South	37.8000	7.4000	30.4000	0.1400	4.2560	70.0000	2128.0000	(29a)
Total net area of external elements Aum(A, m2)			100.1700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.4247			(33)
Main dwelling								
Party Wall 1 East			30.5600	0.0000	0.0000	45.0000	1375.2000	(32)
Party Floor 1			82.0000			30.0000	2460.0000	(32d)
Party Ceiling 1			82.0000			30.0000	2460.0000	(32b)
Internal Wall 1			104.6100			9.0000	941.4900	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 13212.5900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 161.1291 (35)
List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element				
E7 Party floor between dwellings (in blocks of flats)	41.5000	0.0300	1.2450	
E18 Party wall between dwellings	12.6000	0.0300	0.3780	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 1.6230 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.0477 (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	23.4407	22.4818	22.1621	20.5639	20.5639	19.6050	19.9246	19.2853	19.9246	20.8836	21.2032	22.1621	(38)
Heat transfer coeff	48.4884	47.5295	47.2098	45.6116	45.6116	44.6526	44.9723	44.3330	44.9723	45.9312	46.2509	47.2098	(39)

Average = Sum(39)m / 12 = 46.0644

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.5913	0.5796	0.5757	0.5562	0.5562	0.5445	0.5484	0.5406	0.5484	0.5601	0.5640	0.5757	(40)
HLP (average)												0.5618	
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 2.4997 (42)
Hot water usage for mixer showers

	72.5185	71.4083	69.7721	67.2550	64.9998	61.8448	59.3493	62.2666	63.7339	66.8588	70.1132	72.4531 (42a)

Hot water usage for baths

	27.9253	27.5038	26.9041	26.0060	25.1966	24.0824	23.2371	24.2707	24.8132	25.9172	27.0651	27.9032 (42b)

Hot water usage for other uses

	40.2296	38.7667	37.3038	35.8409	34.3780	32.9151	32.9151	34.3780	35.8409	37.3038	38.7667	40.2296 (42c)

Average daily hot water use (litres/day) 129.3222 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	140.6734	137.6787	133.9799	129.1019	124.5744	118.8423	115.5015	120.9154	124.3880	130.0799	135.9449	140.5859	(44)
Energy conte	207.0955	182.1768	191.4545	168.6393	160.5267	137.4371	127.6326	142.3196	144.2839	167.6210	183.7340	206.4606	(45)

Energy content (annual) Total = Sum(45)m = 2019.3818
Distribution loss (46)m = 0.15 x (45)m

	31.0643	27.3265	28.7182	25.2959	24.0790	20.6156	19.1449	21.3479	21.6426	25.1432	27.5601	30.9691 (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

	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374 (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

	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374 (64)

Total per year (kWh/year) = Sum(64)m = 2670.2216 (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

	113.0807	100.5157	107.8801	98.8675	97.5966	88.4928	86.6593	91.5427	90.7693	99.9554	103.8865	112.8696 (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	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	(66)

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

	23.6793	21.0318	17.1042	12.9490	9.6795	8.1718	8.8300	11.4775	15.4051	19.5603	22.8298	24.3374 (67)

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

	333.6861	337.1487	328.4230	309.8470	286.3982	264.3597	249.6366	246.1740	254.8996	273.4756	296.9244	318.9629 (68)

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

	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980 (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)													
	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	(71)
Water heating gains (Table 5)													
	151.9902	149.5770	145.0001	137.3160	131.1782	122.9066	116.4775	123.0413	126.0685	134.3487	144.2868	151.7065	(72)
Total internal gains													
	611.8479	610.2497	593.0196	562.6043	529.7482	497.9305	477.4363	483.1850	498.8656	529.8769	566.5333	597.4991	(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	7.4000	12.7054	0.3500	0.8500	0.7700	19.3838	(74)
South	7.4000	53.5774	0.3500	0.8500	0.7700	81.7397	(78)

Solar gains	101.1236	151.9331	207.2974	276.6322	306.7359	330.5462	312.8445	282.0126	241.7787	179.2674	121.9575	83.9595	(83)
Total gains	712.9714	762.1828	800.3169	839.2365	836.4842	828.4766	790.2808	765.1977	740.6443	709.1443	688.4908	681.4586	(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	75.6916	77.2187	77.7416	80.4656	80.4656	82.1937	81.6095	82.7863	81.6095	79.9056	79.3534	77.7416	
alpha	6.0461	6.1479	6.1828	6.3644	6.3644	6.4796	6.4406	6.5191	6.4406	6.3270	6.2902	6.1828	
util living area													
	0.8916	0.8480	0.7630	0.6129	0.4563	0.3017	0.2049	0.2028	0.3640	0.5924	0.7941	0.8965	(86)
MIT	20.7033	20.7978	20.9030	20.9782	20.9969	20.9998	21.0000	21.0000	20.9994	20.9849	20.8934	20.7128	(87)
Th 2	20.4378	20.4484	20.4519	20.4695	20.4695	20.4802	20.4766	20.4837	20.4766	20.4660	20.4625	20.4519	(88)
util rest of house													
	0.8781	0.8313	0.7410	0.5870	0.4280	0.2738	0.1751	0.1729	0.3324	0.5608	0.7715	0.8833	(89)
MIT 2	20.1049	20.2258	20.3500	20.4484	20.4670	20.4801	20.4766	20.4837	20.4762	20.4525	20.3512	20.1295	(90)
Living area fraction										fLA = Living area / (4) =		0.2439	(91)
MIT	20.2508	20.3653	20.4849	20.5776	20.5962	20.6068	20.6043	20.6096	20.6039	20.5824	20.4834	20.2717	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.2508	20.3653	20.4849	20.5776	20.5962	20.6068	20.6043	20.6096	20.6039	20.5824	20.4834	20.2717	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8733	0.8287	0.7424	0.5923	0.4348	0.2806	0.1823	0.1802	0.3401	0.5678	0.7724	0.8787	(94)
Useful gains	622.6051	631.6221	594.1223	497.1151	363.6731	232.4546	144.1013	137.8577	251.8577	402.6419	531.7893	598.7673	(95)
Ext temp.	5.0000	5.4000	7.1000	9.5000	12.6000	15.4000	17.4000	17.5000	15.0000	11.7000	8.1000	5.2000	(96)
Heat loss rate W													
	739.4884	711.2926	631.8987	505.2688	364.7199	232.4991	144.1034	137.8593	252.0182	407.9780	572.7452	711.5334	(97)
Space heating kWh													
	86.9611	53.5385	28.1056	5.8706	0.7788	0.0000	0.0000	0.0000	0.0000	3.9701	29.4883	83.8980	(98a)
Space heating requirement - total per year (kWh/year)												292.6110	
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													
	86.9611	53.5385	28.1056	5.8706	0.7788	0.0000	0.0000	0.0000	0.0000	3.9701	29.4883	83.8980	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												292.6110	
Space heating per m2											(98c) / (4) =	3.5684	(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												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.0000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement													
	86.9611	53.5385	28.1056	5.8706	0.7788	0.0000	0.0000	0.0000	0.0000	3.9701	29.4883	83.8980	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00													
307a	86.9611	53.5385	28.1056	5.8706	0.7788	0.0000	0.0000	0.0000	0.0000	3.9701	29.4883	83.8980	
Space heating requirement													
	86.9611	53.5385	28.1056	5.8706	0.7788	0.0000	0.0000	0.0000	0.0000	3.9701	29.4883	83.8980	(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													
	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00													
310a	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	
Water heating fuel													
	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	(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	18.7349	16.9218	18.7349	18.1305	18.7349	18.1305	18.7349	18.7349	18.1305	18.7349	18.1305	18.7349	(331)
Lighting	20.7264	16.6275	14.9712	10.9685	8.4724	6.9220	7.7288	10.0462	13.0490	17.1210	19.3382	21.3024	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-23.1948	-31.3680	-47.6697	-58.9363	-64.8136	-64.1172	-62.8834	-58.2506	-49.6437	-39.1704	-26.2836	-19.3001	(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	292.6110	(307)
Space heating fuel - secondary	0.0000	(309)
Water heating fuel - community heating	2670.2216	(310)
Efficiency of water heater	0.0000	(311)
Electricity used for heat distribution	2.9261	(313)
Space cooling fuel	0.0000	(321)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7000)		
mechanical ventilation fans (SFP = 0.7000)	220.5882	(330a)
Total electricity for the above, kWh/year	220.5882	(331)
Electricity for lighting (calculated in Appendix L)	167.2737	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-545.6313	(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	2805.0631	(338)

10b. Fuel costs - using BEDF prices (568)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	292.6110	5.6000	16.3862	(340a)
Space heating total			16.3862	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2670.2216	5.6000	149.5324	(342a)
Water heating total			149.5324	(342)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(347a)
Pumps, fans and electric keep-hot	220.5882	26.0600	57.4853	(349)
Energy for lighting	167.2737	26.0600	43.5915	(350)
Additional standing charges			99.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-545.6313	26.0600	-142.1915	
PV Unit electricity exported	0.0000	5.8100	0.0000	
Total			-142.1915	(352)
Total energy cost			223.8039	(355)

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			333.0000	(367)
Space and Water heating from Heat pump	889.7395	0.1594	14.0094	(367)
Electrical energy for heat distribution (space & water)	2.9261	0.0000	4.2283	(372)
Overall CO2 factor for heat network			0.0443	(386)
Total CO2 associated with community systems			131.2039	(373)
Space and water heating			131.2039	(376)
Pumps, fans and electric keep-hot	220.5882	0.1387	30.5983	(378)
Energy for lighting	167.2737	0.1443	24.1428	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-545.6313	0.1334	-72.7730	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-72.7730	(380)
Total CO2, kg/year			113.1719	(383)

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			333.0000	(467a)
Space and Water heating from Heat pump	889.7395	1.5901	139.7281	(467)
Electrical energy for heat distribution (space & water)	2.9261	0.0000	45.2648	(472)
Overall CO2 factor for heat network			0.4741	(486)
Total CO2 associated with community systems			1404.5675	(473)
Space and water heating			1404.5675	(476)
Pumps, fans and electric keep-hot	220.5882	1.5128	333.7058	(478)
Energy for lighting	167.2737	1.5338	256.5699	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-545.6313	1.4928	-814.5434	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-814.5434	(480)
Total Primary energy kWh/year			1180.2998	(483)

SAP 10 EPC IMPROVEMENTS

0301_2B4P_BG

Current energy efficiency rating:	B 90
Current environmental impact rating:	A 99

N Solar water heating — Not applicable
U Solar photovoltaic panels — Not applicable
V2 Wind turbine — Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 90
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 568 TEST (31 Mar 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, South East England):

	Current	Potential	Saving
Electricity	£101	£101	£0
Community scheme	£265	£265	£0
Space heating	£173	£173	£0
Water heating	£150	£150	£0
Lighting	£44	£44	£0
Generated (PV)	-£142	-£142	£0
Total cost of fuels	£224	£224	£0
Total cost of uses	£225	£225	£0
Delivered energy	34 kWh/m²	34 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	14 kWh/m²	14 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	82.0000	(1b)	x 3.1500	(2b) =	258.3000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	82.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	258.3000	(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		0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1500 (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	0.1912	0.1875	0.1837	0.1650	0.1612	0.1425	0.1425	0.1388	0.1500	0.1612	0.1687	0.1762	(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	0.2862	0.2825	0.2787	0.2600	0.2562	0.2375	0.2375	0.2337	0.2450	0.2562	0.2637	0.2712	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Glazing			14.8000	0.7752	11.4729			(27)

External Wall North	34.6500	7.4000	27.2500	0.1400	3.8150	70.0000	1907.5000 (29a)
External Wall West	27.7200		27.7200	0.1400	3.8808	70.0000	1940.4000 (29a)
External Wall South	37.8000	7.4000	30.4000	0.1400	4.2560	70.0000	2128.0000 (29a)
Total net area of external elements Aum(A, m2)			100.1700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.4247		(33)
Main dwelling							
Party Wall 1 East			30.5600	0.0000	0.0000	45.0000	1375.2000 (32)
Party Floor 1			82.0000			30.0000	2460.0000 (32d)
Party Ceiling 1			82.0000			30.0000	2460.0000 (32b)
Internal Wall 1			104.6100			9.0000	941.4900 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 13212.5900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 161.1291 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	41.5000	0.0300	1.2450
E18 Party wall between dwellings	12.6000	0.0300	0.3780

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 1.6230 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 25.0477 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	24.3997	24.0800	23.7604	22.1621	21.8425	20.2443	20.2443	19.9246	20.8836	21.8425	22.4818	23.1211	(38)
Heat transfer coeff	49.4473	49.1277	48.8080	47.2098	46.8902	45.2919	45.2919	44.9723	45.9312	46.8902	47.5295	48.1687	(39)
Average = Sum(39)m / 12 =												47.1299	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6030	0.5991	0.5952	0.5757	0.5718	0.5523	0.5523	0.5484	0.5601	0.5718	0.5796	0.5874	(40)
HLP (average)												0.5748	
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 2.4997 (42)
Hot water usage for mixer showers

72.5185	71.4083	69.7721	67.2550	64.9998	61.8448	59.3493	62.2666	63.7339	66.8588	70.1132	72.4531	(42a)

Hot water usage for baths

27.9253	27.5038	26.9041	26.0060	25.1966	24.0824	23.2371	24.2707	24.8132	25.9172	27.0651	27.9032	(42b)

Hot water usage for other uses

40.2296	38.7667	37.3038	35.8409	34.3780	32.9151	32.9151	34.3780	35.8409	37.3038	38.7667	40.2296	(42c)

Average daily hot water use (litres/day) 129.3222 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	140.6734	137.6787	133.9799	129.1019	124.5744	118.8423	115.5015	120.9154	124.3880	130.0799	135.9449	140.5859	(44)
Energy conte	207.0955	182.1768	191.4545	168.6393	160.5267	137.4371	127.6326	142.3196	144.2839	167.6210	183.7340	206.4606	(45)
Energy content (annual)										Total = Sum(45)m =		2019.3818	
Distribution loss (46)m = 0.15 x (45)m	31.0643	27.3265	28.7182	25.2959	24.0790	20.6156	19.1449	21.3479	21.6426	25.1432	27.5601	30.9691	(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	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	(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	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	(64)
										Total per year (kWh/year) = Sum(64)m =		2670.2216	(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	113.0807	100.5157	107.8801	98.8675	97.5966	88.4928	86.6593	91.5427	90.7693	99.9554	103.8865	112.8696	(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	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.6793	21.0318	17.1042	12.9490	9.6795	8.1718	8.8300	11.4775	15.4051	19.5603	22.8298	24.3374	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	333.6861	337.1487	328.4230	309.8470	286.3982	264.3597	249.6366	246.1740	254.8996	273.4756	296.9244	318.9629	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	(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)	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	(71)
Water heating gains (Table 5)	151.9902	149.5770	145.0001	137.3160	131.1782	122.9066	116.4775	123.0413	126.0685	134.3487	144.2868	151.7065	(72)
Total internal gains	611.8479	610.2497	593.0196	562.6043	529.7482	497.9305	477.4363	483.1850	498.8656	529.8769	566.5333	597.4991	(73)

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6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains

				m2		Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c		factor Table 6d		W	
North				7.4000		10.6334	0.3500	0.8500		0.7700		16.2227	(74)
South				7.4000		46.7521	0.3500	0.8500		0.7700		71.3268	(78)
Solar gains	87.5495	147.8174	201.4822	252.7968	289.2411	290.6849	278.7168	250.4198	218.7800	162.9002	104.5594	75.1570	(83)
Total gains	699.3974	758.0671	794.5018	815.4010	818.9893	788.6154	756.1531	733.6048	717.6456	692.7771	671.0927	672.6561	(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	74.2237	74.7066	75.1959	77.7416	78.2715	81.0335	81.0335	81.6095	79.9056	78.2715	77.2187	76.1939	
alpha	5.9482	5.9804	6.0131	6.1828	6.2181	6.4022	6.4022	6.4406	6.3270	6.2181	6.1479	6.0796	
util living area	0.9168	0.8743	0.8034	0.6754	0.5275	0.3672	0.2635	0.2819	0.4402	0.6784	0.8533	0.9248	(86)
MIT	20.6104	20.7291	20.8532	20.9563	20.9913	20.9994	20.9999	20.9999	20.9978	20.9624	20.8129	20.6032	(87)
Th 2	20.4273	20.4308	20.4343	20.4519	20.4554	20.4731	20.4731	20.4766	20.4660	20.4554	20.4484	20.4413	(88)
util rest of house	0.9058	0.8595	0.7831	0.6493	0.4978	0.3371	0.2320	0.2499	0.4066	0.6481	0.8348	0.9148	(89)
MIT 2	19.9833	20.1286	20.2771	20.4085	20.4477	20.4726	20.4731	20.4766	20.4644	20.4196	20.2460	19.9870	(90)
Living area fraction									fLA = Living area / (4) =			0.2439	(91)
MIT	20.1362	20.2751	20.4176	20.5421	20.5803	20.6011	20.6016	20.6042	20.5945	20.5520	20.3843	20.1373	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1362	20.2751	20.4176	20.5421	20.5803	20.6011	20.6016	20.6042	20.5945	20.5520	20.3843	20.1373	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8997	0.8552	0.7825	0.6537	0.5047	0.3444	0.2397	0.2577	0.4147	0.6536	0.8326	0.9088	(94)
Useful gains	629.2453	648.2957	621.6933	533.0099	413.3247	271.6065	181.2237	189.0506	297.6245	452.7963	558.7250	611.2887	(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	783.0595	755.3428	679.2904	549.6204	416.3988	271.8011	181.2384	189.0732	298.3002	466.6487	631.3947	767.6779	(97)
Space heating kWh	114.4378	71.9356	42.8523	11.9595	2.2871	0.0000	0.0000	0.0000	0.0000	10.3062	52.3222	116.3535	(98a)
Space heating requirement - total per year (kWh/year)												422.4542	
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	114.4378	71.9356	42.8523	11.9595	2.2871	0.0000	0.0000	0.0000	0.0000	10.3062	52.3222	116.3535	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												422.4542	
Space heating per m2										(98c) / (4) =		5.1519	(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												1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating												1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system												1.0000	(306)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating:													
Space heating requirement	114.4378	71.9356	42.8523	11.9595	2.2871	0.0000	0.0000	0.0000	0.0000	10.3062	52.3222	116.3535	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00													
307a	114.4378	71.9356	42.8523	11.9595	2.2871	0.0000	0.0000	0.0000	0.0000	10.3062	52.3222	116.3535	
Space heating requirement	114.4378	71.9356	42.8523	11.9595	2.2871	0.0000	0.0000	0.0000	0.0000	10.3062	52.3222	116.3535	(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	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00													
310a	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	
Water heating fuel	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	(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	18.7349	16.9218	18.7349	18.1305	18.7349	18.1305	18.7349	18.7349	18.1305	18.7349	18.1305	18.7349	(331)
Lighting	20.7264	16.6275	14.9712	10.9685	8.4724	6.9220	7.7288	10.0462	13.0490	17.1210	19.3382	21.3024	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-20.0839	-30.0387	-45.8825	-54.9402	-62.2016	-59.1968	-58.4577	-53.6636	-45.7567	-35.7455	-22.6762	-17.1644	(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												422.4542	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												2670.2216	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												4.2245	(313)
Space cooling fuel												0.0000	(321)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7000)

mechanical ventilation fans (SFP = 0.7000)	220.5882	(330a)
Total electricity for the above, kWh/year	220.5882	(331)
Electricity for lighting (calculated in Appendix L)	167.2737	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-505.8077	(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	2974.7299	(338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	422.4542	4.4400	18.7570	(340a)
Space heating total			18.7570	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2670.2216	4.4400	118.5578	(342a)
Water heating total			118.5578	(342)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(347a)
Pumps, fans and electric keep-hot	220.5882	16.4900	36.3750	(349)
Energy for lighting	167.2737	16.4900	27.5834	(350)
Additional standing charges			92.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-505.8077	16.4900	-83.4077	
PV Unit electricity exported	0.0000	5.5900	0.0000	
Total			-83.4077	(352)
Total energy cost			209.8655	(355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.3600	(356)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.5949	(357)
SAP value	90.3568	
SAP rating (Section 12)	90	(358)
SAP band	B	

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			333.0000	(367)
Space and Water heating from Heat pump	928.7315	0.1586	20.1200	(367)
Electrical energy for heat distribution (space & water)	4.2245	0.0000	4.4318	(372)
Overall CO2 factor for heat network			0.0445	(386)
Total CO2 associated with community systems			137.5179	(373)
Space and water heating			137.5179	(376)
Pumps, fans and electric keep-hot	220.5882	0.1387	30.5983	(378)
Energy for lighting	167.2737	0.1443	24.1428	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-505.8077	0.1333	-67.4353	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-67.4353	(380)
Total CO2, kg/year			124.8237	(383)
CO2 emissions per m2			1.5200	(384)
EI value			98.6830	(384a)
EI rating			99	(385)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	82.0000	(1b)	x 3.1500	(2b) =	258.3000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 82.0000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		258.3000	(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		0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1500 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.8000	4.5000	4.4000	3.9000	3.9000	3.6000	3.7000	3.5000	3.7000	4.0000	4.1000	4.4000	(22)
Wind factor	1.2000	1.1250	1.1000	0.9750	0.9750	0.9000	0.9250	0.8750	0.9250	1.0000	1.0250	1.1000	(22a)
Adj infilt rate	0.1800	0.1687	0.1650	0.1462	0.1462	0.1350	0.1388	0.1313	0.1388	0.1500	0.1537	0.1650	(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	0.2750	0.2637	0.2600	0.2412	0.2412	0.2300	0.2337	0.2262	0.2337	0.2450	0.2487	0.2600	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Glazing			14.8000	0.7752	11.4729			(27)
External Wall North	34.6500	7.4000	27.2500	0.1400	3.8150	70.0000	1907.5000	(29a)
External Wall West	27.7200		27.7200	0.1400	3.8808	70.0000	1940.4000	(29a)
External Wall South	37.8000	7.4000	30.4000	0.1400	4.2560	70.0000	2128.0000	(29a)
Total net area of external elements Aum(A, m2)			100.1700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.4247			(33)
Main dwelling								
Party Wall 1 East			30.5600	0.0000	0.0000	45.0000	1375.2000	(32)
Party Floor 1			82.0000			30.0000	2460.0000	(32d)
Party Ceiling 1			82.0000			30.0000	2460.0000	(32b)
Internal Wall 1			104.6100			9.0000	941.4900	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	13212.5900 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		161.1291 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	41.5000	0.0300	1.2450
E18 Party wall between dwellings	12.6000	0.0300	0.3780

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		1.6230 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	25.0477 (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	23.4407	22.4818	22.1621	20.5639	20.5639	19.6050	19.9246	19.2853	19.9246	20.8836	21.2032	22.1621	(38)
Heat transfer coeff	48.4884	47.5295	47.2098	45.6116	45.6116	44.6526	44.9723	44.3330	44.9723	45.9312	46.2509	47.2098	(39)
Average = Sum(39)m / 12 =												46.0644	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.5913	0.5796	0.5757	0.5562	0.5562	0.5445	0.5484	0.5406	0.5484	0.5601	0.5640	0.5757	(40)
HLP (average)												0.5618	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.4997 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	72.5185	71.4083	69.7721	67.2550	64.9998	61.8448	59.3493	62.2666	63.7339	66.8588	70.1132	72.4531	(42a)
Hot water usage for baths	27.9253	27.5038	26.9041	26.0060	25.1966	24.0824	23.2371	24.2707	24.8132	25.9172	27.0651	27.9032	(42b)
Hot water usage for other uses	40.2296	38.7667	37.3038	35.8409	34.3780	32.9151	32.9151	34.3780	35.8409	37.3038	38.7667	40.2296	(42c)
Average daily hot water use (litres/day)												129.3222	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	140.6734	137.6787	133.9799	129.1019	124.5744	118.8423	115.5015	120.9154	124.3880	130.0799	135.9449	140.5859	(44)
Energy conte	207.0955	182.1768	191.4545	168.6393	160.5267	137.4371	127.6326	142.3196	144.2839	167.6210	183.7340	206.4606	(45)
Energy content (annual)										Total = Sum(45)m =		2019.3818	
Distribution loss (46)m = 0.15 x (45)m	31.0643	27.3265	28.7182	25.2959	24.0790	20.6156	19.1449	21.3479	21.6426	25.1432	27.5601	30.9691	(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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	(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

	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374 (64)
Total per year (kWh/year) = Sum(64)m =												2670.2216 (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												
	113.0807	100.5157	107.8801	98.8675	97.5966	88.4928	86.6593	91.5427	90.7693	99.9554	103.8865	112.8696 (65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	149.9829	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	23.6793	21.0318	17.1042	12.9490	9.6795	8.1718	8.8300	11.4775	15.4051	19.5603	22.8298	24.3374	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	333.6861	337.1487	328.4230	309.8470	286.3982	264.3597	249.6366	246.1740	254.8996	273.4756	296.9244	318.9629	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	52.4980	(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)													
	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	-99.9886	(71)
Water heating gains (Table 5)													
	151.9902	149.5770	145.0001	137.3160	131.1782	122.9066	116.4775	123.0413	126.0685	134.3487	144.2868	151.7065	(72)
Total internal gains													
	611.8479	610.2497	593.0196	562.6043	529.7482	497.9305	477.4363	483.1850	498.8656	529.8769	566.5333	597.4991	(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	7.4000	12.7054	0.3500	0.8500	0.7700	19.3838	(74)
South	7.4000	53.5774	0.3500	0.8500	0.7700	81.7397	(78)

Solar gains	101.1236	151.9331	207.2974	276.6322	306.7359	330.5462	312.8445	282.0126	241.7787	179.2674	121.9575	83.9595	(83)
Total gains	712.9714	762.1828	800.3169	839.2365	836.4842	828.4766	790.2808	765.1977	740.6443	709.1443	688.4908	681.4586	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.6916	77.2187	77.7416	80.4656	80.4656	82.1937	81.6095	82.7863	81.6095	79.9056	79.3534	77.7416	
alpha	6.0461	6.1479	6.1828	6.3644	6.3644	6.4796	6.4406	6.5191	6.4406	6.3270	6.2902	6.1828	
util living area													
	0.8916	0.8480	0.7630	0.6129	0.4563	0.3017	0.2049	0.2028	0.3640	0.5924	0.7941	0.8965	(86)
MIT	20.7033	20.7978	20.9030	20.9782	20.9969	20.9998	21.0000	21.0000	20.9994	20.9849	20.8934	20.7128	(87)
Th 2	20.4378	20.4484	20.4519	20.4695	20.4695	20.4802	20.4766	20.4837	20.4766	20.4660	20.4625	20.4519	(88)
util rest of house													
	0.8781	0.8313	0.7410	0.5870	0.4280	0.2738	0.1751	0.1729	0.3324	0.5608	0.7715	0.8833	(89)
MIT 2	20.1049	20.2258	20.3500	20.4484	20.4670	20.4801	20.4766	20.4837	20.4762	20.4525	20.3512	20.1295	(90)
Living area fraction									fLA = Living area / (4) =			0.2439	(91)
MIT	20.2508	20.3653	20.4849	20.5776	20.5962	20.6068	20.6043	20.6096	20.6039	20.5824	20.4834	20.2717	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.2508	20.3653	20.4849	20.5776	20.5962	20.6068	20.6043	20.6096	20.6039	20.5824	20.4834	20.2717	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8733	0.8287	0.7424	0.5923	0.4348	0.2806	0.1823	0.1802	0.3401	0.5678	0.7724	0.8787	(94)
Useful gains	622.6051	631.6221	594.1223	497.1151	363.6731	232.4546	144.1013	137.8577	251.8577	402.6419	531.7893	598.7673	(95)
Ext temp.	5.0000	5.4000	7.1000	9.5000	12.6000	15.4000	17.4000	17.5000	15.0000	11.7000	8.1000	5.2000	(96)
Heat loss rate W													
	739.4884	711.2926	631.8987	505.2688	364.7199	232.4991	144.1034	137.8593	252.0182	407.9780	572.7452	711.5334	(97)
Space heating kWh													
	86.9611	53.5385	28.1056	5.8706	0.7788	0.0000	0.0000	0.0000	0.0000	3.9701	29.4883	83.8980	(98a)
Space heating requirement - total per year (kWh/year)												292.6110	
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													
	86.9611	53.5385	28.1056	5.8706	0.7788	0.0000	0.0000	0.0000	0.0000	3.9701	29.4883	83.8980	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												292.6110	
Space heating per m2											(98c) / (4) =	3.5684	(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	1.0000	(305)
Factor for charging method (Table 4c(3)) for water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.0000	(306)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating:		
Space heating requirement		

	86.9611	53.5385	28.1056	5.8706	0.7788	0.0000	0.0000	0.0000	0.0000	3.9701	29.4883	83.8980	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.00													
307a	86.9611	53.5385	28.1056	5.8706	0.7788	0.0000	0.0000	0.0000	0.0000	3.9701	29.4883	83.8980	
Space heating requirement													

	86.9611	53.5385	28.1056	5.8706	0.7788	0.0000	0.0000	0.0000	0.0000	3.9701	29.4883	83.8980	(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													
	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.00													
310a	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	
Water heating fuel													
	262.3723	232.1042	246.7313	222.1330	215.8035	190.9308	182.9094	197.5964	197.7776	222.8978	237.2277	261.7374	(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	18.7349	16.9218	18.7349	18.1305	18.7349	18.1305	18.7349	18.7349	18.1305	18.7349	18.1305	18.7349	(331)
Lighting	20.7264	16.6275	14.9712	10.9685	8.4724	6.9220	7.7288	10.0462	13.0490	17.1210	19.3382	21.3024	(332)
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m	-23.1948	-31.3680	-47.6697	-58.9363	-64.8136	-64.1172	-62.8834	-58.2506	-49.6437	-39.1704	-26.2836	-19.3001	(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												292.6110	(307)
Space heating fuel - secondary												0.0000	(309)
Water heating fuel - community heating												2670.2216	(310)
Efficiency of water heater												0.0000	(311)
Electricity used for heat distribution												2.9261	(313)
Space cooling fuel												0.0000	(321)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7000)													
mechanical ventilation fans (SFP = 0.7000)												220.5882	(330a)
Total electricity for the above, kWh/year												220.5882	(331)
Electricity for lighting (calculated in Appendix L)												167.2737	(332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-545.6313	(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												2805.0631	(338)

10b. Fuel costs - using BEDF prices (568)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating from Heat pump	292.6110	5.6000	16.3862	(340a)
Space heating total			16.3862	(340)
Total CO2 associated with community systems			0.0000	(473)
Space heating - secondary	0.0000	0.0000	0.0000	(341)
Water heating from Heat pump	2670.2216	5.6000	149.5324	(342a)
Water heating total			149.5324	(342)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(347a)
Pumps, fans and electric keep-hot	220.5882	26.0600	57.4853	(349)
Energy for lighting	167.2737	26.0600	43.5915	(350)
Additional standing charges			99.0000	(351)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-545.6313	26.0600	-142.1915	
PV Unit electricity exported	0.0000	5.8100	0.0000	
Total			-142.1915	(352)
Total energy cost			223.8039	(355)

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			333.0000	(367)
Space and Water heating from Heat pump	889.7395	0.1594	14.0094	(367)
Electrical energy for heat distribution (space & water)	2.9261	0.0000	4.2283	(372)
Overall CO2 factor for heat network			0.0443	(386)
Total CO2 associated with community systems			131.2039	(373)
Space and water heating			131.2039	(376)
Pumps, fans and electric keep-hot	220.5882	0.1387	30.5983	(378)
Energy for lighting	167.2737	0.1443	24.1428	(379)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-545.6313	0.1334	-72.7730	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-72.7730	(380)
Total CO2, kg/year			113.1719	(383)

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			333.0000	(467a)
Space and Water heating from Heat pump	889.7395	1.5901	139.7281	(467)
Electrical energy for heat distribution (space & water)	2.9261	0.0000	45.2648	(472)
Overall CO2 factor for heat network			0.4741	(486)
Total CO2 associated with community systems			1404.5675	(473)
Space and water heating			1404.5675	(476)

Pumps, fans and electric keep-hot	220.5882	1.5128	333.7058	(478)
Energy for lighting	167.2737	1.5338	256.5699	(479)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-545.6313	1.4928	-814.5434	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-814.5434	(480)
Total Primary energy kWh/year			1180.2998	(483)

Appendix 2 – BRUKL's

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

CG15060 Blackburn Road - Be Lean Results

As designed

Date: Thu Mar 27 16:07:01 2025

Administrative information

Building Details

Address: 14 Blackburn Road, London, NW6 1RZ

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.e.2

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: v7.0.28

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

Certifier details

Name: CGP MEP

Telephone number: 02081442406

Address: MYO, St. Pauls, One New Change, London, EC4M 9AF

Foundation area [m^2]: 510.34

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

Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	3.47	
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	2.53	
Target primary energy rate (TPER), $kWh_{PE}/m^2.annum$	37.12	
Building primary energy rate (BPER), $kWh_{PE}/m^2.annum$	27.31	
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	0.13	0.14	02000041_W1
Floors	0.18	0.13	0.13	01000004_F
Pitched roofs	0.16	-	-	No heat loss pitched roofs
Flat roofs	0.18	0.12	0.13	MZ000003_C_A9
Windows** and roof windows	1.6	0.8	0.8	02000041_W2_O0
Rooflights***	2.2	-	-	No external rooflights
Personnel doors^	1.6	-	-	No external personnel doors
Vehicle access & similar large doors	1.3	-	-	No external vehicle access doors
High usage entrance doors	3	-	-	No external high usage entrance doors

$U_{a\text{-}Limit}$ = 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	0.9 to 0.95

1- ASHP Heating

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	2.64	-	-	-	-
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.					

2- VRF Heating and Cooling

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	6	6	-	-	-
Standard value	2.5*	5	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- ASHP Hot Water

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	2.86	-	-	-	-
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- SYST0003-DHW

	Water heating efficiency	**Storage loss factor [kWh/litre per day]**
This building	Hot water provided by HVAC system	0.01
Standard value	N/A	N/A

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**
01 - Studio1	-	-	-	-	0.6	-	-	-	-	0.8	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 - Studio1 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio3 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio3	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio4	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio4 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio5 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio5	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio6	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio6 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio7 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio7	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio8 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio8	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio24	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio24 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio23	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio23 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio22 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio22	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio21	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio21 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio20	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio20 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio19 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio19	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio18	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio18 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio17 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio17	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio16	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio16 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio15 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio15	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio2	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio2 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio14 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio14	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio12	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio12 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio11 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio11	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio10 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio10	-	-	-	-	0.6	-	-	-	-	0.8	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 - Studio9	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio9 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio13 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio13	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio1	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio1 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio3 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio3	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio4	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio4 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio5 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio5	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio6	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio6 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio7 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio7	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio8 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio8	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio24	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio24 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio23	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio23 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio22 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio22	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio21	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio21 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio20	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio20 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio19 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio19	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio18	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio18 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio17 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio17	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio16	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio16 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio15 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio15	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio2	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio2 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio14 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio14	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio12	-	-	-	-	0.6	-	-	-	-	0.8	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 - Studio12 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio11 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio11	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio10 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio10	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio9	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio9 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio13 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio13	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio1	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio1 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio3 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio3	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio4	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio4 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio5 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio5	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio6	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio6 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio7 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio7	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio8 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio8	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio24	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio24 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio23	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio23 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio22 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio22	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio21	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio21 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio20	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio20 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio19 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio19	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio18	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio18 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio17 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio17	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio16	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio16 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio15 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio15	-	-	-	-	0.6	-	-	-	-	0.8	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 - Studio2	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio2 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio14 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio14	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio12	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio12 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio11 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio11	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio10 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio10	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio9	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio9 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio13 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio13	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio1	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio1 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio3 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio3	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio4	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio4 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio5 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio5	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio6	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio6 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio7 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio7	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio8 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio8	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio24	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio24 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio23	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio23 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio22 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio22	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio21	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio21 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio20	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio20 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio19 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio19	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio18	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio18 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio17 WC	-	-	-	-	0.6	-	-	-	-	0.8	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 - Studio17	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio16	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio16 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio15 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio15	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio2	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio2 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio14 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio14	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio12	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio12 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio11 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio11	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio10 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio10	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio9	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio9 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio13 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio13	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio1	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio1 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio3 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio3	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio4	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio4 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio5 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio5	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio6	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio6 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio7 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio7	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio8 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio8	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio24	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio24 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio23	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio23 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio22 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio22	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio21	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio21 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio20	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio20 WC	-	-	-	-	0.6	-	-	-	-	0.8	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 - Studio19 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio19	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio18	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio18 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio17 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio17	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio16	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio16 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio15 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio15	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio2	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio2 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio14 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio14	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio12	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio12 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio11 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio11	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio10 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio10	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio9	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio9 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio13 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio13	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio1	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio1 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio3 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio3	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio4	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio4 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio5 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio5	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio6	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio6 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio7 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio7	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio8 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio8	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio24	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio24 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio23	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio23 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio22 WC	-	-	-	-	0.6	-	-	-	-	0.8	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
06 - Studio22	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio21	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio21 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio20	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio20 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio19 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio19	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio18	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio18 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio17 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio17	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio16	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio16 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio15 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio15	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio2	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio2 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio14 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio14	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio12	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio12 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio11 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio11	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio10 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio10	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio9	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio9 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio13 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio13	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio1	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio1 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio3 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio3	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio4	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio4 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio5 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio5	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio6	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio6 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio7 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio7	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio8 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio8	-	-	-	-	0.6	-	-	-	-	0.8	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
07 - Studio24	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio24 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio23	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio23 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio22 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio22	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio21	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio21 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio20	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio20 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio19 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio19	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio18	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio18 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio17 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio17	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio16	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio16 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio15 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio15	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio2	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio2 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio14 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio14	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio12	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio12 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio11 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio11	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio10 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio10	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio9	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio9 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio13 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio13	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio1	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio1 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio3 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio3	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio4	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio4 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio5 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio5	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio6	-	-	-	-	0.6	-	-	-	-	0.8	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
08 - Studio6 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio7 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio7	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio8 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio8	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio24	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio24 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio23	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio23 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio22 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio22	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio21	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio21 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio20	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio20 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio19 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio19	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio18	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio18 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio17 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio17	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio16	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio16 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio15 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio15	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio2	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio2 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio14 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio14	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio12	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio12 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio11 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio11	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio10 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio10	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio9	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio9 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio13 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio13	-	-	-	-	0.6	-	-	-	-	0.8	N/A
Mez - PBSA Amenity	-	-	-	-	0.6	-	-	-	-	0.8	N/A
MEZ - PBSA Cafe	-	-	-	-	0.6	-	-	-	-	0.8	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
01 - Studio1	120	-	-
01 - Studio1 WC	120	-	-
01 - Studio3 WC	120	-	-
01 - Studio3	120	-	-
01 - Studio4	120	-	-
01 - Studio4 WC	120	-	-
01 - Studio5 WC	120	-	-
01 - Studio5	120	-	-
01 - Studio6	120	-	-
01 - Studio6 WC	120	-	-
01 - Studio7 WC	120	-	-
01 - Studio7	120	-	-
01 - Studio8 WC	120	-	-
01 - Studio8	120	-	-
01 - Studio24	120	-	-
01 - Studio24 WC	120	-	-
01 - Studio23	120	-	-
01 - Studio23 WC	120	-	-
01 - Studio22 WC	120	-	-
01 - Studio22	120	-	-
01 - Studio21	120	-	-
01 - Studio21 WC	120	-	-
01 - Studio20	120	-	-
01 - Studio20 WC	120	-	-
01 - Studio19 WC	120	-	-
01 - Studio19	120	-	-
01 - Studio18	120	-	-
01 - Studio18 WC	120	-	-
01 - Studio17 WC	120	-	-
01 - Studio17	120	-	-
01 - Studio16	120	-	-
01 - Studio16 WC	120	-	-
01 - Studio15 WC	120	-	-
01 - Studio15	120	-	-
01 - Studio2	120	-	-
01 - Studio2 WC	120	-	-
01 - Studio14 WC	120	-	-
01 - Studio14	120	-	-
01 - Studio12	120	-	-
01 - Studio12 WC	120	-	-
01 - Studio11 WC	120	-	-
01 - Studio11	120	-	-

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 - Studio10 WC	120	-	-
01 - Studio10	120	-	-
01 - Studio9	120	-	-
01 - Studio9 WC	120	-	-
01 - Studio13 WC	120	-	-
01 - Studio13	120	-	-
02 - Studio1	120	-	-
02 - Studio1 WC	120	-	-
02 - Studio3 WC	120	-	-
02 - Studio3	120	-	-
02 - Studio4	120	-	-
02 - Studio4 WC	120	-	-
02 - Studio5 WC	120	-	-
02 - Studio5	120	-	-
02 - Studio6	120	-	-
02 - Studio6 WC	120	-	-
02 - Studio7 WC	120	-	-
02 - Studio7	120	-	-
02 - Studio8 WC	120	-	-
02 - Studio8	120	-	-
02 - Studio24	120	-	-
02 - Studio24 WC	120	-	-
02 - Studio23	120	-	-
02 - Studio23 WC	120	-	-
02 - Studio22 WC	120	-	-
02 - Studio22	120	-	-
02 - Studio21	120	-	-
02 - Studio21 WC	120	-	-
02 - Studio20	120	-	-
02 - Studio20 WC	120	-	-
02 - Studio19 WC	120	-	-
02 - Studio19	120	-	-
02 - Studio18	120	-	-
02 - Studio18 WC	120	-	-
02 - Studio17 WC	120	-	-
02 - Studio17	120	-	-
02 - Studio16	120	-	-
02 - Studio16 WC	120	-	-
02 - Studio15 WC	120	-	-
02 - Studio15	120	-	-
02 - Studio2	120	-	-
02 - Studio2 WC	120	-	-
02 - Studio14 WC	120	-	-

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 - Studio14	120	-	-
02 - Studio12	120	-	-
02 - Studio12 WC	120	-	-
02 - Studio11 WC	120	-	-
02 - Studio11	120	-	-
02 - Studio10 WC	120	-	-
02 - Studio10	120	-	-
02 - Studio9	120	-	-
02 - Studio9 WC	120	-	-
02 - Studio13 WC	120	-	-
02 - Studio13	120	-	-
03 - Studio1	120	-	-
03 - Studio1 WC	120	-	-
03 - Studio3 WC	120	-	-
03 - Studio3	120	-	-
03 - Studio4	120	-	-
03 - Studio4 WC	120	-	-
03 - Studio5 WC	120	-	-
03 - Studio5	120	-	-
03 - Studio6	120	-	-
03 - Studio6 WC	120	-	-
03 - Studio7 WC	120	-	-
03 - Studio7	120	-	-
03 - Studio8 WC	120	-	-
03 - Studio8	120	-	-
03 - Studio24	120	-	-
03 - Studio24 WC	120	-	-
03 - Studio23	120	-	-
03 - Studio23 WC	120	-	-
03 - Studio22 WC	120	-	-
03 - Studio22	120	-	-
03 - Studio21	120	-	-
03 - Studio21 WC	120	-	-
03 - Studio20	120	-	-
03 - Studio20 WC	120	-	-
03 - Studio19 WC	120	-	-
03 - Studio19	120	-	-
03 - Studio18	120	-	-
03 - Studio18 WC	120	-	-
03 - Studio17 WC	120	-	-
03 - Studio17	120	-	-
03 - Studio16	120	-	-
03 - Studio16 WC	120	-	-

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 - Studio15 WC	120	-	-
03 - Studio15	120	-	-
03 - Studio2	120	-	-
03 - Studio2 WC	120	-	-
03 - Studio14 WC	120	-	-
03 - Studio14	120	-	-
03 - Studio12	120	-	-
03 - Studio12 WC	120	-	-
03 - Studio11 WC	120	-	-
03 - Studio11	120	-	-
03 - Studio10 WC	120	-	-
03 - Studio10	120	-	-
03 - Studio9	120	-	-
03 - Studio9 WC	120	-	-
03 - Studio13 WC	120	-	-
03 - Studio13	120	-	-
04 - Studio1	120	-	-
04 - Studio1 WC	120	-	-
04 - Studio3 WC	120	-	-
04 - Studio3	120	-	-
04 - Studio4	120	-	-
04 - Studio4 WC	120	-	-
04 - Studio5 WC	120	-	-
04 - Studio5	120	-	-
04 - Studio6	120	-	-
04 - Studio6 WC	120	-	-
04 - Studio7 WC	120	-	-
04 - Studio7	120	-	-
04 - Studio8 WC	120	-	-
04 - Studio8	120	-	-
04 - Studio24	120	-	-
04 - Studio24 WC	120	-	-
04 - Studio23	120	-	-
04 - Studio23 WC	120	-	-
04 - Studio22 WC	120	-	-
04 - Studio22	120	-	-
04 - Studio21	120	-	-
04 - Studio21 WC	120	-	-
04 - Studio20	120	-	-
04 - Studio20 WC	120	-	-
04 - Studio19 WC	120	-	-
04 - Studio19	120	-	-
04 - Studio18	120	-	-

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 - Studio18 WC	120	-	-
04 - Studio17 WC	120	-	-
04 - Studio17	120	-	-
04 - Studio16	120	-	-
04 - Studio16 WC	120	-	-
04 - Studio15 WC	120	-	-
04 - Studio15	120	-	-
04 - Studio2	120	-	-
04 - Studio2 WC	120	-	-
04 - Studio14 WC	120	-	-
04 - Studio14	120	-	-
04 - Studio12	120	-	-
04 - Studio12 WC	120	-	-
04 - Studio11 WC	120	-	-
04 - Studio11	120	-	-
04 - Studio10 WC	120	-	-
04 - Studio10	120	-	-
04 - Studio9	120	-	-
04 - Studio9 WC	120	-	-
04 - Studio13 WC	120	-	-
04 - Studio13	120	-	-
05 - Studio1	120	-	-
05 - Studio1 WC	120	-	-
05 - Studio3 WC	120	-	-
05 - Studio3	120	-	-
05 - Studio4	120	-	-
05 - Studio4 WC	120	-	-
05 - Studio5 WC	120	-	-
05 - Studio5	120	-	-
05 - Studio6	120	-	-
05 - Studio6 WC	120	-	-
05 - Studio7 WC	120	-	-
05 - Studio7	120	-	-
05 - Studio8 WC	120	-	-
05 - Studio8	120	-	-
05 - Studio24	120	-	-
05 - Studio24 WC	120	-	-
05 - Studio23	120	-	-
05 - Studio23 WC	120	-	-
05 - Studio22 WC	120	-	-
05 - Studio22	120	-	-
05 - Studio21	120	-	-
05 - Studio21 WC	120	-	-

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 - Studio20	120	-	-
05 - Studio20 WC	120	-	-
05 - Studio19 WC	120	-	-
05 - Studio19	120	-	-
05 - Studio18	120	-	-
05 - Studio18 WC	120	-	-
05 - Studio17 WC	120	-	-
05 - Studio17	120	-	-
05 - Studio16	120	-	-
05 - Studio16 WC	120	-	-
05 - Studio15 WC	120	-	-
05 - Studio15	120	-	-
05 - Studio2	120	-	-
05 - Studio2 WC	120	-	-
05 - Studio14 WC	120	-	-
05 - Studio14	120	-	-
05 - Studio12	120	-	-
05 - Studio12 WC	120	-	-
05 - Studio11 WC	120	-	-
05 - Studio11	120	-	-
05 - Studio10 WC	120	-	-
05 - Studio10	120	-	-
05 - Studio9	120	-	-
05 - Studio9 WC	120	-	-
05 - Studio13 WC	120	-	-
05 - Studio13	120	-	-
06 - Studio1	120	-	-
06 - Studio1 WC	120	-	-
06 - Studio3 WC	120	-	-
06 - Studio3	120	-	-
06 - Studio4	120	-	-
06 - Studio4 WC	120	-	-
06 - Studio5 WC	120	-	-
06 - Studio5	120	-	-
06 - Studio6	120	-	-
06 - Studio6 WC	120	-	-
06 - Studio7 WC	120	-	-
06 - Studio7	120	-	-
06 - Studio8 WC	120	-	-
06 - Studio8	120	-	-
06 - Studio24	120	-	-
06 - Studio24 WC	120	-	-
06 - Studio23	120	-	-

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
06 - Studio23 WC	120	-	-
06 - Studio22 WC	120	-	-
06 - Studio22	120	-	-
06 - Studio21	120	-	-
06 - Studio21 WC	120	-	-
06 - Studio20	120	-	-
06 - Studio20 WC	120	-	-
06 - Studio19 WC	120	-	-
06 - Studio19	120	-	-
06 - Studio18	120	-	-
06 - Studio18 WC	120	-	-
06 - Studio17 WC	120	-	-
06 - Studio17	120	-	-
06 - Studio16	120	-	-
06 - Studio16 WC	120	-	-
06 - Studio15 WC	120	-	-
06 - Studio15	120	-	-
06 - Studio2	120	-	-
06 - Studio2 WC	120	-	-
06 - Studio14 WC	120	-	-
06 - Studio14	120	-	-
06 - Studio12	120	-	-
06 - Studio12 WC	120	-	-
06 - Studio11 WC	120	-	-
06 - Studio11	120	-	-
06 - Studio10 WC	120	-	-
06 - Studio10	120	-	-
06 - Studio9	120	-	-
06 - Studio9 WC	120	-	-
06 - Studio13 WC	120	-	-
06 - Studio13	120	-	-
07 - Studio1	120	-	-
07 - Studio1 WC	120	-	-
07 - Studio3 WC	120	-	-
07 - Studio3	120	-	-
07 - Studio4	120	-	-
07 - Studio4 WC	120	-	-
07 - Studio5 WC	120	-	-
07 - Studio5	120	-	-
07 - Studio6	120	-	-
07 - Studio6 WC	120	-	-
07 - Studio7 WC	120	-	-
07 - Studio7	120	-	-

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
07 - Studio8 WC	120	-	-
07 - Studio8	120	-	-
07 - Studio24	120	-	-
07 - Studio24 WC	120	-	-
07 - Studio23	120	-	-
07 - Studio23 WC	120	-	-
07 - Studio22 WC	120	-	-
07 - Studio22	120	-	-
07 - Studio21	120	-	-
07 - Studio21 WC	120	-	-
07 - Studio20	120	-	-
07 - Studio20 WC	120	-	-
07 - Studio19 WC	120	-	-
07 - Studio19	120	-	-
07 - Studio18	120	-	-
07 - Studio18 WC	120	-	-
07 - Studio17 WC	120	-	-
07 - Studio17	120	-	-
07 - Studio16	120	-	-
07 - Studio16 WC	120	-	-
07 - Studio15 WC	120	-	-
07 - Studio15	120	-	-
07 - Studio2	120	-	-
07 - Studio2 WC	120	-	-
07 - Studio14 WC	120	-	-
07 - Studio14	120	-	-
07 - Studio12	120	-	-
07 - Studio12 WC	120	-	-
07 - Studio11 WC	120	-	-
07 - Studio11	120	-	-
07 - Studio10 WC	120	-	-
07 - Studio10	120	-	-
07 - Studio9	120	-	-
07 - Studio9 WC	120	-	-
07 - Studio13 WC	120	-	-
07 - Studio13	120	-	-
08 - Studio1	120	-	-
08 - Studio1 WC	120	-	-
08 - Studio3 WC	120	-	-
08 - Studio3	120	-	-
08 - Studio4	120	-	-
08 - Studio4 WC	120	-	-
08 - Studio5 WC	120	-	-

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
08 - Studio5	120	-	-
08 - Studio6	120	-	-
08 - Studio6 WC	120	-	-
08 - Studio7 WC	120	-	-
08 - Studio7	120	-	-
08 - Studio8 WC	120	-	-
08 - Studio8	120	-	-
08 - Studio24	120	-	-
08 - Studio24 WC	120	-	-
08 - Studio23	120	-	-
08 - Studio23 WC	120	-	-
08 - Studio22 WC	120	-	-
08 - Studio22	120	-	-
08 - Studio21	120	-	-
08 - Studio21 WC	120	-	-
08 - Studio20	120	-	-
08 - Studio20 WC	120	-	-
08 - Studio19 WC	120	-	-
08 - Studio19	120	-	-
08 - Studio18	120	-	-
08 - Studio18 WC	120	-	-
08 - Studio17 WC	120	-	-
08 - Studio17	120	-	-
08 - Studio16	120	-	-
08 - Studio16 WC	120	-	-
08 - Studio15 WC	120	-	-
08 - Studio15	120	-	-
08 - Studio2	120	-	-
08 - Studio2 WC	120	-	-
08 - Studio14 WC	120	-	-
08 - Studio14	120	-	-
08 - Studio12	120	-	-
08 - Studio12 WC	120	-	-
08 - Studio11 WC	120	-	-
08 - Studio11	120	-	-
08 - Studio10 WC	120	-	-
08 - Studio10	120	-	-
08 - Studio9	120	-	-
08 - Studio9 WC	120	-	-
08 - Studio13 WC	120	-	-
08 - Studio13	120	-	-
Mez - PBSA Amenity	120	-	-
MEZ - PBSA Cafe	120	-	-

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?
01 - Studio1	NO (-89.1%)	NO
01 - Studio3	NO (-65.4%)	NO
01 - Studio4	NO (-65.6%)	NO
01 - Studio5	NO (-66.1%)	NO
01 - Studio6	NO (-65.3%)	NO
01 - Studio7	NO (-65.7%)	NO
01 - Studio8	NO (-66.1%)	NO
01 - Studio24	NO (-83.2%)	NO
01 - Studio23	NO (-51.5%)	NO
01 - Studio22	NO (-52.9%)	NO
01 - Studio21	NO (-46.5%)	NO
01 - Studio20	NO (-47.6%)	NO
01 - Studio19	NO (-48.3%)	NO
01 - Studio18	NO (-47.1%)	NO
01 - Studio17	NO (-47.2%)	NO
01 - Studio16	NO (-63.3%)	NO
01 - Studio15	NO (-47.1%)	NO
01 - Studio2	NO (-63.2%)	NO
01 - Studio14	NO (-50.7%)	NO
01 - Studio12	NO (-75.3%)	NO
01 - Studio11	NO (-74.9%)	NO
01 - Studio10	NO (-65.7%)	NO
01 - Studio9	NO (-65.2%)	NO
01 - Studio13	NO (-73.2%)	NO
02 - Studio1	NO (-89.1%)	NO
02 - Studio3	NO (-65.4%)	NO
02 - Studio4	NO (-65.6%)	NO
02 - Studio5	NO (-66.1%)	NO
02 - Studio6	NO (-65.3%)	NO
02 - Studio7	NO (-65.7%)	NO
02 - Studio8	NO (-66.1%)	NO
02 - Studio24	NO (-83.2%)	NO
02 - Studio23	NO (-51.5%)	NO
02 - Studio22	NO (-52.9%)	NO
02 - Studio21	NO (-46.5%)	NO
02 - Studio20	NO (-47.6%)	NO
02 - Studio19	NO (-48.3%)	NO
02 - Studio18	NO (-47.1%)	NO
02 - Studio17	NO (-47.2%)	NO
02 - Studio16	NO (-63.3%)	NO
02 - Studio15	NO (-47.1%)	NO
02 - Studio2	NO (-63.2%)	NO
02 - Studio14	NO (-50.7%)	NO
02 - Studio12	NO (-75.3%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
02 - Studio11	NO (-74.9%)	NO
02 - Studio10	NO (-65.7%)	NO
02 - Studio9	NO (-65.2%)	NO
02 - Studio13	NO (-73.2%)	NO
03 - Studio1	NO (-89.1%)	NO
03 - Studio3	NO (-65.4%)	NO
03 - Studio4	NO (-65.6%)	NO
03 - Studio5	NO (-66.1%)	NO
03 - Studio6	NO (-65.3%)	NO
03 - Studio7	NO (-65.7%)	NO
03 - Studio8	NO (-66.1%)	NO
03 - Studio24	NO (-83.2%)	NO
03 - Studio23	NO (-51.5%)	NO
03 - Studio22	NO (-52.9%)	NO
03 - Studio21	NO (-46.5%)	NO
03 - Studio20	NO (-47.6%)	NO
03 - Studio19	NO (-48.3%)	NO
03 - Studio18	NO (-47.1%)	NO
03 - Studio17	NO (-47.2%)	NO
03 - Studio16	NO (-63.3%)	NO
03 - Studio15	NO (-47.1%)	NO
03 - Studio2	NO (-63.2%)	NO
03 - Studio14	NO (-50.7%)	NO
03 - Studio12	NO (-75.3%)	NO
03 - Studio11	NO (-74.9%)	NO
03 - Studio10	NO (-65.7%)	NO
03 - Studio9	NO (-65.2%)	NO
03 - Studio13	NO (-73.2%)	NO
04 - Studio1	NO (-89.1%)	NO
04 - Studio3	NO (-65.4%)	NO
04 - Studio4	NO (-65.6%)	NO
04 - Studio5	NO (-66.1%)	NO
04 - Studio6	NO (-65.3%)	NO
04 - Studio7	NO (-65.7%)	NO
04 - Studio8	NO (-66.1%)	NO
04 - Studio24	NO (-83.2%)	NO
04 - Studio23	NO (-51.5%)	NO
04 - Studio22	NO (-52.9%)	NO
04 - Studio21	NO (-46.5%)	NO
04 - Studio20	NO (-47.6%)	NO
04 - Studio19	NO (-48.3%)	NO
04 - Studio18	NO (-47.1%)	NO
04 - Studio17	NO (-47.2%)	NO
04 - Studio16	NO (-63.3%)	NO
04 - Studio15	NO (-47.1%)	NO
04 - Studio2	NO (-63.2%)	NO
04 - Studio14	NO (-50.7%)	NO
04 - Studio12	NO (-75.3%)	NO
04 - Studio11	NO (-74.9%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
04 - Studio10	NO (-65.7%)	NO
04 - Studio9	NO (-65.2%)	NO
04 - Studio13	NO (-73.2%)	NO
05 - Studio1	NO (-89.1%)	NO
05 - Studio3	NO (-65.4%)	NO
05 - Studio4	NO (-65.6%)	NO
05 - Studio5	NO (-66.1%)	NO
05 - Studio6	NO (-65.3%)	NO
05 - Studio7	NO (-65.7%)	NO
05 - Studio8	NO (-66.1%)	NO
05 - Studio24	NO (-83.2%)	NO
05 - Studio23	NO (-51.5%)	NO
05 - Studio22	NO (-52.9%)	NO
05 - Studio21	NO (-46.5%)	NO
05 - Studio20	NO (-47.6%)	NO
05 - Studio19	NO (-48.3%)	NO
05 - Studio18	NO (-47.1%)	NO
05 - Studio17	NO (-47.2%)	NO
05 - Studio16	NO (-63.3%)	NO
05 - Studio15	NO (-47.1%)	NO
05 - Studio2	NO (-63.2%)	NO
05 - Studio14	NO (-50.7%)	NO
05 - Studio12	NO (-75.3%)	NO
05 - Studio11	NO (-74.9%)	NO
05 - Studio10	NO (-65.7%)	NO
05 - Studio9	NO (-65.2%)	NO
05 - Studio13	NO (-73.2%)	NO
06 - Studio1	NO (-89.1%)	NO
06 - Studio3	NO (-65.4%)	NO
06 - Studio4	NO (-65.6%)	NO
06 - Studio5	NO (-66.1%)	NO
06 - Studio6	NO (-65.3%)	NO
06 - Studio7	NO (-65.7%)	NO
06 - Studio8	NO (-66.1%)	NO
06 - Studio24	NO (-83.2%)	NO
06 - Studio23	NO (-51.5%)	NO
06 - Studio22	NO (-52.9%)	NO
06 - Studio21	NO (-46.5%)	NO
06 - Studio20	NO (-47.6%)	NO
06 - Studio19	NO (-48.3%)	NO
06 - Studio18	NO (-47.1%)	NO
06 - Studio17	NO (-47.2%)	NO
06 - Studio16	NO (-63.3%)	NO
06 - Studio15	NO (-47.1%)	NO
06 - Studio2	NO (-63.2%)	NO
06 - Studio14	NO (-50.7%)	NO
06 - Studio12	NO (-75.3%)	NO
06 - Studio11	NO (-74.9%)	NO
06 - Studio10	NO (-65.7%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
06 - Studio9	NO (-65.2%)	NO
06 - Studio13	NO (-73.2%)	NO
07 - Studio1	NO (-89.1%)	NO
07 - Studio3	NO (-65.4%)	NO
07 - Studio4	NO (-65.6%)	NO
07 - Studio5	NO (-66.1%)	NO
07 - Studio6	NO (-65.3%)	NO
07 - Studio7	NO (-65.7%)	NO
07 - Studio8	NO (-66.1%)	NO
07 - Studio24	NO (-83.2%)	NO
07 - Studio23	NO (-51.5%)	NO
07 - Studio22	NO (-52.9%)	NO
07 - Studio21	NO (-46.5%)	NO
07 - Studio20	NO (-47.6%)	NO
07 - Studio19	NO (-48.3%)	NO
07 - Studio18	NO (-47.1%)	NO
07 - Studio17	NO (-47.2%)	NO
07 - Studio16	NO (-63.3%)	NO
07 - Studio15	NO (-47.1%)	NO
07 - Studio2	NO (-63.2%)	NO
07 - Studio14	NO (-50.7%)	NO
07 - Studio12	NO (-75.3%)	NO
07 - Studio11	NO (-74.9%)	NO
07 - Studio10	NO (-65.7%)	NO
07 - Studio9	NO (-65.2%)	NO
07 - Studio13	NO (-73.2%)	NO
08 - Studio1	NO (-89.1%)	NO
08 - Studio3	NO (-65.4%)	NO
08 - Studio4	NO (-65.6%)	NO
08 - Studio5	NO (-66.1%)	NO
08 - Studio6	NO (-65.3%)	NO
08 - Studio7	NO (-65.7%)	NO
08 - Studio8	NO (-66.1%)	NO
08 - Studio24	NO (-83.2%)	NO
08 - Studio23	NO (-51.5%)	NO
08 - Studio22	NO (-52.9%)	NO
08 - Studio21	NO (-46.5%)	NO
08 - Studio20	NO (-47.6%)	NO
08 - Studio19	NO (-48.3%)	NO
08 - Studio18	NO (-47.1%)	NO
08 - Studio17	NO (-47.2%)	NO
08 - Studio16	NO (-63.3%)	NO
08 - Studio15	NO (-47.1%)	NO
08 - Studio2	NO (-63.2%)	NO
08 - Studio14	NO (-50.7%)	NO
08 - Studio12	NO (-75.3%)	NO
08 - Studio11	NO (-74.9%)	NO
08 - Studio10	NO (-65.7%)	NO
08 - Studio9	NO (-65.2%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
08 - Studio13	NO (-73.2%)	NO
Mez - PBSA Amenity	NO (-19.7%)	NO
MEZ - PBSA Cafe	YES (+80%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	4592.9	4592.9
External area [m^2]	6380.5	6380.5
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	3	3
Average conductance [W/K]	1250.85	2472.01
Average U-value [W/m^2K]	0.2	0.39
Alpha value* [%]	40.72	18.2

* 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
	Residential Institutions: Residential Schools
100	**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	2.71	6.19
Cooling	0.73	0.57
Auxiliary	7.11	8.82
Lighting	3.02	5
Hot water	4.56	4.32
Equipment*	10.85	10.85
TOTAL**	**18.12**	**24.89**

* 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]	73.02	102.72
Primary energy [kWh_{PE}/m^2]	27.31	37.12
Total emissions [kg/m^2]	2.53	3.47

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	24.7	38.1	2.8	0	7.2	2.48	0	2.64	0
	Notional	59.2	37.5	6.2	0	8.9	2.64	0	----	----
[ST] Split or multi-split system, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	39.5	174.2	1.9	10.8	3	5.89	4.48	6	6
	Notional	54.4	132.7	5.7	8.4	4	2.64	4.4	----	----

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

CG15060 Blackburn Road - Be Green Results

As designed

Date: Thu Mar 27 16:03:45 2025

Administrative information

Building Details

Address: 14 Blackburn Road, London, NW6 1RZ

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.e.2

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: v7.0.28

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

Certifier details

Name: CGP MEP

Telephone number: 02081442406

Address: MYO, St. Pauls, One New Change, London, EC4M 9AF

Foundation area [m^2]: 510.34

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	3.47	
Building CO_2 emission rate (BER), $kgCO_2/m^2$.annum	1.15	
Target primary energy rate (TPER), kWh_{PE}/m^2.annum	37.12	
Building primary energy rate (BPER), kWh_{PE}/m^2.annum	11.51	
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	0.13	0.14	02000041_W1
Floors	0.18	0.13	0.13	01000004_F
Pitched roofs	0.16	-	-	No heat loss pitched roofs
Flat roofs	0.18	0.12	0.13	MZ000003_C_A9
Windows** and roof windows	1.6	0.8	0.8	02000041_W2_O0
Rooflights***	2.2	-	-	No external rooflights
Personnel doors^	1.6	-	-	No external personnel doors
Vehicle access & similar large doors	1.3	-	-	No external vehicle access doors
High usage entrance doors	3	-	-	No external high usage entrance doors

$U_{a\text{-}Limit}$ = 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	0.9 to 0.95

1- ASHP Heating

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	2.64	-	-	-	-
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.					

2- VRF Heating and Cooling

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	6	6	-	-	-
Standard value	2.5*	5	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- ASHP Hot Water

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	2.86	-	-	-	-
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- SYST0003-DHW

	Water heating efficiency	**Storage loss factor [kWh/litre per day]**
This building	Hot water provided by HVAC system	0.01
Standard value	N/A	N/A

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**
01 - Studio1	-	-	-	-	0.6	-	-	-	-	0.8	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 - Studio1 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio3 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio3	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio4	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio4 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio5 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio5	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio6	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio6 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio7 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio7	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio8 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio8	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio24	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio24 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio23	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio23 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio22 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio22	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio21	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio21 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio20	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio20 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio19 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio19	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio18	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio18 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio17 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio17	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio16	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio16 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio15 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio15	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio2	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio2 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio14 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio14	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio12	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio12 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio11 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio11	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio10 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio10	-	-	-	-	0.6	-	-	-	-	0.8	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 - Studio9	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio9 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio13 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
01 - Studio13	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio1	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio1 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio3 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio3	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio4	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio4 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio5 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio5	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio6	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio6 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio7 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio7	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio8 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio8	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio24	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio24 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio23	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio23 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio22 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio22	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio21	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio21 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio20	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio20 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio19 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio19	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio18	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio18 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio17 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio17	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio16	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio16 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio15 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio15	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio2	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio2 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio14 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio14	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio12	-	-	-	-	0.6	-	-	-	-	0.8	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 - Studio12 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio11 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio11	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio10 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio10	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio9	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio9 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio13 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
02 - Studio13	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio1	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio1 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio3 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio3	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio4	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio4 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio5 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio5	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio6	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio6 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio7 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio7	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio8 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio8	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio24	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio24 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio23	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio23 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio22 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio22	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio21	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio21 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio20	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio20 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio19 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio19	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio18	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio18 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio17 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio17	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio16	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio16 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio15 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio15	-	-	-	-	0.6	-	-	-	-	0.8	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 - Studio2	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio2 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio14 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio14	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio12	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio12 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio11 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio11	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio10 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio10	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio9	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio9 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio13 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
03 - Studio13	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio1	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio1 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio3 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio3	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio4	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio4 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio5 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio5	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio6	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio6 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio7 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio7	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio8 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio8	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio24	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio24 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio23	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio23 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio22 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio22	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio21	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio21 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio20	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio20 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio19 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio19	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio18	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio18 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio17 WC	-	-	-	-	0.6	-	-	-	-	0.8	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 - Studio17	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio16	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio16 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio15 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio15	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio2	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio2 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio14 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio14	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio12	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio12 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio11 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio11	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio10 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio10	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio9	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio9 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio13 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
04 - Studio13	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio1	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio1 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio3 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio3	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio4	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio4 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio5 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio5	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio6	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio6 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio7 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio7	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio8 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio8	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio24	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio24 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio23	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio23 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio22 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio22	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio21	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio21 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio20	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio20 WC	-	-	-	-	0.6	-	-	-	-	0.8	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 - Studio19 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio19	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio18	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio18 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio17 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio17	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio16	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio16 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio15 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio15	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio2	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio2 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio14 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio14	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio12	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio12 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio11 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio11	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio10 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio10	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio9	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio9 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio13 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
05 - Studio13	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio1	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio1 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio3 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio3	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio4	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio4 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio5 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio5	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio6	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio6 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio7 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio7	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio8 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio8	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio24	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio24 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio23	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio23 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio22 WC	-	-	-	-	0.6	-	-	-	-	0.8	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
06 - Studio22	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio21	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio21 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio20	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio20 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio19 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio19	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio18	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio18 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio17 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio17	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio16	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio16 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio15 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio15	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio2	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio2 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio14 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio14	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio12	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio12 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio11 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio11	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio10 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio10	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio9	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio9 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio13 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
06 - Studio13	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio1	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio1 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio3 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio3	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio4	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio4 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio5 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio5	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio6	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio6 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio7 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio7	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio8 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio8	-	-	-	-	0.6	-	-	-	-	0.8	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
07 - Studio24	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio24 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio23	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio23 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio22 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio22	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio21	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio21 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio20	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio20 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio19 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio19	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio18	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio18 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio17 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio17	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio16	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio16 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio15 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio15	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio2	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio2 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio14 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio14	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio12	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio12 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio11 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio11	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio10 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio10	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio9	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio9 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio13 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
07 - Studio13	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio1	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio1 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio3 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio3	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio4	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio4 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio5 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio5	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio6	-	-	-	-	0.6	-	-	-	-	0.8	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
08 - Studio6 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio7 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio7	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio8 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio8	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio24	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio24 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio23	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio23 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio22 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio22	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio21	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio21 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio20	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio20 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio19 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio19	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio18	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio18 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio17 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio17	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio16	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio16 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio15 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio15	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio2	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio2 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio14 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio14	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio12	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio12 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio11 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio11	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio10 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio10	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio9	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio9 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio13 WC	-	-	-	-	0.6	-	-	-	-	0.8	N/A
08 - Studio13	-	-	-	-	0.6	-	-	-	-	0.8	N/A
Mez - PBSA Amenity	-	-	-	-	0.6	-	-	-	-	0.8	N/A
MEZ - PBSA Cafe	-	-	-	-	0.6	-	-	-	-	0.8	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
01 - Studio1	120	-	-
01 - Studio1 WC	120	-	-
01 - Studio3 WC	120	-	-
01 - Studio3	120	-	-
01 - Studio4	120	-	-
01 - Studio4 WC	120	-	-
01 - Studio5 WC	120	-	-
01 - Studio5	120	-	-
01 - Studio6	120	-	-
01 - Studio6 WC	120	-	-
01 - Studio7 WC	120	-	-
01 - Studio7	120	-	-
01 - Studio8 WC	120	-	-
01 - Studio8	120	-	-
01 - Studio24	120	-	-
01 - Studio24 WC	120	-	-
01 - Studio23	120	-	-
01 - Studio23 WC	120	-	-
01 - Studio22 WC	120	-	-
01 - Studio22	120	-	-
01 - Studio21	120	-	-
01 - Studio21 WC	120	-	-
01 - Studio20	120	-	-
01 - Studio20 WC	120	-	-
01 - Studio19 WC	120	-	-
01 - Studio19	120	-	-
01 - Studio18	120	-	-
01 - Studio18 WC	120	-	-
01 - Studio17 WC	120	-	-
01 - Studio17	120	-	-
01 - Studio16	120	-	-
01 - Studio16 WC	120	-	-
01 - Studio15 WC	120	-	-
01 - Studio15	120	-	-
01 - Studio2	120	-	-
01 - Studio2 WC	120	-	-
01 - Studio14 WC	120	-	-
01 - Studio14	120	-	-
01 - Studio12	120	-	-
01 - Studio12 WC	120	-	-
01 - Studio11 WC	120	-	-
01 - Studio11	120	-	-

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 - Studio10 WC	120	-	-
01 - Studio10	120	-	-
01 - Studio9	120	-	-
01 - Studio9 WC	120	-	-
01 - Studio13 WC	120	-	-
01 - Studio13	120	-	-
02 - Studio1	120	-	-
02 - Studio1 WC	120	-	-
02 - Studio3 WC	120	-	-
02 - Studio3	120	-	-
02 - Studio4	120	-	-
02 - Studio4 WC	120	-	-
02 - Studio5 WC	120	-	-
02 - Studio5	120	-	-
02 - Studio6	120	-	-
02 - Studio6 WC	120	-	-
02 - Studio7 WC	120	-	-
02 - Studio7	120	-	-
02 - Studio8 WC	120	-	-
02 - Studio8	120	-	-
02 - Studio24	120	-	-
02 - Studio24 WC	120	-	-
02 - Studio23	120	-	-
02 - Studio23 WC	120	-	-
02 - Studio22 WC	120	-	-
02 - Studio22	120	-	-
02 - Studio21	120	-	-
02 - Studio21 WC	120	-	-
02 - Studio20	120	-	-
02 - Studio20 WC	120	-	-
02 - Studio19 WC	120	-	-
02 - Studio19	120	-	-
02 - Studio18	120	-	-
02 - Studio18 WC	120	-	-
02 - Studio17 WC	120	-	-
02 - Studio17	120	-	-
02 - Studio16	120	-	-
02 - Studio16 WC	120	-	-
02 - Studio15 WC	120	-	-
02 - Studio15	120	-	-
02 - Studio2	120	-	-
02 - Studio2 WC	120	-	-
02 - Studio14 WC	120	-	-

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 - Studio14	120	-	-
02 - Studio12	120	-	-
02 - Studio12 WC	120	-	-
02 - Studio11 WC	120	-	-
02 - Studio11	120	-	-
02 - Studio10 WC	120	-	-
02 - Studio10	120	-	-
02 - Studio9	120	-	-
02 - Studio9 WC	120	-	-
02 - Studio13 WC	120	-	-
02 - Studio13	120	-	-
03 - Studio1	120	-	-
03 - Studio1 WC	120	-	-
03 - Studio3 WC	120	-	-
03 - Studio3	120	-	-
03 - Studio4	120	-	-
03 - Studio4 WC	120	-	-
03 - Studio5 WC	120	-	-
03 - Studio5	120	-	-
03 - Studio6	120	-	-
03 - Studio6 WC	120	-	-
03 - Studio7 WC	120	-	-
03 - Studio7	120	-	-
03 - Studio8 WC	120	-	-
03 - Studio8	120	-	-
03 - Studio24	120	-	-
03 - Studio24 WC	120	-	-
03 - Studio23	120	-	-
03 - Studio23 WC	120	-	-
03 - Studio22 WC	120	-	-
03 - Studio22	120	-	-
03 - Studio21	120	-	-
03 - Studio21 WC	120	-	-
03 - Studio20	120	-	-
03 - Studio20 WC	120	-	-
03 - Studio19 WC	120	-	-
03 - Studio19	120	-	-
03 - Studio18	120	-	-
03 - Studio18 WC	120	-	-
03 - Studio17 WC	120	-	-
03 - Studio17	120	-	-
03 - Studio16	120	-	-
03 - Studio16 WC	120	-	-

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 - Studio15 WC	120	-	-
03 - Studio15	120	-	-
03 - Studio2	120	-	-
03 - Studio2 WC	120	-	-
03 - Studio14 WC	120	-	-
03 - Studio14	120	-	-
03 - Studio12	120	-	-
03 - Studio12 WC	120	-	-
03 - Studio11 WC	120	-	-
03 - Studio11	120	-	-
03 - Studio10 WC	120	-	-
03 - Studio10	120	-	-
03 - Studio9	120	-	-
03 - Studio9 WC	120	-	-
03 - Studio13 WC	120	-	-
03 - Studio13	120	-	-
04 - Studio1	120	-	-
04 - Studio1 WC	120	-	-
04 - Studio3 WC	120	-	-
04 - Studio3	120	-	-
04 - Studio4	120	-	-
04 - Studio4 WC	120	-	-
04 - Studio5 WC	120	-	-
04 - Studio5	120	-	-
04 - Studio6	120	-	-
04 - Studio6 WC	120	-	-
04 - Studio7 WC	120	-	-
04 - Studio7	120	-	-
04 - Studio8 WC	120	-	-
04 - Studio8	120	-	-
04 - Studio24	120	-	-
04 - Studio24 WC	120	-	-
04 - Studio23	120	-	-
04 - Studio23 WC	120	-	-
04 - Studio22 WC	120	-	-
04 - Studio22	120	-	-
04 - Studio21	120	-	-
04 - Studio21 WC	120	-	-
04 - Studio20	120	-	-
04 - Studio20 WC	120	-	-
04 - Studio19 WC	120	-	-
04 - Studio19	120	-	-
04 - Studio18	120	-	-

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 - Studio18 WC	120	-	-
04 - Studio17 WC	120	-	-
04 - Studio17	120	-	-
04 - Studio16	120	-	-
04 - Studio16 WC	120	-	-
04 - Studio15 WC	120	-	-
04 - Studio15	120	-	-
04 - Studio2	120	-	-
04 - Studio2 WC	120	-	-
04 - Studio14 WC	120	-	-
04 - Studio14	120	-	-
04 - Studio12	120	-	-
04 - Studio12 WC	120	-	-
04 - Studio11 WC	120	-	-
04 - Studio11	120	-	-
04 - Studio10 WC	120	-	-
04 - Studio10	120	-	-
04 - Studio9	120	-	-
04 - Studio9 WC	120	-	-
04 - Studio13 WC	120	-	-
04 - Studio13	120	-	-
05 - Studio1	120	-	-
05 - Studio1 WC	120	-	-
05 - Studio3 WC	120	-	-
05 - Studio3	120	-	-
05 - Studio4	120	-	-
05 - Studio4 WC	120	-	-
05 - Studio5 WC	120	-	-
05 - Studio5	120	-	-
05 - Studio6	120	-	-
05 - Studio6 WC	120	-	-
05 - Studio7 WC	120	-	-
05 - Studio7	120	-	-
05 - Studio8 WC	120	-	-
05 - Studio8	120	-	-
05 - Studio24	120	-	-
05 - Studio24 WC	120	-	-
05 - Studio23	120	-	-
05 - Studio23 WC	120	-	-
05 - Studio22 WC	120	-	-
05 - Studio22	120	-	-
05 - Studio21	120	-	-
05 - Studio21 WC	120	-	-

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 - Studio20	120	-	-
05 - Studio20 WC	120	-	-
05 - Studio19 WC	120	-	-
05 - Studio19	120	-	-
05 - Studio18	120	-	-
05 - Studio18 WC	120	-	-
05 - Studio17 WC	120	-	-
05 - Studio17	120	-	-
05 - Studio16	120	-	-
05 - Studio16 WC	120	-	-
05 - Studio15 WC	120	-	-
05 - Studio15	120	-	-
05 - Studio2	120	-	-
05 - Studio2 WC	120	-	-
05 - Studio14 WC	120	-	-
05 - Studio14	120	-	-
05 - Studio12	120	-	-
05 - Studio12 WC	120	-	-
05 - Studio11 WC	120	-	-
05 - Studio11	120	-	-
05 - Studio10 WC	120	-	-
05 - Studio10	120	-	-
05 - Studio9	120	-	-
05 - Studio9 WC	120	-	-
05 - Studio13 WC	120	-	-
05 - Studio13	120	-	-
06 - Studio1	120	-	-
06 - Studio1 WC	120	-	-
06 - Studio3 WC	120	-	-
06 - Studio3	120	-	-
06 - Studio4	120	-	-
06 - Studio4 WC	120	-	-
06 - Studio5 WC	120	-	-
06 - Studio5	120	-	-
06 - Studio6	120	-	-
06 - Studio6 WC	120	-	-
06 - Studio7 WC	120	-	-
06 - Studio7	120	-	-
06 - Studio8 WC	120	-	-
06 - Studio8	120	-	-
06 - Studio24	120	-	-
06 - Studio24 WC	120	-	-
06 - Studio23	120	-	-

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
06 - Studio23 WC	120	-	-
06 - Studio22 WC	120	-	-
06 - Studio22	120	-	-
06 - Studio21	120	-	-
06 - Studio21 WC	120	-	-
06 - Studio20	120	-	-
06 - Studio20 WC	120	-	-
06 - Studio19 WC	120	-	-
06 - Studio19	120	-	-
06 - Studio18	120	-	-
06 - Studio18 WC	120	-	-
06 - Studio17 WC	120	-	-
06 - Studio17	120	-	-
06 - Studio16	120	-	-
06 - Studio16 WC	120	-	-
06 - Studio15 WC	120	-	-
06 - Studio15	120	-	-
06 - Studio2	120	-	-
06 - Studio2 WC	120	-	-
06 - Studio14 WC	120	-	-
06 - Studio14	120	-	-
06 - Studio12	120	-	-
06 - Studio12 WC	120	-	-
06 - Studio11 WC	120	-	-
06 - Studio11	120	-	-
06 - Studio10 WC	120	-	-
06 - Studio10	120	-	-
06 - Studio9	120	-	-
06 - Studio9 WC	120	-	-
06 - Studio13 WC	120	-	-
06 - Studio13	120	-	-
07 - Studio1	120	-	-
07 - Studio1 WC	120	-	-
07 - Studio3 WC	120	-	-
07 - Studio3	120	-	-
07 - Studio4	120	-	-
07 - Studio4 WC	120	-	-
07 - Studio5 WC	120	-	-
07 - Studio5	120	-	-
07 - Studio6	120	-	-
07 - Studio6 WC	120	-	-
07 - Studio7 WC	120	-	-
07 - Studio7	120	-	-

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
07 - Studio8 WC	120	-	-
07 - Studio8	120	-	-
07 - Studio24	120	-	-
07 - Studio24 WC	120	-	-
07 - Studio23	120	-	-
07 - Studio23 WC	120	-	-
07 - Studio22 WC	120	-	-
07 - Studio22	120	-	-
07 - Studio21	120	-	-
07 - Studio21 WC	120	-	-
07 - Studio20	120	-	-
07 - Studio20 WC	120	-	-
07 - Studio19 WC	120	-	-
07 - Studio19	120	-	-
07 - Studio18	120	-	-
07 - Studio18 WC	120	-	-
07 - Studio17 WC	120	-	-
07 - Studio17	120	-	-
07 - Studio16	120	-	-
07 - Studio16 WC	120	-	-
07 - Studio15 WC	120	-	-
07 - Studio15	120	-	-
07 - Studio2	120	-	-
07 - Studio2 WC	120	-	-
07 - Studio14 WC	120	-	-
07 - Studio14	120	-	-
07 - Studio12	120	-	-
07 - Studio12 WC	120	-	-
07 - Studio11 WC	120	-	-
07 - Studio11	120	-	-
07 - Studio10 WC	120	-	-
07 - Studio10	120	-	-
07 - Studio9	120	-	-
07 - Studio9 WC	120	-	-
07 - Studio13 WC	120	-	-
07 - Studio13	120	-	-
08 - Studio1	120	-	-
08 - Studio1 WC	120	-	-
08 - Studio3 WC	120	-	-
08 - Studio3	120	-	-
08 - Studio4	120	-	-
08 - Studio4 WC	120	-	-
08 - Studio5 WC	120	-	-

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
08 - Studio5	120	-	-
08 - Studio6	120	-	-
08 - Studio6 WC	120	-	-
08 - Studio7 WC	120	-	-
08 - Studio7	120	-	-
08 - Studio8 WC	120	-	-
08 - Studio8	120	-	-
08 - Studio24	120	-	-
08 - Studio24 WC	120	-	-
08 - Studio23	120	-	-
08 - Studio23 WC	120	-	-
08 - Studio22 WC	120	-	-
08 - Studio22	120	-	-
08 - Studio21	120	-	-
08 - Studio21 WC	120	-	-
08 - Studio20	120	-	-
08 - Studio20 WC	120	-	-
08 - Studio19 WC	120	-	-
08 - Studio19	120	-	-
08 - Studio18	120	-	-
08 - Studio18 WC	120	-	-
08 - Studio17 WC	120	-	-
08 - Studio17	120	-	-
08 - Studio16	120	-	-
08 - Studio16 WC	120	-	-
08 - Studio15 WC	120	-	-
08 - Studio15	120	-	-
08 - Studio2	120	-	-
08 - Studio2 WC	120	-	-
08 - Studio14 WC	120	-	-
08 - Studio14	120	-	-
08 - Studio12	120	-	-
08 - Studio12 WC	120	-	-
08 - Studio11 WC	120	-	-
08 - Studio11	120	-	-
08 - Studio10 WC	120	-	-
08 - Studio10	120	-	-
08 - Studio9	120	-	-
08 - Studio9 WC	120	-	-
08 - Studio13 WC	120	-	-
08 - Studio13	120	-	-
Mez - PBSA Amenity	120	-	-
MEZ - PBSA Cafe	120	-	-

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?
01 - Studio1	NO (-89.1%)	NO
01 - Studio3	NO (-65.4%)	NO
01 - Studio4	NO (-65.6%)	NO
01 - Studio5	NO (-66.1%)	NO
01 - Studio6	NO (-65.3%)	NO
01 - Studio7	NO (-65.7%)	NO
01 - Studio8	NO (-66.1%)	NO
01 - Studio24	NO (-83.2%)	NO
01 - Studio23	NO (-51.5%)	NO
01 - Studio22	NO (-52.9%)	NO
01 - Studio21	NO (-46.5%)	NO
01 - Studio20	NO (-47.6%)	NO
01 - Studio19	NO (-48.3%)	NO
01 - Studio18	NO (-47.1%)	NO
01 - Studio17	NO (-47.2%)	NO
01 - Studio16	NO (-63.3%)	NO
01 - Studio15	NO (-47.1%)	NO
01 - Studio2	NO (-63.2%)	NO
01 - Studio14	NO (-50.7%)	NO
01 - Studio12	NO (-75.3%)	NO
01 - Studio11	NO (-74.9%)	NO
01 - Studio10	NO (-65.7%)	NO
01 - Studio9	NO (-65.2%)	NO
01 - Studio13	NO (-73.2%)	NO
02 - Studio1	NO (-89.1%)	NO
02 - Studio3	NO (-65.4%)	NO
02 - Studio4	NO (-65.6%)	NO
02 - Studio5	NO (-66.1%)	NO
02 - Studio6	NO (-65.3%)	NO
02 - Studio7	NO (-65.7%)	NO
02 - Studio8	NO (-66.1%)	NO
02 - Studio24	NO (-83.2%)	NO
02 - Studio23	NO (-51.5%)	NO
02 - Studio22	NO (-52.9%)	NO
02 - Studio21	NO (-46.5%)	NO
02 - Studio20	NO (-47.6%)	NO
02 - Studio19	NO (-48.3%)	NO
02 - Studio18	NO (-47.1%)	NO
02 - Studio17	NO (-47.2%)	NO
02 - Studio16	NO (-63.3%)	NO
02 - Studio15	NO (-47.1%)	NO
02 - Studio2	NO (-63.2%)	NO
02 - Studio14	NO (-50.7%)	NO
02 - Studio12	NO (-75.3%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
02 - Studio11	NO (-74.9%)	NO
02 - Studio10	NO (-65.7%)	NO
02 - Studio9	NO (-65.2%)	NO
02 - Studio13	NO (-73.2%)	NO
03 - Studio1	NO (-89.1%)	NO
03 - Studio3	NO (-65.4%)	NO
03 - Studio4	NO (-65.6%)	NO
03 - Studio5	NO (-66.1%)	NO
03 - Studio6	NO (-65.3%)	NO
03 - Studio7	NO (-65.7%)	NO
03 - Studio8	NO (-66.1%)	NO
03 - Studio24	NO (-83.2%)	NO
03 - Studio23	NO (-51.5%)	NO
03 - Studio22	NO (-52.9%)	NO
03 - Studio21	NO (-46.5%)	NO
03 - Studio20	NO (-47.6%)	NO
03 - Studio19	NO (-48.3%)	NO
03 - Studio18	NO (-47.1%)	NO
03 - Studio17	NO (-47.2%)	NO
03 - Studio16	NO (-63.3%)	NO
03 - Studio15	NO (-47.1%)	NO
03 - Studio2	NO (-63.2%)	NO
03 - Studio14	NO (-50.7%)	NO
03 - Studio12	NO (-75.3%)	NO
03 - Studio11	NO (-74.9%)	NO
03 - Studio10	NO (-65.7%)	NO
03 - Studio9	NO (-65.2%)	NO
03 - Studio13	NO (-73.2%)	NO
04 - Studio1	NO (-89.1%)	NO
04 - Studio3	NO (-65.4%)	NO
04 - Studio4	NO (-65.6%)	NO
04 - Studio5	NO (-66.1%)	NO
04 - Studio6	NO (-65.3%)	NO
04 - Studio7	NO (-65.7%)	NO
04 - Studio8	NO (-66.1%)	NO
04 - Studio24	NO (-83.2%)	NO
04 - Studio23	NO (-51.5%)	NO
04 - Studio22	NO (-52.9%)	NO
04 - Studio21	NO (-46.5%)	NO
04 - Studio20	NO (-47.6%)	NO
04 - Studio19	NO (-48.3%)	NO
04 - Studio18	NO (-47.1%)	NO
04 - Studio17	NO (-47.2%)	NO
04 - Studio16	NO (-63.3%)	NO
04 - Studio15	NO (-47.1%)	NO
04 - Studio2	NO (-63.2%)	NO
04 - Studio14	NO (-50.7%)	NO
04 - Studio12	NO (-75.3%)	NO
04 - Studio11	NO (-74.9%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
04 - Studio10	NO (-65.7%)	NO
04 - Studio9	NO (-65.2%)	NO
04 - Studio13	NO (-73.2%)	NO
05 - Studio1	NO (-89.1%)	NO
05 - Studio3	NO (-65.4%)	NO
05 - Studio4	NO (-65.6%)	NO
05 - Studio5	NO (-66.1%)	NO
05 - Studio6	NO (-65.3%)	NO
05 - Studio7	NO (-65.7%)	NO
05 - Studio8	NO (-66.1%)	NO
05 - Studio24	NO (-83.2%)	NO
05 - Studio23	NO (-51.5%)	NO
05 - Studio22	NO (-52.9%)	NO
05 - Studio21	NO (-46.5%)	NO
05 - Studio20	NO (-47.6%)	NO
05 - Studio19	NO (-48.3%)	NO
05 - Studio18	NO (-47.1%)	NO
05 - Studio17	NO (-47.2%)	NO
05 - Studio16	NO (-63.3%)	NO
05 - Studio15	NO (-47.1%)	NO
05 - Studio2	NO (-63.2%)	NO
05 - Studio14	NO (-50.7%)	NO
05 - Studio12	NO (-75.3%)	NO
05 - Studio11	NO (-74.9%)	NO
05 - Studio10	NO (-65.7%)	NO
05 - Studio9	NO (-65.2%)	NO
05 - Studio13	NO (-73.2%)	NO
06 - Studio1	NO (-89.1%)	NO
06 - Studio3	NO (-65.4%)	NO
06 - Studio4	NO (-65.6%)	NO
06 - Studio5	NO (-66.1%)	NO
06 - Studio6	NO (-65.3%)	NO
06 - Studio7	NO (-65.7%)	NO
06 - Studio8	NO (-66.1%)	NO
06 - Studio24	NO (-83.2%)	NO
06 - Studio23	NO (-51.5%)	NO
06 - Studio22	NO (-52.9%)	NO
06 - Studio21	NO (-46.5%)	NO
06 - Studio20	NO (-47.6%)	NO
06 - Studio19	NO (-48.3%)	NO
06 - Studio18	NO (-47.1%)	NO
06 - Studio17	NO (-47.2%)	NO
06 - Studio16	NO (-63.3%)	NO
06 - Studio15	NO (-47.1%)	NO
06 - Studio2	NO (-63.2%)	NO
06 - Studio14	NO (-50.7%)	NO
06 - Studio12	NO (-75.3%)	NO
06 - Studio11	NO (-74.9%)	NO
06 - Studio10	NO (-65.7%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
06 - Studio9	NO (-65.2%)	NO
06 - Studio13	NO (-73.2%)	NO
07 - Studio1	NO (-89.1%)	NO
07 - Studio3	NO (-65.4%)	NO
07 - Studio4	NO (-65.6%)	NO
07 - Studio5	NO (-66.1%)	NO
07 - Studio6	NO (-65.3%)	NO
07 - Studio7	NO (-65.7%)	NO
07 - Studio8	NO (-66.1%)	NO
07 - Studio24	NO (-83.2%)	NO
07 - Studio23	NO (-51.5%)	NO
07 - Studio22	NO (-52.9%)	NO
07 - Studio21	NO (-46.5%)	NO
07 - Studio20	NO (-47.6%)	NO
07 - Studio19	NO (-48.3%)	NO
07 - Studio18	NO (-47.1%)	NO
07 - Studio17	NO (-47.2%)	NO
07 - Studio16	NO (-63.3%)	NO
07 - Studio15	NO (-47.1%)	NO
07 - Studio2	NO (-63.2%)	NO
07 - Studio14	NO (-50.7%)	NO
07 - Studio12	NO (-75.3%)	NO
07 - Studio11	NO (-74.9%)	NO
07 - Studio10	NO (-65.7%)	NO
07 - Studio9	NO (-65.2%)	NO
07 - Studio13	NO (-73.2%)	NO
08 - Studio1	NO (-89.1%)	NO
08 - Studio3	NO (-65.4%)	NO
08 - Studio4	NO (-65.6%)	NO
08 - Studio5	NO (-66.1%)	NO
08 - Studio6	NO (-65.3%)	NO
08 - Studio7	NO (-65.7%)	NO
08 - Studio8	NO (-66.1%)	NO
08 - Studio24	NO (-83.2%)	NO
08 - Studio23	NO (-51.5%)	NO
08 - Studio22	NO (-52.9%)	NO
08 - Studio21	NO (-46.5%)	NO
08 - Studio20	NO (-47.6%)	NO
08 - Studio19	NO (-48.3%)	NO
08 - Studio18	NO (-47.1%)	NO
08 - Studio17	NO (-47.2%)	NO
08 - Studio16	NO (-63.3%)	NO
08 - Studio15	NO (-47.1%)	NO
08 - Studio2	NO (-63.2%)	NO
08 - Studio14	NO (-50.7%)	NO
08 - Studio12	NO (-75.3%)	NO
08 - Studio11	NO (-74.9%)	NO
08 - Studio10	NO (-65.7%)	NO
08 - Studio9	NO (-65.2%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
08 - Studio13	NO (-73.2%)	NO
Mez - PBSA Amenity	NO (-19.7%)	NO
MEZ - PBSA Cafe	YES (+80%)	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]	4592.9	4592.9
External area [m^2]	6380.5	6380.5
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	3	3
Average conductance [W/K]	1250.85	2472.01
Average U-value [W/m^2K]	0.2	0.39
Alpha value* [%]	40.72	18.2

* 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
	Residential Institutions: Residential Schools
100	**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	2.71	6.19
Cooling	0.73	0.57
Auxiliary	7.11	8.82
Lighting	3.02	5
Hot water	4.56	4.32
Equipment*	10.85	10.85
TOTAL**	**18.12**	**24.89**

* 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	10.73	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*10.73*	*0*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	73.02	102.72
Primary energy [kWh_{PE}/m^2]	11.51	37.12
Total emissions [kg/m^2]	1.15	3.47

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	24.7	38.1	2.8	0	7.2	2.48	0	2.64	0
	Notional	59.2	37.5	6.2	0	8.9	2.64	0	----	----
[ST] Split or multi-split system, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	39.5	174.2	1.9	10.8	3	5.89	4.48	6	6
	Notional	54.4	132.7	5.7	8.4	4	2.64	4.4	----	----

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

CG15060 Blackburn Road Commercial Unit - Be Lean Results

As designed

Date: Wed Apr 16 16:32:25 2025

Administrative information

Building Details

Address: 14 Blackburn Road, London, NW6 1RZ

Certifier details

Name: CGP MEP

Telephone number: 02081442406

Address: MYO, St. Pauls, One New Change, London, EC4M 9AF

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.e.2

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: v7.0.28

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

Foundation area [m^2]: 572.2

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	4.41	
Building CO_2 emission rate (BER), $kgCO_2/m^2$.annum	2.63	
Target primary energy rate (TPER), kWh_{PE}/m^2.annum	46.13	
Building primary energy rate (BPER), kWh_{PE}/m^2.annum	28.64	
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	0.14	0.14	GF00000B_W12_A0
Floors	0.18	0.13	0.13	BS000000_F
Pitched roofs	0.16	-	-	No heat loss pitched roofs
Flat roofs	0.18	0.12	0.12	BS000008_C
Windows** and roof windows	1.6	0.8	0.8	GF00000B_W1_O0
Rooflights***	2.2	-	-	No external rooflights
Personnel doors^	1.6	-	-	No external personnel doors
Vehicle access & similar large doors	1.3	-	-	No external vehicle access doors
High usage entrance doors	3	-	-	No external high usage entrance doors

$U_{a\text{-}Limit}$ = 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	0.9 to 0.95

1- VRF Heating and Cooling

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	6	6	-	-	-
Standard value	2.5*	5	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.					

2- ASHP Hot Water

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	2.86	-	-	-	-
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- SYST0003-DHW

	Water heating efficiency	**Storage loss factor [kWh/litre per day]**
This building	Hot water provided by HVAC system	0.01
Standard value	N/A	N/A

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**
BS - Commercial Showroom - Ancillary - Offices	-	-	-	-	0.6	-	-	-	-	0.8	N/A
BS - Commercial Showroom	-	-	-	-	0.6	-	-	-	-	0.8	N/A
GF - Commercial Showroom2	-	-	-	-	0.6	-	-	-	-	0.8	N/A
GF - Commercial Showroom - Ancillary - Offices	-	-	-	-	0.6	-	-	-	-	0.8	N/A
GF - Commercial Showroom 1	-	-	-	-	0.6	-	-	-	-	0.8	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
BS - Commercial Showroom - Ancillary Offices	120	-	-
BS - Commercial Showroom	120	-	-
GF - Commercial Showroom2	120	-	-
GF - Commercial Showroom - Ancillary Offices	120	-	-
GF - Commercial Showroom 1	120	-	-

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?
BS - Commercial Showroom - Ancillary Offices	N/A	N/A
BS - Commercial Showroom	N/A	N/A
GF - Commercial Showroom2	YES (+71.2%)	NO
GF - Commercial Showroom - Ancillary Offices	YES (+36.2%)	NO
GF - Commercial Showroom 1	YES (+152.4%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	1144.4	1144.4
External area [m^2]	3357.5	3357.5
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	3	5
Average conductance [W/K]	734.31	1047.92
Average U-value [W/m^2K]	0.22	0.31
Alpha value* [%]	65.66	74.94

* 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
100	**Storage or Distribution**
	Hotels
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
	Residential Spaces
	Non-residential Institutions: Community/Day Centre
	Non-residential Institutions: Libraries, Museums, and Galleries
	Non-residential Institutions: Education
	Non-residential Institutions: Primary Health Care Building
	Non-residential Institutions: Crown and County Courts
	General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger Terminals
	Others: Emergency Services
	Others: Miscellaneous 24hr Activities
	Others: Car Parks 24 hrs
	Others: Stand Alone Utility Block

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

	Actual	Notional
Heating	5.46	20.19
Cooling	5.29	3.62
Auxiliary	2.9	3.72
Lighting	3.07	2.79
Hot water	2.4	0.27
Equipment*	13.99	13.99
TOTAL**	**19.11**	**30.59**

* 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]	200.98	249.21
Primary energy [kWh_{PE}/m^2]	28.64	46.13
Total emissions [kg/m^2]	2.63	4.41

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] Split or multi-split system, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	115.6	85.3	5.5	5.3	2.5	5.89	4.48	6	6
	Notional	191.8	57.4	20.2	3.6	3.7	2.64	4.4	----	----

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

CG15060 Blackburn Road Commercial Unit - Be Green Results

As designed

Date: Thu Apr 17 15:11:38 2025

Administrative information

Building Details

Address: 14 Blackburn Road, London, NW6 1RZ

Certifier details

Name: CGP MEP

Telephone number: 02081442406

Address: MYO, St. Pauls, One New Change, London, EC4M 9AF

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.e.2

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: v7.0.28

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

Foundation area [m^2]: 572.2

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	4.41	
Building CO_2 emission rate (BER), $kgCO_2/m^2$.annum	2.58	
Target primary energy rate (TPER), kWh_{PE}/m^2.annum	46.13	
Building primary energy rate (BPER), kWh_{PE}/m^2.annum	28.16	
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	0.14	0.14	GF00000B_W12_A0
Floors	0.18	0.13	0.13	BS000000_F
Pitched roofs	0.16	-	-	No heat loss pitched roofs
Flat roofs	0.18	0.12	0.12	BS000008_C
Windows** and roof windows	1.6	0.8	0.8	GF00000B_W1_O0
Rooflights***	2.2	-	-	No external rooflights
Personnel doors^	1.6	-	-	No external personnel doors
Vehicle access & similar large doors	1.3	-	-	No external vehicle access doors
High usage entrance doors	3	-	-	No external high usage entrance doors

$U_{a\text{-}Limit}$ = 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	0.9 to 0.95

1- VRF Heating and Cooling

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	6	6	-	-	-
Standard value	2.5*	5	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.					

2- ASHP Hot Water

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	3.3	-	-	-	-
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- SYST0003-DHW

	Water heating efficiency	**Storage loss factor [kWh/litre per day]**
This building	Hot water provided by HVAC system	0.01
Standard value	N/A	N/A

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**
BS - Commercial Showroom - Ancillary - Offices	-	-	-	-	0.6	-	-	-	-	0.8	N/A
BS - Commercial Showroom	-	-	-	-	0.6	-	-	-	-	0.8	N/A
GF - Commercial Showroom2	-	-	-	-	0.6	-	-	-	-	0.8	N/A
GF - Commercial Showroom - Ancillary - Offices	-	-	-	-	0.6	-	-	-	-	0.8	N/A
GF - Commercial Showroom 1	-	-	-	-	0.6	-	-	-	-	0.8	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
BS - Commercial Showroom - Ancillary Offices	120	-	-
BS - Commercial Showroom	120	-	-
GF - Commercial Showroom2	120	-	-
GF - Commercial Showroom - Ancillary Offices	120	-	-
GF - Commercial Showroom 1	120	-	-

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?
BS - Commercial Showroom - Ancillary Offices	N/A	N/A
BS - Commercial Showroom	N/A	N/A
GF - Commercial Showroom2	YES (+71.2%)	NO
GF - Commercial Showroom - Ancillary Offices	YES (+36.2%)	NO
GF - Commercial Showroom 1	YES (+152.4%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	1144.4	1144.4
External area [m^2]	3357.5	3357.5
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	3	5
Average conductance [W/K]	734.31	1047.92
Average U-value [W/m^2K]	0.22	0.31
Alpha value* [%]	65.66	74.94

* 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
100	**Storage or Distribution**
	Hotels
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
	Residential Spaces
	Non-residential Institutions: Community/Day Centre
	Non-residential Institutions: Libraries, Museums, and Galleries
	Non-residential Institutions: Education
	Non-residential Institutions: Primary Health Care Building
	Non-residential Institutions: Crown and County Courts
	General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger Terminals
	Others: Emergency Services
	Others: Miscellaneous 24hr Activities
	Others: Car Parks 24 hrs
	Others: Stand Alone Utility Block

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

	Actual	Notional
Heating	5.46	20.19
Cooling	5.29	3.62
Auxiliary	2.9	3.72
Lighting	3.07	2.79
Hot water	2.08	0.27
Equipment*	13.99	13.99
TOTAL**	**18.79**	**30.59**

* 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]	200.98	249.21
Primary energy [kWh_{PE}/m^2]	28.16	46.13
Total emissions [kg/m^2]	2.58	4.41

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] Split or multi-split system, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	115.6	85.3	5.5	5.3	2.5	5.89	4.48	6	6
	Notional	191.8	57.4	20.2	3.6	3.7	2.64	4.4	----	----

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 3 – TM59 Overheating Results

Approved Document O report
Overheating risk in residential buildings
for
CG15060 Blackburn Road

CG15060 Blackburn Road

Building details

Project name: CG15060 Blackburn Road	Date: 03-03-2025 11:20:56
Location: London Heathrow , United Kingdom	
Address: Blackburn Road, Hampstead	
Building use: Student Living, Affordable Housing, Workspace	
Are there any security, noise, or pollution issues: Refer to main body of report	

Designer's details

Designer's name: Amaan Hussain
Designer's organisation: CGP MEP
Designer's address: Myo St Paul's, One New Change, London, EC4M 9AF

Dynamic thermal model

Software: IESVE version 2024.1.0.0	
Weather file: London_LHR_DSY1_2020High50.epw	
Results file: CG15060 Blackburn Road Overheating Run25.aps	
Number of rooms analysed: 280	
TM59: summer elevated air speed: 0.1	
TM59: occupant category: Category II (normal)	
Overheating mitigation strategy: Refer to main body of report	
Has the building construction proposal been modelled accurately?	YES
Have the analysed rooms passed the assessment for Approved Doc O Dynamic Thermal Modelling Method (CIBSE TM 59)?	YES
Designer's signature:	

Summary

CIBSE TM59 overheating methodology for predominantly naturally ventilated rooms assesses against two criteria, (a) and (b) (for Category I occupancy, Tmax is reduced by 1K):

- Criterion (a) states that for living rooms, kitchens and bedrooms, the number of hours during which ΔT is greater than or equal to 1K from May to September (or November to March for southern hemisphere locations) shall not exceed 3% of occupied hours
- Criterion (b) states that the operative temperature of the bedrooms from 22:00-07:00 shall not exceed 26°C for more than 1% of annual hours (33 hours is therefore recorded as a fail). Approved document O applies limits to CIBSE TM59 section 3.3 (openings); these requirements are applied by appropriate assignment of MacroFlo types / scripted profiles in the model (see Modelled Openings Section).

CIBSE TM59 overheating methodology for predominantly mechanically ventilated rooms states the operative temperature of all rooms shall not exceed 26°C for more than 3% of annual occupied hours.

CIBSE TM59 also states that the inclusion of corridors in the overheating analysis is mandatory where community heating pipework runs through them. While there is no mandatory target for communal corridors, if an operative temperature of 28°C is exceeded for more than 3% of the total annual hours this should be identified as a significant risk.

Room name	Naturally ventilated Criterion a check	Naturally ventilated Criterion b check	Mechanically ventilated check	Corridor overheating risk check
01 - A1 B1	-	-	Pass	-
01 - A1 B2	-	-	Pass	-
01 - A1 LDK	-	-	Pass	-
01 - A2 LDK	-	-	Pass	-
01 - A2 B1	-	-	Pass	-
01 - A3 B1	-	-	Pass	-
01 - A3 LDK	-	-	Pass	-
01 - A4 LDK	-	-	Pass	-
01 - A4 B1	-	-	Pass	-
01 - A5 LDK	-	-	Pass	-
01 - A5 B1	-	-	Pass	-
01 - A5 B2	-	-	Pass	-
01 - A6 LDK	-	-	Pass	-
01 - A6 B1	-	-	Pass	-
01 - A6 B2	-	-	Pass	-
01 - A6 B3	-	-	Pass	-
01 - A7 B3	-	-	Pass	-
01 - A7 B2	-	-	Pass	-
01 - A7 B1	-	-	Pass	-
01 - A7 LDK	-	-	Pass	-
01 - A8 LDK	-	-	Pass	-
01 - A8 B1	-	-	Pass	-
01 - A8 B2	-	-	Pass	-
01 - Studio2	-	-	Pass	-
01 - Studio3	-	-	Pass	-
01 - Studio4	-	-	Pass	-
01 - Studio5	-	-	Pass	-
01 - Studio6	-	-	Pass	-
01 - Studio7	-	-	Pass	-

CG15060 Blackburn Road

Room name	Naturally ventilated Criterion a check	Naturally ventilated Criterion b check	Mechanically ventilated check	Corridor overheating risk check
01 - Studio8	-	-	Pass	-
01 - Studio9	-	-	Pass	-
01 - Studio10	-	-	Pass	-
01 - Studio11	-	-	Pass	-
01 - Studio12	-	-	Pass	-
01 - Studio13	-	-	Pass	-
01 - Studio30	-	-	Pass	-
01 - Studio29	-	-	Pass	-
01 - Studio28	-	-	Pass	-
01 - Studio27	-	-	Pass	-
01 - Studio26	-	-	Pass	-
01 - Studio25	-	-	Pass	-
01 - Studio24	-	-	Pass	-
01 - Studio23	-	-	Pass	-
01 - Studio22	-	-	Pass	-
01 - Studio21	-	-	Pass	-
01 - Studio20	-	-	Pass	-
01 - Studio19	-	-	Pass	-
01 - Studio18	-	-	Pass	-
01 - Studio17	-	-	Pass	-
01 - Studio16	-	-	Pass	-
01 - Studio15	-	-	Pass	-
01 - Studio14	-	-	Pass	-
01 - Lobby	-	-	-	No
01 - Lift Lobby	-	-	-	No
01 - Lift Lobby 2	-	-	-	No
01 - Corridor	-	-	-	No
02 - A1 B1	-	-	Pass	-
02 - A1 B2	-	-	Pass	-
02 - A1 LDK	-	-	Pass	-
02 - A2 LDK	-	-	Pass	-
02 - A2 B1	-	-	Pass	-
02 - A3 B1	-	-	Pass	-
02 - A3 LDK	-	-	Pass	-
02 - A4 LDK	-	-	Pass	-
02 - A4 B1	-	-	Pass	-
02 - A5 LDK	-	-	Pass	-
02 - A5 B1	-	-	Pass	-
02 - A5 B2	-	-	Pass	-
02 - A6 LDK	-	-	Pass	-
02 - A6 B1	-	-	Pass	-
02 - A6 B2	-	-	Pass	-

CG15060 Blackburn Road

Room name	Naturally ventilated Criterion a check	Naturally ventilated Criterion b check	Mechanically ventilated check	Corridor overheating risk check
02 - A6 B3	-	-	Pass	-
02 - A7 B3	-	-	Pass	-
02 - A7 B2	-	-	Pass	-
02 - A7 B1	-	-	Pass	-
02 - A7 LDK	-	-	Pass	-
02 - A8 LDK	-	-	Pass	-
02 - A8 B1	-	-	Pass	-
02 - A8 B2	-	-	Pass	-
02 - Studio2	-	-	Pass	-
02 - Studio3	-	-	Pass	-
02 - Studio4	-	-	Pass	-
02 - Studio5	-	-	Pass	-
02 - Studio6	-	-	Pass	-
02 - Studio7	-	-	Pass	-
02 - Studio8	-	-	Pass	-
02 - Studio9	-	-	Pass	-
02 - Studio10	-	-	Pass	-
02 - Studio11	-	-	Pass	-
02 - Studio12	-	-	Pass	-
02 - Studio13	-	-	Pass	-
02 - Studio30	-	-	Pass	-
02 - Studio29	-	-	Pass	-
02 - Studio28	-	-	Pass	-
02 - Studio27	-	-	Pass	-
02 - Studio26	-	-	Pass	-
02 - Studio25	-	-	Pass	-
02 - Studio24	-	-	Pass	-
02 - Studio23	-	-	Pass	-
02 - Studio22	-	-	Pass	-
02 - Studio21	-	-	Pass	-
02 - Studio20	-	-	Pass	-
02 - Studio19	-	-	Pass	-
02 - Studio18	-	-	Pass	-
02 - Studio17	-	-	Pass	-
02 - Studio16	-	-	Pass	-
02 - Studio15	-	-	Pass	-
02 - Studio14	-	-	Pass	-
02 - Lobby	-	-	-	No
02 - Lift Lobby	-	-	-	No
02 - Lift Lobby 2	-	-	-	No
02 - Corridor	-	-	-	No
05 - A1 B1	-	-	Pass	-

CG15060 Blackburn Road

Room name	Naturally ventilated Criterion a check	Naturally ventilated Criterion b check	Mechanically ventilated check	Corridor overheating risk check
05 - A1 B2	-	-	Pass	-
05 - A1 LDK	-	-	Pass	-
05 - A2 LDK	-	-	Pass	-
05 - A2 B1	-	-	Pass	-
05 - A3 B1	-	-	Pass	-
05 - A3 LDK	-	-	Pass	-
05 - A4 LDK	-	-	Pass	-
05 - A4 B1	-	-	Pass	-
05 - A5 LDK	-	-	Pass	-
05 - A5 B1	-	-	Pass	-
05 - A5 B2	-	-	Pass	-
05 - A6 LDK	-	-	Pass	-
05 - A6 B1	-	-	Pass	-
05 - A6 B2	-	-	Pass	-
05 - A6 B3	-	-	Pass	-
05 - A7 B3	-	-	Pass	-
05 - A7 B2	-	-	Pass	-
05 - A7 B1	-	-	Pass	-
05 - A7 LDK	-	-	Pass	-
05 - A8 LDK	-	-	Pass	-
05 - A8 B1	-	-	Pass	-
05 - A8 B2	-	-	Pass	-
05 - Studio2	-	-	Pass	-
05 - Studio3	-	-	Pass	-
05 - Studio4	-	-	Pass	-
05 - Studio5	-	-	Pass	-
05 - Studio6	-	-	Pass	-
05 - Studio7	-	-	Pass	-
05 - Studio8	-	-	Pass	-
05 - Studio9	-	-	Pass	-
05 - Studio10	-	-	Pass	-
05 - Studio11	-	-	Pass	-
05 - Studio12	-	-	Pass	-
05 - Studio13	-	-	Pass	-
05 - Studio30	-	-	Pass	-
05 - Studio29	-	-	Pass	-
05 - Studio28	-	-	Pass	-
05 - Studio27	-	-	Pass	-
05 - Studio26	-	-	Pass	-
05 - Studio25	-	-	Pass	-
05 - Studio24	-	-	Pass	-
05 - Studio23	-	-	Pass	-

CG15060 Blackburn Road

Room name	Naturally ventilated Criterion a check	Naturally ventilated Criterion b check	Mechanically ventilated check	Corridor overheating risk check
05 - Studio22	-	-	Pass	-
05 - Studio21	-	-	Pass	-
05 - Studio20	-	-	Pass	-
05 - Studio19	-	-	Pass	-
05 - Studio18	-	-	Pass	-
05 - Studio17	-	-	Pass	-
05 - Studio16	-	-	Pass	-
05 - Studio15	-	-	Pass	-
05 - Studio14	-	-	Pass	-
05 - Lobby	-	-	-	No
05 - Lift Lobby	-	-	-	No
05 - Lift Lobby 2	-	-	-	No
05 - Corridor	-	-	-	No
03 - A1 B1	-	-	Pass	-
03 - A1 B2	-	-	Pass	-
03 - A1 LDK	-	-	Pass	-
03 - A2 LDK	-	-	Pass	-
03 - A2 B1	-	-	Pass	-
03 - A3 B1	-	-	Pass	-
03 - A3 LDK	-	-	Pass	-
03 - A4 LDK	-	-	Pass	-
03 - A4 B1	-	-	Pass	-
03 - A5 LDK	-	-	Pass	-
03 - A5 B1	-	-	Pass	-
03 - A5 B2	-	-	Pass	-
03 - A6 LDK	-	-	Pass	-
03 - A6 B1	-	-	Pass	-
03 - A6 B2	-	-	Pass	-
03 - A6 B3	-	-	Pass	-
03 - A7 B3	-	-	Pass	-
03 - A7 B2	-	-	Pass	-
03 - A7 B1	-	-	Pass	-
03 - A7 LDK	-	-	Pass	-
03 - A8 LDK	-	-	Pass	-
03 - A8 B1	-	-	Pass	-
03 - A8 B2	-	-	Pass	-
03 - Studio2	-	-	Pass	-
03 - Studio3	-	-	Pass	-
03 - Studio4	-	-	Pass	-
03 - Studio5	-	-	Pass	-
03 - Studio6	-	-	Pass	-
03 - Studio7	-	-	Pass	-

CG15060 Blackburn Road

Room name	Naturally ventilated Criterion a check	Naturally ventilated Criterion b check	Mechanically ventilated check	Corridor overheating risk check
03 - Studio8	-	-	Pass	-
03 - Studio9	-	-	Pass	-
03 - Studio10	-	-	Pass	-
03 - Studio11	-	-	Pass	-
03 - Studio12	-	-	Pass	-
03 - Studio13	-	-	Pass	-
03 - Studio30	-	-	Pass	-
03 - Studio29	-	-	Pass	-
03 - Studio28	-	-	Pass	-
03 - Studio27	-	-	Pass	-
03 - Studio26	-	-	Pass	-
03 - Studio25	-	-	Pass	-
03 - Studio24	-	-	Pass	-
03 - Studio23	-	-	Pass	-
03 - Studio22	-	-	Pass	-
03 - Studio21	-	-	Pass	-
03 - Studio20	-	-	Pass	-
03 - Studio19	-	-	Pass	-
03 - Studio18	-	-	Pass	-
03 - Studio17	-	-	Pass	-
03 - Studio16	-	-	Pass	-
03 - Studio15	-	-	Pass	-
03 - Studio14	-	-	Pass	-
03 - Lobby	-	-	-	No
03 - Lift Lobby	-	-	-	No
03 - Lift Lobby 2	-	-	-	No
03 - Corridor	-	-	-	No
04 - A1 B1	-	-	Pass	-
04 - A1 B2	-	-	Pass	-
04 - A1 LDK	-	-	Pass	-
04 - A2 LDK	-	-	Pass	-
04 - A2 B1	-	-	Pass	-
04 - A3 B1	-	-	Pass	-
04 - A3 LDK	-	-	Pass	-
04 - A4 LDK	-	-	Pass	-
04 - A4 B1	-	-	Pass	-
04 - A5 LDK	-	-	Pass	-
04 - A5 B1	-	-	Pass	-
04 - A5 B2	-	-	Pass	-
04 - A6 LDK	-	-	Pass	-
04 - A6 B1	-	-	Pass	-
04 - A6 B2	-	-	Pass	-

CG15060 Blackburn Road

Room name	Naturally ventilated Criterion a check	Naturally ventilated Criterion b check	Mechanically ventilated check	Corridor overheating risk check
04 - A6 B3	-	-	Pass	-
04 - A7 B3	-	-	Pass	-
04 - A7 B2	-	-	Pass	-
04 - A7 B1	-	-	Pass	-
04 - A7 LDK	-	-	Pass	-
04 - A8 LDK	-	-	Pass	-
04 - A8 B1	-	-	Pass	-
04 - A8 B2	-	-	Pass	-
04 - Studio2	-	-	Pass	-
04 - Studio3	-	-	Pass	-
04 - Studio4	-	-	Pass	-
04 - Studio5	-	-	Pass	-
04 - Studio6	-	-	Pass	-
04 - Studio7	-	-	Pass	-
04 - Studio8	-	-	Pass	-
04 - Studio9	-	-	Pass	-
04 - Studio10	-	-	Pass	-
04 - Studio11	-	-	Pass	-
04 - Studio12	-	-	Pass	-
04 - Studio13	-	-	Pass	-
04 - Studio30	-	-	Pass	-
04 - Studio29	-	-	Pass	-
04 - Studio28	-	-	Pass	-
04 - Studio27	-	-	Pass	-
04 - Studio26	-	-	Pass	-
04 - Studio25	-	-	Pass	-
04 - Studio24	-	-	Pass	-
04 - Studio23	-	-	Pass	-
04 - Studio22	-	-	Pass	-
04 - Studio21	-	-	Pass	-
04 - Studio20	-	-	Pass	-
04 - Studio19	-	-	Pass	-
04 - Studio18	-	-	Pass	-
04 - Studio17	-	-	Pass	-
04 - Studio16	-	-	Pass	-
04 - Studio15	-	-	Pass	-
04 - Studio14	-	-	Pass	-
04 - Lobby	-	-	-	No
04 - Lift Lobby	-	-	-	No
04 - Lift Lobby 2	-	-	-	No
04 - Corridor	-	-	-	No

Naturally ventilated rooms – criterion (a)

Criterion (a) states that for living rooms, kitchens and bedrooms, the number of hours during which ΔT is greater than or equal to 1K from May to September (or November to March for southern hemisphere locations) shall not exceed 3% of occupied hours.

Room name	Occupied hours	No. hours ΔT ≥ 1°K	% Occupied hours ΔT ≥ 1°K	Criterion a check
No nat vent rooms	N/A	N/A	N/A	N/A

Naturally ventilated rooms – criterion (b)

Criterion (b) states that the operative temperature of the bedrooms from 22:00-07:00 shall not exceed 26°C for more than 1% of annual hours (33 hours is therefore recorded as a fail). Any rooms that are not bedrooms are therefore not assessed, hence the corresponding N/A values.

Room name	No. hours > 26°C 22:00-24:00	No. hours > 26°C 00:00-07:00	Total hours > 26°C	Criterion b check
No nat vent rooms	N/A	N/A	N/A	N/A

Mechanically ventilated rooms

CIBSE TM59 overheating methodology for predominantly mech. vent. rooms states the operative temperature of all rooms shall not exceed 26°C for more than 3% of annual occupied hours.

Room name	No. hours > 26°C	% Annual hours > 26°C	Mechanically ventilated check
01 - A1 B1	195	2.2	Pass
01 - A1 B2	200	2.3	Pass
01 - A1 LDK	138	2.9	Pass
01 - A2 LDK	104	2.2	Pass
01 - A2 B1	177	2.0	Pass
01 - A3 B1	169	1.9	Pass
01 - A3 LDK	124	2.6	Pass
01 - A4 LDK	124	2.6	Pass
01 - A4 B1	182	2.1	Pass
01 - A5 LDK	140	3.0	Pass
01 - A5 B1	181	2.1	Pass
01 - A5 B2	181	2.1	Pass
01 - A6 LDK	139	2.9	Pass
01 - A6 B1	213	2.4	Pass
01 - A6 B2	190	2.2	Pass
01 - A6 B3	173	2.0	Pass
01 - A7 B3	151	1.7	Pass
01 - A7 B2	186	2.1	Pass
01 - A7 B1	202	2.3	Pass
01 - A7 LDK	65	1.4	Pass
01 - A8 LDK	93	2.0	Pass
01 - A8 B1	175	2.0	Pass
01 - A8 B2	167	1.9	Pass
01 - Studio2	204	2.3	Pass
01 - Studio3	212	2.4	Pass
01 - Studio4	195	2.2	Pass
01 - Studio5	168	1.9	Pass
01 - Studio6	220	2.5	Pass
01 - Studio7	195	2.2	Pass
01 - Studio8	220	2.5	Pass
01 - Studio9	197	2.2	Pass
01 - Studio10	220	2.5	Pass
01 - Studio11	200	2.3	Pass
01 - Studio12	175	2.0	Pass
01 - Studio13	172	2.0	Pass
01 - Studio30	215	2.5	Pass
01 - Studio29	220	2.5	Pass

CG15060 Blackburn Road

Room name	No. hours > 26°C	% Annual hours > 26°C	Mechanically ventilated check
01 - Studio28	226	2.6	Pass
01 - Studio27	220	2.5	Pass
01 - Studio26	209	2.4	Pass
01 - Studio25	208	2.4	Pass
01 - Studio24	215	2.5	Pass
01 - Studio23	221	2.5	Pass
01 - Studio22	225	2.6	Pass
01 - Studio21	220	2.5	Pass
01 - Studio20	221	2.5	Pass
01 - Studio19	194	2.2	Pass
01 - Studio18	204	2.3	Pass
01 - Studio17	199	2.3	Pass
01 - Studio16	204	2.3	Pass
01 - Studio15	174	2.0	Pass
01 - Studio14	177	2.0	Pass
02 - A1 B1	161	1.8	Pass
02 - A1 B2	168	1.9	Pass
02 - A1 LDK	70	1.5	Pass
02 - A2 LDK	111	2.3	Pass
02 - A2 B1	184	2.1	Pass
02 - A3 B1	175	2.0	Pass
02 - A3 LDK	125	2.6	Pass
02 - A4 LDK	126	2.7	Pass
02 - A4 B1	188	2.1	Pass
02 - A5 LDK	43	0.9	Pass
02 - A5 B1	176	2.0	Pass
02 - A5 B2	182	2.1	Pass
02 - A6 LDK	142	3.0	Pass
02 - A6 B1	229	2.6	Pass
02 - A6 B2	205	2.3	Pass
02 - A6 B3	181	2.1	Pass
02 - A7 B3	161	1.8	Pass
02 - A7 B2	205	2.3	Pass
02 - A7 B1	219	2.5	Pass
02 - A7 LDK	123	2.6	Pass
02 - A8 LDK	97	2.0	Pass
02 - A8 B1	180	2.1	Pass
02 - A8 B2	173	2.0	Pass
02 - Studio2	222	2.5	Pass
02 - Studio3	230	2.6	Pass
02 - Studio4	217	2.5	Pass
02 - Studio5	185	2.1	Pass

CG15060 Blackburn Road

Room name	No. hours > 26°C	% Annual hours > 26°C	Mechanically ventilated check
02 - Studio6	234	2.7	Pass
02 - Studio7	216	2.5	Pass
02 - Studio8	234	2.7	Pass
02 - Studio9	217	2.5	Pass
02 - Studio10	234	2.7	Pass
02 - Studio11	216	2.5	Pass
02 - Studio12	189	2.2	Pass
02 - Studio13	189	2.2	Pass
02 - Studio30	236	2.7	Pass
02 - Studio29	238	2.7	Pass
02 - Studio28	242	2.8	Pass
02 - Studio27	237	2.7	Pass
02 - Studio26	226	2.6	Pass
02 - Studio25	224	2.6	Pass
02 - Studio24	232	2.6	Pass
02 - Studio23	238	2.7	Pass
02 - Studio22	241	2.8	Pass
02 - Studio21	237	2.7	Pass
02 - Studio20	233	2.7	Pass
02 - Studio19	214	2.4	Pass
02 - Studio18	224	2.6	Pass
02 - Studio17	218	2.5	Pass
02 - Studio16	224	2.6	Pass
02 - Studio15	200	2.3	Pass
02 - Studio14	204	2.3	Pass
05 - A1 B1	164	1.9	Pass
05 - A1 B2	174	2.0	Pass
05 - A1 LDK	76	1.6	Pass
05 - A2 LDK	119	2.5	Pass
05 - A2 B1	185	2.1	Pass
05 - A3 B1	182	2.1	Pass
05 - A3 LDK	132	2.8	Pass
05 - A4 LDK	136	2.9	Pass
05 - A4 B1	189	2.2	Pass
05 - A5 LDK	53	1.1	Pass
05 - A5 B1	184	2.1	Pass
05 - A5 B2	190	2.2	Pass
05 - A6 LDK	64	1.3	Pass
05 - A6 B1	206	2.4	Pass
05 - A6 B2	183	2.1	Pass
05 - A6 B3	179	2.0	Pass
05 - A7 B3	171	2.0	Pass

CG15060 Blackburn Road

Room name	No. hours > 26°C	% Annual hours > 26°C	Mechanically ventilated check
05 - A7 B2	201	2.3	Pass
05 - A7 B1	211	2.4	Pass
05 - A7 LDK	66	1.4	Pass
05 - A8 LDK	107	2.3	Pass
05 - A8 B1	185	2.1	Pass
05 - A8 B2	177	2.0	Pass
05 - Studio2	185	2.1	Pass
05 - Studio3	186	2.1	Pass
05 - Studio4	178	2.0	Pass
05 - Studio5	157	1.8	Pass
05 - Studio6	193	2.2	Pass
05 - Studio7	185	2.1	Pass
05 - Studio8	192	2.2	Pass
05 - Studio9	187	2.1	Pass
05 - Studio10	193	2.2	Pass
05 - Studio11	174	2.0	Pass
05 - Studio12	153	1.7	Pass
05 - Studio13	155	1.8	Pass
05 - Studio30	193	2.2	Pass
05 - Studio29	205	2.3	Pass
05 - Studio28	205	2.3	Pass
05 - Studio27	206	2.4	Pass
05 - Studio26	193	2.2	Pass
05 - Studio25	193	2.2	Pass
05 - Studio24	206	2.4	Pass
05 - Studio23	205	2.3	Pass
05 - Studio22	205	2.3	Pass
05 - Studio21	205	2.3	Pass
05 - Studio20	204	2.3	Pass
05 - Studio19	182	2.1	Pass
05 - Studio18	191	2.2	Pass
05 - Studio17	189	2.2	Pass
05 - Studio16	189	2.2	Pass
05 - Studio15	161	1.8	Pass
05 - Studio14	164	1.9	Pass
03 - A1 B1	161	1.8	Pass
03 - A1 B2	167	1.9	Pass
03 - A1 LDK	71	1.5	Pass
03 - A2 LDK	111	2.3	Pass
03 - A2 B1	184	2.1	Pass
03 - A3 B1	172	2.0	Pass
03 - A3 LDK	125	2.6	Pass

CG15060 Blackburn Road

Room name	No. hours > 26°C	% Annual hours > 26°C	Mechanically ventilated check
03 - A4 LDK	126	2.7	Pass
03 - A4 B1	188	2.1	Pass
03 - A5 LDK	46	1.0	Pass
03 - A5 B1	178	2.0	Pass
03 - A5 B2	183	2.1	Pass
03 - A6 LDK	142	3.0	Pass
03 - A6 B1	226	2.6	Pass
03 - A6 B2	197	2.2	Pass
03 - A6 B3	179	2.0	Pass
03 - A7 B3	154	1.8	Pass
03 - A7 B2	192	2.2	Pass
03 - A7 B1	196	2.2	Pass
03 - A7 LDK	65	1.4	Pass
03 - A8 LDK	98	2.1	Pass
03 - A8 B1	183	2.1	Pass
03 - A8 B2	174	2.0	Pass
03 - Studio2	225	2.6	Pass
03 - Studio3	230	2.6	Pass
03 - Studio4	218	2.5	Pass
03 - Studio5	188	2.1	Pass
03 - Studio6	236	2.7	Pass
03 - Studio7	218	2.5	Pass
03 - Studio8	236	2.7	Pass
03 - Studio9	219	2.5	Pass
03 - Studio10	236	2.7	Pass
03 - Studio11	217	2.5	Pass
03 - Studio12	190	2.2	Pass
03 - Studio13	190	2.2	Pass
03 - Studio30	238	2.7	Pass
03 - Studio29	239	2.7	Pass
03 - Studio28	242	2.8	Pass
03 - Studio27	240	2.7	Pass
03 - Studio26	228	2.6	Pass
03 - Studio25	226	2.6	Pass
03 - Studio24	237	2.7	Pass
03 - Studio23	241	2.8	Pass
03 - Studio22	243	2.8	Pass
03 - Studio21	238	2.7	Pass
03 - Studio20	236	2.7	Pass
03 - Studio19	216	2.5	Pass
03 - Studio18	227	2.6	Pass
03 - Studio17	220	2.5	Pass

CG15060 Blackburn Road

Room name	No. hours > 26°C	% Annual hours > 26°C	Mechanically ventilated check
03 - Studio16	227	2.6	Pass
03 - Studio15	201	2.3	Pass
03 - Studio14	207	2.4	Pass
04 - A1 B1	169	1.9	Pass
04 - A1 B2	174	2.0	Pass
04 - A1 LDK	75	1.6	Pass
04 - A2 LDK	114	2.4	Pass
04 - A2 B1	183	2.1	Pass
04 - A3 B1	172	2.0	Pass
04 - A3 LDK	126	2.7	Pass
04 - A4 LDK	132	2.8	Pass
04 - A4 B1	188	2.1	Pass
04 - A5 LDK	142	3.0	Pass
04 - A5 B1	185	2.1	Pass
04 - A5 B2	187	2.1	Pass
04 - A6 LDK	144	3.0	Pass
04 - A6 B1	224	2.6	Pass
04 - A6 B2	198	2.3	Pass
04 - A6 B3	180	2.1	Pass
04 - A7 B3	154	1.8	Pass
04 - A7 B2	192	2.2	Pass
04 - A7 B1	194	2.2	Pass
04 - A7 LDK	65	1.4	Pass
04 - A8 LDK	99	2.1	Pass
04 - A8 B1	184	2.1	Pass
04 - A8 B2	172	2.0	Pass
04 - Studio2	225	2.6	Pass
04 - Studio3	230	2.6	Pass
04 - Studio4	218	2.5	Pass
04 - Studio5	188	2.1	Pass
04 - Studio6	236	2.7	Pass
04 - Studio7	218	2.5	Pass
04 - Studio8	237	2.7	Pass
04 - Studio9	219	2.5	Pass
04 - Studio10	237	2.7	Pass
04 - Studio11	217	2.5	Pass
04 - Studio12	190	2.2	Pass
04 - Studio13	190	2.2	Pass
04 - Studio30	238	2.7	Pass
04 - Studio29	241	2.8	Pass
04 - Studio28	242	2.8	Pass
04 - Studio27	241	2.8	Pass

Room name	No. hours > 26°C	% Annual hours > 26°C	Mechanically ventilated check
04 - Studio26	227	2.6	Pass
04 - Studio25	226	2.6	Pass
04 - Studio24	237	2.7	Pass
04 - Studio23	241	2.8	Pass
04 - Studio22	242	2.8	Pass
04 - Studio21	240	2.7	Pass
04 - Studio20	236	2.7	Pass
04 - Studio19	217	2.5	Pass
04 - Studio18	228	2.6	Pass
04 - Studio17	221	2.5	Pass
04 - Studio16	226	2.6	Pass
04 - Studio15	201	2.3	Pass
04 - Studio14	207	2.4	Pass

Communal corridors

CIBSE TM59 states that whilst there is no mandatory target for communal corridors, if an operative temperature of 28°C is exceeded for more than 3% of annual hours, then this should be identified as a significant risk within the TM59 overheating report.

Room name	No. hours > 28°C	% Annual hours > 28°C	Corridor overheating risk check
01 - Lobby	0	0.0	No
01 - Lift Lobby	0	0.0	No
01 - Lift Lobby 2	0	0.0	No
01 - Corridor	0	0.0	No
02 - Lobby	0	0.0	No
02 - Lift Lobby	0	0.0	No
02 - Lift Lobby 2	0	0.0	No
02 - Corridor	0	0.0	No
05 - Lobby	0	0.0	No
05 - Lift Lobby	0	0.0	No
05 - Lift Lobby 2	0	0.0	No
05 - Corridor	0	0.0	No
03 - Lobby	0	0.0	No
03 - Lift Lobby	0	0.0	No
03 - Lift Lobby 2	0	0.0	No
03 - Corridor	0	0.0	No
04 - Lobby	0	0.0	No
04 - Lift Lobby	0	0.0	No
04 - Lift Lobby 2	0	0.0	No
04 - Corridor	0	0.0	No

Modelled details & overheating mitigation strategy

Approved document O: Providing Information & Appendix B requires information about the model and the overheating mitigation strategy. The following tables detail the modelling method and mitigation strategies applied to each analysed room. Where multiple active openings per space (windows & louvres) exist they are all listed. Occupancy, equipment and lighting profiles for occupied rooms comply with TM59 section 5.

Modelled occupancy

Room name	Floor area m²	Thermal template	Occupancy profile	Equipment profile	Lighting profile
01 - A1 B1	13.25	TM59 - 2B4P DB	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
01 - A1 B2	13.1	TM59 - 2B4P DB	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
01 - A1 LDK	42.37	TM59 - 2B4P LDK	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
01 - A2 LDK	26.83	TM59 - 1B2P LDK	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
01 - A2 B1	15.38	TM59 - 1B2P DB	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
01 - A3 B1	14.63	TM59 - 1B2P DB	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
01 - A3 LDK	26.92	TM59 - 1B2P LDK	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
01 - A4 LDK	28.07	TM59 - 1B2P LDK	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
01 - A4 B1	16.02	TM59 - 1B2P DB	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
01 - A5 LDK	27.04	TM59 - 2B3P LDK	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
01 - A5 B1	8.86	TM59 - 2B3P SB	Single Bedroom Occupancy	Single Bedroom Equipment	18-23h
01 - A5 B2	13.68	TM59 - 2B3P DB	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
01 - A6 LDK	35.79	TM59 - 3B5P LDK	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
01 - A6 B1	8.76	TM59 - 3B5P SB	Single Bedroom Occupancy	Single Bedroom Equipment	18-23h
01 - A6 B2	15.02	TM59 - 3B5P DB	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
01 - A6 B3	13.94	TM59 - 3B5P DB	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
01 - A7 B3	14.08	TM59 - 3B5P DB - A6/7	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
01 - A7 B2	14.59	TM59 - 3B5P DB - A6/7	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
01 - A7 B1	8.93	TM59 - 3B5P SB - A6/7	Single Bedroom Occupancy	Single Bedroom Equipment	18-23h
01 - A7 LDK	35.74	TM59 - 3B5P LDK - A6/7	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h

CG15060 Blackburn Road

Room name	Floor area m²	Thermal template	Occupancy profile	Equipment profile	Lighting profile
01 - A8 LDK	35.75	TM59 - 2B3P LDK	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
01 - A8 B1	17.42	TM59 - 2B3P DB	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
01 - A8 B2	11.43	TM59 - 2B3P SB	Single Bedroom Occupancy	Single Bedroom Equipment	18-23h
01 - Studio2	17.68	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
01 - Studio3	17.5	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
01 - Studio4	17.77	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
01 - Studio5	17.56	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
01 - Studio6	17.5	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
01 - Studio7	17.66	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
01 - Studio8	17.77	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
01 - Studio9	17.57	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
01 - Studio10	17.71	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
01 - Studio11	17.94	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
01 - Studio12	17.41	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
01 - Studio13	23.08	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
01 - Studio30	17.98	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
01 - Studio29	17.4	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
01 - Studio28	17.49	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
01 - Studio27	17.39	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
01 - Studio26	17.56	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
01 - Studio25	18.09	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
01 - Studio24	17.1	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
01 - Studio23	17.39	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
01 - Studio22	17.55	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
01 - Studio21	17.35	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
01 - Studio20	17.37	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
01 - Studio19	21.58	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
01 - Studio18	21.51	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
01 - Studio17	21.66	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
01 - Studio16	21.49	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
01 - Studio15	24.16	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
01 - Studio14	25.85	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
01 - Lobby	39.65	TM59 - Circulation - Corridors			on continuously
01 - Lift Lobby	13.63	TM59 - Circulation - Corridors			on continuously
01 - Lift Lobby 2	12.93	TM59 - Circulation - Corridors			on continuously
01 - Corridor	97.39	TM59 - Circulation - Corridors			on continuously

CG15060 Blackburn Road

Room name	Floor area m²	Thermal template	Occupancy profile	Equipment profile	Lighting profile
02 - A1 B1	13.25	TM59 - 2B4P DB - A1	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
02 - A1 B2	13.1	TM59 - 2B4P DB - A1	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
02 - A1 LDK	42.37	TM59 - 2B4P LDK - A1	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
02 - A2 LDK	26.83	TM59 - 1B2P LDK	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
02 - A2 B1	15.38	TM59 - 1B2P DB	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
02 - A3 B1	14.63	TM59 - 1B2P DB	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
02 - A3 LDK	26.92	TM59 - 1B2P LDK	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
02 - A4 LDK	28.07	TM59 - 1B2P LDK	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
02 - A4 B1	16.02	TM59 - 1B2P DB	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
02 - A5 LDK	27.04	TM59 - 2B3P LDK - A5	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
02 - A5 B1	8.86	TM59 - 2B3P SB - A5	Single Bedroom Occupancy	Single Bedroom Equipment	18-23h
02 - A5 B2	13.68	TM59 - 2B3P DB - A5	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
02 - A6 LDK	35.79	TM59 - 3B5P LDK	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
02 - A6 B1	8.76	TM59 - 3B5P SB	Single Bedroom Occupancy	Single Bedroom Equipment	18-23h
02 - A6 B2	15.02	TM59 - 3B5P DB	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
02 - A6 B3	13.94	TM59 - 3B5P DB	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
02 - A7 B3	14.08	TM59 - 3B5P DB	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
02 - A7 B2	14.59	TM59 - 3B5P DB	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
02 - A7 B1	8.93	TM59 - 3B5P SB	Single Bedroom Occupancy	Single Bedroom Equipment	18-23h
02 - A7 LDK	35.74	TM59 - 3B5P LDK	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
02 - A8 LDK	35.75	TM59 - 2B3P LDK	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
02 - A8 B1	17.42	TM59 - 2B3P DB	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
02 - A8 B2	11.43	TM59 - 2B3P SB	Single Bedroom Occupancy	Single Bedroom Equipment	18-23h
02 - Studio2	17.68	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h

CG15060 Blackburn Road

Room name	Floor area m²	Thermal template	Occupancy profile	Equipment profile	Lighting profile
02 - Studio3	17.5	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
02 - Studio4	17.77	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
02 - Studio5	17.56	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
02 - Studio6	17.5	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
02 - Studio7	17.66	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
02 - Studio8	17.77	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
02 - Studio9	17.57	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
02 - Studio10	17.71	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
02 - Studio11	17.94	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
02 - Studio12	17.41	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
02 - Studio13	23.08	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
02 - Studio30	17.98	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
02 - Studio29	17.4	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
02 - Studio28	17.49	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
02 - Studio27	17.39	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
02 - Studio26	17.56	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
02 - Studio25	18.09	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
02 - Studio24	17.1	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
02 - Studio23	17.39	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
02 - Studio22	17.55	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
02 - Studio21	17.35	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
02 - Studio20	17.37	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
02 - Studio19	21.58	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
02 - Studio18	21.51	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
02 - Studio17	21.66	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
02 - Studio16	21.49	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
02 - Studio15	24.16	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
02 - Studio14	25.85	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
02 - Lobby	39.65	TM59 - Circulation - Corridors			on continuously
02 - Lift Lobby	13.63	TM59 - Circulation - Corridors			on continuously
02 - Lift Lobby 2	12.93	TM59 - Circulation - Corridors			on continuously
02 - Corridor	97.39	TM59 - Circulation - Corridors			on continuously
05 - A1 B1	13.25	TM59 - 2B4P DB - A1	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
05 - A1 B2	13.1	TM59 - 2B4P DB - A1	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
05 - A1 LDK	42.37	TM59 - 2B4P LDK - A1	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
05 - A2 LDK	26.83	TM59 - 1B2P LDK	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h

CG15060 Blackburn Road

Room name	Floor area m²	Thermal template	Occupancy profile	Equipment profile	Lighting profile
05 - A2 B1	15.38	TM59 - 1B2P DB	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
05 - A3 B1	14.63	TM59 - 1B2P DB	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
05 - A3 LDK	26.92	TM59 - 1B2P LDK	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
05 - A4 LDK	28.07	TM59 - 1B2P LDK	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
05 - A4 B1	16.02	TM59 - 1B2P DB	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
05 - A5 LDK	27.04	TM59 - 2B3P LDK - A5	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
05 - A5 B1	8.86	TM59 - 2B3P SB - A5	Single Bedroom Occupancy	Single Bedroom Equipment	18-23h
05 - A5 B2	13.68	TM59 - 2B3P DB - A5	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
05 - A6 LDK	35.79	TM59 - 3B5P LDK - A6/7	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
05 - A6 B1	8.76	TM59 - 3B5P SB - A6/7	Single Bedroom Occupancy	Single Bedroom Equipment	18-23h
05 - A6 B2	15.02	TM59 - 3B5P DB - A6/7	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
05 - A6 B3	13.94	TM59 - 3B5P DB - A6/7	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
05 - A7 B3	14.08	TM59 - 3B5P DB - A6/7	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
05 - A7 B2	14.59	TM59 - 3B5P DB - A6/7	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
05 - A7 B1	8.93	TM59 - 3B5P SB - A6/7	Single Bedroom Occupancy	Single Bedroom Equipment	18-23h
05 - A7 LDK	35.74	TM59 - 3B5P LDK - A6/7	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
05 - A8 LDK	35.75	TM59 - 2B3P LDK	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
05 - A8 B1	17.42	TM59 - 2B3P DB	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
05 - A8 B2	11.43	TM59 - 2B3P SB	Single Bedroom Occupancy	Single Bedroom Equipment	18-23h
05 - Studio2	17.68	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
05 - Studio3	17.5	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
05 - Studio4	17.77	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
05 - Studio5	17.56	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
05 - Studio6	17.5	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
05 - Studio7	17.66	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
05 - Studio8	17.77	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
05 - Studio9	17.57	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h

CG15060 Blackburn Road

Room name	Floor area m²	Thermal template	Occupancy profile	Equipment profile	Lighting profile
05 - Studio10	17.71	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
05 - Studio11	17.94	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
05 - Studio12	17.41	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
05 - Studio13	23.08	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
05 - Studio30	17.98	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
05 - Studio29	17.4	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
05 - Studio28	17.49	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
05 - Studio27	17.39	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
05 - Studio26	17.56	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
05 - Studio25	18.09	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
05 - Studio24	17.1	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
05 - Studio23	17.39	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
05 - Studio22	17.55	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
05 - Studio21	17.35	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
05 - Studio20	17.37	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
05 - Studio19	21.58	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
05 - Studio18	21.51	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
05 - Studio17	21.66	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
05 - Studio16	21.49	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
05 - Studio15	24.16	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
05 - Studio14	25.85	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
05 - Lobby	39.65	TM59 - Circulation - Corridors			on continuously
05 - Lift Lobby	13.63	TM59 - Circulation - Corridors			on continuously
05 - Lift Lobby 2	12.93	TM59 - Circulation - Corridors			on continuously
05 - Corridor	97.39	TM59 - Circulation - Corridors			on continuously
03 - A1 B1	13.25	TM59 - 2B4P DB - A1	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
03 - A1 B2	13.1	TM59 - 2B4P DB - A1	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
03 - A1 LDK	42.37	TM59 - 2B4P LDK - A1	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
03 - A2 LDK	26.83	TM59 - 1B2P LDK	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
03 - A2 B1	15.38	TM59 - 1B2P DB	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
03 - A3 B1	14.63	TM59 - 1B2P DB	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
03 - A3 LDK	26.92	TM59 - 1B2P LDK	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
03 - A4 LDK	28.07	TM59 - 1B2P LDK	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h

CG15060 Blackburn Road

Room name	Floor area m²	Thermal template	Occupancy profile	Equipment profile	Lighting profile
03 - A4 B1	16.02	TM59 - 1B2P DB	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
03 - A5 LDK	27.04	TM59 - 2B3P LDK - A5	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
03 - A5 B1	8.86	TM59 - 2B3P SB - A5	Single Bedroom Occupancy	Single Bedroom Equipment	18-23h
03 - A5 B2	13.68	TM59 - 2B3P DB - A5	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
03 - A6 LDK	35.79	TM59 - 3B5P LDK	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
03 - A6 B1	8.76	TM59 - 3B5P SB	Single Bedroom Occupancy	Single Bedroom Equipment	18-23h
03 - A6 B2	15.02	TM59 - 3B5P DB	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
03 - A6 B3	13.94	TM59 - 3B5P DB	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
03 - A7 B3	14.08	TM59 - 3B5P DB - A6/7	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
03 - A7 B2	14.59	TM59 - 3B5P DB - A6/7	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
03 - A7 B1	8.93	TM59 - 3B5P SB - A6/7	Single Bedroom Occupancy	Single Bedroom Equipment	18-23h
03 - A7 LDK	35.74	TM59 - 3B5P LDK - A6/7	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
03 - A8 LDK	35.75	TM59 - 2B3P LDK	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
03 - A8 B1	17.42	TM59 - 2B3P DB	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
03 - A8 B2	11.43	TM59 - 2B3P SB	Single Bedroom Occupancy	Single Bedroom Equipment	18-23h
03 - Studio2	17.68	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
03 - Studio3	17.5	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
03 - Studio4	17.77	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
03 - Studio5	17.56	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
03 - Studio6	17.5	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
03 - Studio7	17.66	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
03 - Studio8	17.77	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
03 - Studio9	17.57	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
03 - Studio10	17.71	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
03 - Studio11	17.94	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
03 - Studio12	17.41	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
03 - Studio13	23.08	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
03 - Studio30	17.98	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
03 - Studio29	17.4	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
03 - Studio28	17.49	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
03 - Studio27	17.39	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h

CG15060 Blackburn Road

Room name	Floor area m²	Thermal template	Occupancy profile	Equipment profile	Lighting profile
03 - Studio26	17.56	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
03 - Studio25	18.09	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
03 - Studio24	17.1	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
03 - Studio23	17.39	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
03 - Studio22	17.55	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
03 - Studio21	17.35	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
03 - Studio20	17.37	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
03 - Studio19	21.58	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
03 - Studio18	21.51	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
03 - Studio17	21.66	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
03 - Studio16	21.49	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
03 - Studio15	24.16	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
03 - Studio14	25.85	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
03 - Lobby	39.65	TM59 - Circulation - Corridors			on continuously
03 - Lift Lobby	13.63	TM59 - Circulation - Corridors			on continuously
03 - Lift Lobby 2	12.93	TM59 - Circulation - Corridors			on continuously
03 - Corridor	97.39	TM59 - Circulation - Corridors			on continuously
04 - A1 B1	13.25	TM59 - 2B4P DB - A1	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
04 - A1 B2	13.1	TM59 - 2B4P DB - A1	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
04 - A1 LDK	42.37	TM59 - 2B4P LDK - A1	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
04 - A2 LDK	26.83	TM59 - 1B2P LDK	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
04 - A2 B1	15.38	TM59 - 1B2P DB	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
04 - A3 B1	14.63	TM59 - 1B2P DB	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
04 - A3 LDK	26.92	TM59 - 1B2P LDK	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
04 - A4 LDK	28.07	TM59 - 1B2P LDK	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
04 - A4 B1	16.02	TM59 - 1B2P DB	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
04 - A5 LDK	27.04	TM59 - 2B3P LDK	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
04 - A5 B1	8.86	TM59 - 2B3P SB	Single Bedroom Occupancy	Single Bedroom Equipment	18-23h
04 - A5 B2	13.68	TM59 - 2B3P DB	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h

CG15060 Blackburn Road

Room name	Floor area m²	Thermal template	Occupancy profile	Equipment profile	Lighting profile
04 - A6 LDK	35.79	TM59 - 3B5P LDK	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
04 - A6 B1	8.76	TM59 - 3B5P SB	Single Bedroom Occupancy	Single Bedroom Equipment	18-23h
04 - A6 B2	15.02	TM59 - 3B5P DB	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
04 - A6 B3	13.94	TM59 - 3B5P DB	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
04 - A7 B3	14.08	TM59 - 3B5P DB - A6/7	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
04 - A7 B2	14.59	TM59 - 3B5P DB - A6/7	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
04 - A7 B1	8.93	TM59 - 3B5P SB - A6/7	Single Bedroom Occupancy	Single Bedroom Equipment	18-23h
04 - A7 LDK	35.74	TM59 - 3B5P LDK - A6/7	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
04 - A8 LDK	35.75	TM59 - 2B3P LDK	Living / Kitchen Occupancy	Living / Kitchen Equipment	18-23h
04 - A8 B1	17.42	TM59 - 2B3P DB	Double Bedroom Occupancy	Double Bedroom Equipment	18-23h
04 - A8 B2	11.43	TM59 - 2B3P SB	Single Bedroom Occupancy	Single Bedroom Equipment	18-23h
04 - Studio2	17.68	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
04 - Studio3	17.5	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
04 - Studio4	17.77	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
04 - Studio5	17.56	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
04 - Studio6	17.5	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
04 - Studio7	17.66	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
04 - Studio8	17.77	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
04 - Studio9	17.57	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
04 - Studio10	17.71	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
04 - Studio11	17.94	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
04 - Studio12	17.41	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
04 - Studio13	23.08	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
04 - Studio30	17.98	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
04 - Studio29	17.4	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
04 - Studio28	17.49	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
04 - Studio27	17.39	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
04 - Studio26	17.56	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
04 - Studio25	18.09	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
04 - Studio24	17.1	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
04 - Studio23	17.39	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
04 - Studio22	17.55	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
04 - Studio21	17.35	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
04 - Studio20	17.37	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h

CG15060 Blackburn Road

Room name	Floor area m²	Thermal template	Occupancy profile	Equipment profile	Lighting profile
04 - Studio19	21.58	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
04 - Studio18	21.51	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
04 - Studio17	21.66	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
04 - Studio16	21.49	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
04 - Studio15	24.16	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
04 - Studio14	25.85	TM59 - Studio	Studio Occupancy	Studio Equipment	18-23h
04 - Lobby	39.65	TM59 - Circulation - Corridors			on continuously
04 - Lift Lobby	13.63	TM59 - Circulation - Corridors			on continuously
04 - Lift Lobby 2	12.93	TM59 - Circulation - Corridors			on continuously
04 - Corridor	97.39	TM59 - Circulation - Corridors			on continuously

Modelled openings

Room name	Window to wall ratio %	Window g-value (EN 410)	Opening gross area m²	Opening free area (avg) %	Opening free area / floor area ratio %	Opening profile(s)
01 - A1 B1	16.74	0.3504	0.78, 0.79, 1.8	80.0, 80.0, 100.0	23.06	INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
01 - A1 B2	16.94	0.3504	1.79, 0.78, 0.78	100.0, 80.0, 80.0	23.19	INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
01 - A1 LDK	16.07	0.3504, 0.3504	1.96, 1.27, 0.73, 0.61, 0.78, 0.79, 0.79, 0.78, 0.61, 2.29	80.0, 80.0, 20.0, 20.0, 80.0, 80.0, 80.0, 80.0, 20.0, 100.0	18.35	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
01 - A2 LDK	27.64	0.3504, 0.3504	1.97, 1.27, 0.73, 0.79, 0.79, 1.8	80.0, 80.0, 20.0, 80.0, 80.0, 100.0	21.63	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
01 - A2 B1	10.88	0.3504	0.78, 0.78, 1.79	80.0, 80.0, 100.0	19.75	INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
01 - A3 B1	14.59	0.3504	0.78, 0.78, 1.79	80.0, 80.0, 100.0	20.77	INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually

CG15060 Blackburn Road

Room name	Window to wall ratio %	Window g-value (EN 410)	Opening gross area m²	Opening free area (avg) %	Opening free area / floor area ratio %	Opening profile(s)
01 - A3 LDK	27.52	0.3504, 0.3504	1.98, 1.26, 0.73, 0.79, 0.78, 1.79	80.0, 80.0, 20.0, 80.0, 80.0, 100.0	21.49	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
01 - A4 LDK	32.04	0.3504	0.78, 0.78, 1.97, 1.25, 0.72, 1.8	80.0, 80.0, 80.0, 80.0, 20.0, 100.0	20.55	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
01 - A4 B1	8.58	0.3504	0.78, 0.78, 1.8	80.0, 80.0, 100.0	19.03	INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
01 - A5 LDK	32.7	0.3504	0.78, 0.79, 1.99, 1.25, 0.72, 1.81	80.0, 80.0, 80.0, 80.0, 20.0, 100.0	21.46	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
01 - A5 B1	19.45	0.3504	1.81, 0.98, 0.39	100.0, 80.0, 20.0	30.16	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
01 - A5 B2	16.04	0.3504	1.8, 0.78, 0.77	100.0, 80.0, 80.0	22.22	INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually

CG15060 Blackburn Road

Room name	Window to wall ratio %	Window g-value (EN 410)	Opening gross area m²	Opening free area (avg) %	Opening free area / floor area ratio %	Opening profile(s)
01 - A6 LDK	25.59	0.3504, 0.3504	0.79, 0.79, 1.98, 1.26, 0.72, 1.81	80.0, 80.0, 80.0, 80.0, 20.0, 100.0	16.23	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
01 - A6 B1	21.94	0.3504	1.81, 0.97, 0.39	100.0, 80.0, 20.0	30.41	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
01 - A6 B2	19.29	0.3504	0.78, 0.79, 1.81	80.0, 80.0, 100.0	20.41	INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
01 - A6 B3	14.99	0.3504	1.81, 0.78, 0.78	100.0, 80.0, 80.0	21.94	INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
01 - A7 B3	14.84	0.3504	0.79, 0.78, 1.8	80.0, 80.0, 100.0	21.7	INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
01 - A7 B2	19.82	0.3504	0.79, 0.78, 1.81	80.0, 80.0, 100.0	21.01	INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually

CG15060 Blackburn Road

Room name	Window to wall ratio %	Window g-value (EN 410)	Opening gross area m²	Opening free area (avg) %	Opening free area / floor area ratio %	Opening profile(s)
01 - A7 B1	22.0	0.3504	0.99, 0.39, 1.79	80.0, 20.0, 100.0	29.79	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
01 - A7 LDK	29.96	0.3504, 0.3504	0.78, 0.78, 1.98, 1.26, 0.72, 1.8	80.0, 80.0, 80.0, 80.0, 20.0, 100.0	16.18	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
01 - A8 LDK	36.48	0.3504	1.8, 2.11, 1.11, 0.64	100.0, 80.0, 80.0, 20.0	12.6	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
01 - A8 B1	18.17	0.3504	0.78, 0.78, 1.81	80.0, 80.0, 100.0	17.55	INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
01 - A8 B2	20.28	0.3504	0.78, 0.78, 0.61, 1.8	80.0, 80.0, 20.0, 100.0	27.73	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
01 - Studio2	27.17	0.3504	1.16, 1.16	80.0, 80.0	10.5	ADO.Section_26a
01 - Studio3	27.47	0.3504	1.16, 1.15	80.0, 80.0	10.56	ADO.Section_26a
01 - Studio4	26.77	0.3504	1.16, 1.16	80.0, 80.0	10.44	ADO.Section_26a
01 - Studio5	27.4	0.3504	1.16, 1.16	80.0, 80.0	10.57	ADO.Section_26a
01 - Studio6	27.59	0.3504	1.16, 1.16	80.0, 80.0	10.61	ADO.Section_26a

CG15060 Blackburn Road

Room name	Window to wall ratio %	Window g-value (EN 410)	Opening gross area m²	Opening free area (avg) %	Opening free area / floor area ratio %	Opening profile(s)
01 - Studio7	27.47	0.3504	1.16, 1.15	80.0, 80.0	10.46	ADO.Section_26a
01 - Studio8	27.05	0.3504	1.16, 1.16	80.0, 80.0	10.44	ADO.Section_26a
01 - Studio9	27.7	0.3504	1.16, 1.16	80.0, 80.0	10.56	ADO.Section_26a
01 - Studio10	27.36	0.3504	1.16, 1.16	80.0, 80.0	10.48	ADO.Section_26a
01 - Studio11	27.0	0.3504	1.16, 1.16	80.0, 80.0	10.35	ADO.Section_26a
01 - Studio12	25.31	0.3504	1.16, 1.16	80.0, 80.0	10.66	ADO.Section_26a
01 - Studio13	9.88	0.3504	1.16, 1.16	80.0, 80.0	8.04	ADO.Section_26a
01 - Studio30	15.4	0.3504, 0.3504	1.16, 1.16	80.0, 80.0	10.32	ADO.Section_26a
01 - Studio29	27.35	0.3504, 0.3504	1.16, 1.15	80.0, 80.0	10.62	ADO.Section_26a
01 - Studio28	26.82	0.3504, 0.3504	1.16, 1.16	80.0, 80.0	10.61	ADO.Section_26a
01 - Studio27	27.22	0.3504, 0.3504	1.16, 1.15	80.0, 80.0	10.63	ADO.Section_26a
01 - Studio26	25.38	0.3504, 0.3504	1.16, 1.16	80.0, 80.0	10.57	ADO.Section_26a
01 - Studio25	24.62	0.3504, 0.3504	1.16, 1.16	80.0, 80.0	10.26	ADO.Section_26a
01 - Studio24	27.95	0.3504, 0.3504	1.16, 1.16	80.0, 80.0	10.85	ADO.Section_26a
01 - Studio23	27.42	0.3504, 0.3504	1.16, 1.16	80.0, 80.0	10.67	ADO.Section_26a
01 - Studio22	27.03	0.3504, 0.3504	1.16, 1.15	80.0, 80.0	10.53	ADO.Section_26a
01 - Studio21	27.63	0.3504, 0.3504	1.16, 1.16	80.0, 80.0	10.7	ADO.Section_26a
01 - Studio20	27.61	0.3504, 0.3504	1.16, 1.16	80.0, 80.0	10.69	ADO.Section_26a
01 - Studio19	19.21	0.3504, 0.3504	1.16, 1.16	80.0, 80.0	8.6	ADO.Section_26a
01 - Studio18	27.64	0.3504, 0.3504	1.16, 1.16	80.0, 80.0	8.63	ADO.Section_26a
01 - Studio17	26.97	0.3504, 0.3504	1.16, 1.16	80.0, 80.0	8.57	ADO.Section_26a
01 - Studio16	27.57	0.3504, 0.3504	1.16, 1.16	80.0, 80.0	8.64	ADO.Section_26a
01 - Studio15	19.75	0.3504, 0.3504	1.16, 1.16	80.0, 80.0	7.68	ADO.Section_26a

CG15060 Blackburn Road

Room name	Window to wall ratio %	Window g-value (EN 410)	Opening gross area m²	Opening free area (avg) %	Opening free area / floor area ratio %	Opening profile(s)
01 - Studio14	6.87	0.3504, 0.3504	1.16, 1.16	80.0, 80.0	7.18	ADO.Section_26a
01 - Lobby	9.62	0.3504	1.03, 1.03, 1.03, 1.03, 1.03	20.0, 20.0, 20.0, 20.0, 20.0	2.6	ADO.AlwaysOff
01 - Lift Lobby	N/A				0.0	
01 - Lift Lobby 2	N/A				0.0	
01 - Corridor	46.35	0.3504	1.1, 1.09	20.0, 20.0	0.45	ADO.AlwaysOff
02 - A1 B1	16.74	0.3504	0.78, 0.79, 1.79	80.0, 80.0, 100.0	22.99	INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
02 - A1 B2	16.94	0.3504	1.81, 0.78, 0.78	100.0, 80.0, 80.0	23.34	INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
02 - A1 LDK	16.07	0.3504, 0.3504	1.96, 1.27, 0.73, 0.61, 0.78, 0.79, 0.79, 0.78, 0.61, 2.29	80.0, 80.0, 20.0, 20.0, 80.0, 80.0, 80.0, 80.0, 20.0, 100.0	18.35	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
02 - A2 LDK	27.64	0.3504, 0.3504	1.97, 1.27, 0.73, 0.79, 0.79, 1.78	80.0, 80.0, 20.0, 80.0, 80.0, 100.0	21.55	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
02 - A2 B1	10.88	0.3504	0.78, 0.78, 1.8	80.0, 80.0, 100.0	19.82	INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually

CG15060 Blackburn Road

Room name	Window to wall ratio %	Window g-value (EN 410)	Opening gross area m²	Opening free area (avg) %	Opening free area / floor area ratio %	Opening profile(s)
02 - A3 B1	14.59	0.3504	0.78, 0.78, 1.79	80.0, 80.0, 100.0	20.77	INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
02 - A3 LDK	27.52	0.3504, 0.3504	1.98, 1.26, 0.73, 0.79, 0.78, 1.8	80.0, 80.0, 20.0, 80.0, 80.0, 100.0	21.52	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
02 - A4 LDK	32.04	0.3504	0.78, 0.78, 1.97, 1.25, 0.72, 1.8	80.0, 80.0, 80.0, 80.0, 20.0, 100.0	20.55	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
02 - A4 B1	8.58	0.3504	0.78, 0.78, 1.8	80.0, 80.0, 100.0	19.03	INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
02 - A5 LDK	32.7	0.3504	0.78, 0.79, 1.99, 1.25, 0.72, 1.79	80.0, 80.0, 80.0, 80.0, 20.0, 100.0	21.38	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
02 - A5 B1	19.45	0.3504	1.8, 0.98, 0.39	100.0, 80.0, 20.0	30.05	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually

CG15060 Blackburn Road

Room name	Window to wall ratio %	Window g-value (EN 410)	Opening gross area m²	Opening free area (avg) %	Opening free area / floor area ratio %	Opening profile(s)
02 - A5 B2	16.04	0.3504	1.8, 0.78, 0.77	100.0, 80.0, 80.0	22.22	INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
02 - A6 LDK	25.59	0.3504, 0.3504	0.79, 0.79, 1.98, 1.26, 0.72, 1.79	80.0, 80.0, 80.0, 80.0, 20.0, 100.0	16.18	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
02 - A6 B1	21.94	0.3504	1.8, 0.97, 0.39	100.0, 80.0, 20.0	30.3	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
02 - A6 B2	19.29	0.3504	0.78, 0.79, 1.8	80.0, 80.0, 100.0	20.35	INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
02 - A6 B3	14.99	0.3504	1.8, 0.78, 0.78	100.0, 80.0, 80.0	21.87	INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
02 - A7 B3	14.84	0.3504	0.79, 0.78, 1.81	80.0, 80.0, 100.0	21.78	INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually

CG15060 Blackburn Road

Room name	Window to wall ratio %	Window g-value (EN 410)	Opening gross area m²	Opening free area (avg) %	Opening free area / floor area ratio %	Opening profile(s)
02 - A7 B2	19.82	0.3504	0.79, 0.78, 1.77	80.0, 80.0, 100.0	20.74	INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
02 - A7 B1	22.0	0.3504	0.99, 0.39, 1.81	80.0, 20.0, 100.0	30.01	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
02 - A7 LDK	29.96	0.3504, 0.3504	0.78, 0.78, 1.98, 1.26, 0.72, 1.8	80.0, 80.0, 80.0, 80.0, 20.0, 100.0	16.18	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
02 - A8 LDK	36.48	0.3504	1.8, 2.11, 1.11, 0.64	100.0, 80.0, 80.0, 20.0	12.6	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
02 - A8 B1	18.17	0.3504	0.78, 0.78, 1.76	80.0, 80.0, 100.0	17.27	INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
02 - A8 B2	20.28	0.3504	0.78, 0.78, 0.61, 1.8	80.0, 80.0, 20.0, 100.0	27.73	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
02 - Studio2	27.17	0.3504	1.16, 1.16	80.0, 80.0	10.5	ADO.Section_26a

CG15060 Blackburn Road

Room name	Window to wall ratio %	Window g-value (EN 410)	Opening gross area m²	Opening free area (avg) %	Opening free area / floor area ratio %	Opening profile(s)
02 - Studio3	27.47	0.3504	1.16, 1.15	80.0, 80.0	10.56	ADO.Section_26a
02 - Studio4	26.77	0.3504	1.16, 1.16	80.0, 80.0	10.44	ADO.Section_26a
02 - Studio5	27.4	0.3504	1.16, 1.16	80.0, 80.0	10.57	ADO.Section_26a
02 - Studio6	27.59	0.3504	1.16, 1.16	80.0, 80.0	10.61	ADO.Section_26a
02 - Studio7	27.47	0.3504	1.16, 1.15	80.0, 80.0	10.46	ADO.Section_26a
02 - Studio8	27.05	0.3504	1.16, 1.16	80.0, 80.0	10.44	ADO.Section_26a
02 - Studio9	27.7	0.3504	1.16, 1.16	80.0, 80.0	10.56	ADO.Section_26a
02 - Studio10	27.36	0.3504	1.16, 1.16	80.0, 80.0	10.48	ADO.Section_26a
02 - Studio11	27.0	0.3504	1.16, 1.16	80.0, 80.0	10.35	ADO.Section_26a
02 - Studio12	25.31	0.3504	1.16, 1.16	80.0, 80.0	10.66	ADO.Section_26a
02 - Studio13	9.88	0.3504	1.16, 1.16	80.0, 80.0	8.04	ADO.Section_26a
02 - Studio30	15.4	0.3504, 0.3504	1.16, 1.16	80.0, 80.0	10.32	ADO.Section_26a
02 - Studio29	27.35	0.3504, 0.3504	1.16, 1.15	80.0, 80.0	10.62	ADO.Section_26a
02 - Studio28	26.82	0.3504, 0.3504	1.16, 1.16	80.0, 80.0	10.61	ADO.Section_26a
02 - Studio27	27.22	0.3504, 0.3504	1.16, 1.15	80.0, 80.0	10.63	ADO.Section_26a
02 - Studio26	25.38	0.3504, 0.3504	1.16, 1.16	80.0, 80.0	10.57	ADO.Section_26a
02 - Studio25	24.62	0.3504, 0.3504	1.16, 1.16	80.0, 80.0	10.26	ADO.Section_26a
02 - Studio24	27.95	0.3504, 0.3504	1.16, 1.16	80.0, 80.0	10.85	ADO.Section_26a
02 - Studio23	27.42	0.3504, 0.3504	1.16, 1.16	80.0, 80.0	10.67	ADO.Section_26a
02 - Studio22	27.03	0.3504, 0.3504	1.16, 1.15	80.0, 80.0	10.53	ADO.Section_26a
02 - Studio21	27.63	0.3504, 0.3504	1.16, 1.16	80.0, 80.0	10.7	ADO.Section_26a
02 - Studio20	27.61	0.3504, 0.3504	1.16, 1.16	80.0, 80.0	10.69	ADO.Section_26a
02 - Studio19	19.21	0.3504, 0.3504	1.16, 1.16	80.0, 80.0	8.6	ADO.Section_26a

CG15060 Blackburn Road

Room name	Window to wall ratio %	Window g-value (EN 410)	Opening gross area m²	Opening free area (avg) %	Opening free area / floor area ratio %	Opening profile(s)
02 - Studio18	27.64	0.3504, 0.3504	1.16, 1.16	80.0, 80.0	8.63	ADO.Section_26a
02 - Studio17	26.97	0.3504, 0.3504	1.16, 1.16	80.0, 80.0	8.57	ADO.Section_26a
02 - Studio16	27.57	0.3504, 0.3504	1.16, 1.16	80.0, 80.0	8.64	ADO.Section_26a
02 - Studio15	19.75	0.3504, 0.3504	1.16, 1.16	80.0, 80.0	7.68	ADO.Section_26a
02 - Studio14	6.87	0.3504, 0.3504	1.16, 1.16	80.0, 80.0	7.18	ADO.Section_26a
02 - Lobby	9.62	0.3504	1.03, 1.03, 1.03, 1.03, 1.03	20.0, 20.0, 20.0, 20.0, 20.0	2.6	ADO.AlwaysOff
02 - Lift Lobby	N/A				0.0	
02 - Lift Lobby 2	N/A				0.0	
02 - Corridor	46.35	0.3504	1.1, 1.09	20.0, 20.0	0.45	ADO.AlwaysOff
05 - A1 B1	16.74	0.3504	0.78, 0.79, 1.81	80.0, 80.0, 100.0	23.14	INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
05 - A1 B2	16.94	0.3504	1.81, 0.78, 0.78	100.0, 80.0, 80.0	23.34	INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
05 - A1 LDK	16.07	0.3504, 0.3504	1.96, 1.27, 0.73, 0.61, 0.78, 0.79, 0.79, 0.78, 0.61, 2.29	80.0, 80.0, 20.0, 20.0, 80.0, 80.0, 80.0, 80.0, 20.0, 100.0	18.35	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
05 - A2 LDK	27.64	0.3504, 0.3504	1.97, 1.27, 0.73, 0.79, 0.79, 1.81	80.0, 80.0, 20.0, 80.0, 80.0, 100.0	21.66	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually

Room name	Window to wall ratio %	Window g-value (EN 410)	Opening gross area m²	Opening free area (avg) %	Opening free area / floor area ratio %	Opening profile(s)
05 - A2 B1	10.88	0.3504	0.78, 0.78, 1.81	80.0, 80.0, 100.0	19.88	INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
05 - A3 B1	14.59	0.3504	0.78, 0.78, 1.8	80.0, 80.0, 100.0	20.83	INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
05 - A3 LDK	27.52	0.3504, 0.3504	1.98, 1.26, 0.73, 0.79, 0.78, 1.81	80.0, 80.0, 20.0, 80.0, 80.0, 100.0	21.56	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
05 - A4 LDK	32.04	0.3504	0.78, 0.78, 1.97, 1.25, 0.72, 1.8	80.0, 80.0, 80.0, 80.0, 20.0, 100.0	20.55	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
05 - A4 B1	8.58	0.3504	0.78, 0.78, 1.79	80.0, 80.0, 100.0	18.96	INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
05 - A5 LDK	32.7	0.3504	0.78, 0.79, 1.99, 1.25, 0.72, 1.79	80.0, 80.0, 80.0, 80.0, 20.0, 100.0	21.38	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually

CG15060 Blackburn Road

Room name	Window to wall ratio %	Window g-value (EN 410)	Opening gross area m²	Opening free area (avg) %	Opening free area / floor area ratio %	Opening profile(s)
05 - A5 B1	19.45	0.3504	1.8, 0.98, 0.39	100.0, 80.0, 20.0	30.05	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
05 - A5 B2	16.04	0.3504	1.81, 0.78, 0.77	100.0, 80.0, 80.0	22.3	INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
05 - A6 LDK	25.59	0.3504, 0.3504	0.79, 0.79, 1.98, 1.26, 0.72, 1.81	80.0, 80.0, 80.0, 80.0, 20.0, 100.0	16.23	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
05 - A6 B1	21.94	0.3504	1.8, 0.97, 0.39	100.0, 80.0, 20.0	30.3	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
05 - A6 B2	19.29	0.3504	0.78, 0.79, 1.8	80.0, 80.0, 100.0	20.35	INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
05 - A6 B3	14.99	0.3504	1.81, 0.78, 0.78	100.0, 80.0, 80.0	21.94	INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually

Room name	Window to wall ratio %	Window g-value (EN 410)	Opening gross area m²	Opening free area (avg) %	Opening free area / floor area ratio %	Opening profile(s)
05 - A7 B3	14.84	0.3504	0.79, 0.78, 1.77	80.0, 80.0, 100.0	21.49	INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
05 - A7 B2	19.82	0.3504	0.79, 0.78, 1.8	80.0, 80.0, 100.0	20.95	INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
05 - A7 B1	22.0	0.3504	0.99, 0.39, 1.81	80.0, 20.0, 100.0	30.01	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
05 - A7 LDK	29.96	0.3504, 0.3504	0.78, 0.78, 1.98, 1.26, 0.72, 1.81	80.0, 80.0, 80.0, 80.0, 20.0, 100.0	16.21	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
05 - A8 LDK	36.48	0.3504	1.8, 2.11, 1.11, 0.64	100.0, 80.0, 80.0, 20.0	12.6	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
05 - A8 B1	18.17	0.3504	0.78, 0.78, 1.79	80.0, 80.0, 100.0	17.44	INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually

CG15060 Blackburn Road

Room name	Window to wall ratio %	Window g-value (EN 410)	Opening gross area m²	Opening free area (avg) %	Opening free area / floor area ratio %	Opening profile(s)
05 - A8 B2	20.28	0.3504	0.78, 0.78, 0.61, 1.81	80.0, 80.0, 20.0, 100.0	27.82	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
05 - Studio2	27.17	0.3504	1.16, 1.16, 1.81	80.0, 80.0, 100.0	20.74	ADO.Section_26a, INTERNAL DOOR ANNUAL
05 - Studio3	27.47	0.3504	1.16, 1.15, 1.81	80.0, 80.0, 100.0	20.9	ADO.Section_26a, INTERNAL DOOR ANNUAL
05 - Studio4	26.77	0.3504	1.16, 1.16, 1.81	80.0, 80.0, 100.0	20.63	ADO.Section_26a, INTERNAL DOOR ANNUAL
05 - Studio5	27.4	0.3504	1.16, 1.16, 1.78	80.0, 80.0, 100.0	20.71	ADO.Section_26a, INTERNAL DOOR ANNUAL
05 - Studio6	27.59	0.3504	1.16, 1.16, 1.8	80.0, 80.0, 100.0	20.89	ADO.Section_26a, INTERNAL DOOR ANNUAL
05 - Studio7	27.47	0.3504	1.16, 1.15, 1.8	80.0, 80.0, 100.0	20.66	ADO.Section_26a, INTERNAL DOOR ANNUAL
05 - Studio8	27.05	0.3504	1.16, 1.16, 1.79	80.0, 80.0, 100.0	20.52	ADO.Section_26a, INTERNAL DOOR ANNUAL
05 - Studio9	27.7	0.3504	1.16, 1.16, 1.81	80.0, 80.0, 100.0	20.87	ADO.Section_26a, INTERNAL DOOR ANNUAL

CG15060 Blackburn Road

Room name	Window to wall ratio %	Window g-value (EN 410)	Opening gross area m²	Opening free area (avg) %	Opening free area / floor area ratio %	Opening profile(s)
05 - Studio10	27.36	0.3504	1.16, 1.16, 1.8	80.0, 80.0, 100.0	20.64	ADO.Section_26a, INTERNAL DOOR ANNUAL
05 - Studio11	27.0	0.3504	1.16, 1.16, 1.79	80.0, 80.0, 100.0	20.32	ADO.Section_26a, INTERNAL DOOR ANNUAL
05 - Studio12	25.31	0.3504	1.16, 1.16, 1.79	80.0, 80.0, 100.0	20.94	ADO.Section_26a, INTERNAL DOOR ANNUAL
05 - Studio13	9.88	0.3504	1.16, 1.16, 1.8	80.0, 80.0, 100.0	15.84	ADO.Section_26a, INTERNAL DOOR ANNUAL
05 - Studio30	15.4	0.3504, 0.3504	1.16, 1.16, 1.82	80.0, 80.0, 100.0	20.44	ADO.Section_26a, INTERNAL DOOR ANNUAL
05 - Studio29	27.35	0.3504, 0.3504	1.16, 1.15, 1.81	80.0, 80.0, 100.0	21.02	ADO.Section_26a, INTERNAL DOOR ANNUAL
05 - Studio28	26.82	0.3504, 0.3504	1.82, 1.16, 1.16	100.0, 80.0, 80.0	21.02	ADO.Section_26a, INTERNAL DOOR ANNUAL
05 - Studio27	27.22	0.3504, 0.3504	1.16, 1.15, 1.81	80.0, 80.0, 100.0	21.04	ADO.Section_26a, INTERNAL DOOR ANNUAL
05 - Studio26	25.38	0.3504, 0.3504	1.16, 1.16, 1.81	80.0, 80.0, 100.0	20.88	ADO.Section_26a, INTERNAL DOOR ANNUAL

Room name	Window to wall ratio %	Window g-value (EN 410)	Opening gross area m²	Opening free area (avg) %	Opening free area / floor area ratio %	Opening profile(s)
05 - Studio25	24.62	0.3504, 0.3504	1.16, 1.16, 1.8	80.0, 80.0, 100.0	20.21	ADO.Section_26a, INTERNAL DOOR ANNUAL
05 - Studio24	27.95	0.3504, 0.3504	1.16, 1.16, 1.81	80.0, 80.0, 100.0	21.44	ADO.Section_26a, INTERNAL DOOR ANNUAL
05 - Studio23	27.42	0.3504, 0.3504	1.16, 1.16, 1.81	80.0, 80.0, 100.0	21.08	ADO.Section_26a, INTERNAL DOOR ANNUAL
05 - Studio22	27.03	0.3504, 0.3504	1.8, 1.16, 1.15	100.0, 80.0, 80.0	20.79	ADO.Section_26a, INTERNAL DOOR ANNUAL
05 - Studio21	27.63	0.3504, 0.3504	1.16, 1.16, 1.8	80.0, 80.0, 100.0	21.07	ADO.Section_26a, INTERNAL DOOR ANNUAL
05 - Studio20	27.61	0.3504, 0.3504	1.16, 1.16, 1.8	80.0, 80.0, 100.0	21.05	ADO.Section_26a, INTERNAL DOOR ANNUAL
05 - Studio19	19.21	0.3504, 0.3504	1.16, 1.16, 1.78	80.0, 80.0, 100.0	16.85	ADO.Section_26a, INTERNAL DOOR ANNUAL
05 - Studio18	27.64	0.3504, 0.3504	1.16, 1.16, 1.8	80.0, 80.0, 100.0	17.0	ADO.Section_26a, INTERNAL DOOR ANNUAL
05 - Studio17	26.97	0.3504, 0.3504	1.16, 1.16, 1.81	80.0, 80.0, 100.0	16.93	ADO.Section_26a, INTERNAL DOOR ANNUAL

CG15060 Blackburn Road

Room name	Window to wall ratio %	Window g-value (EN 410)	Opening gross area m²	Opening free area (avg) %	Opening free area / floor area ratio %	Opening profile(s)
05 - Studio16	27.57	0.3504, 0.3504	1.16, 1.16, 1.79	80.0, 80.0, 100.0	16.97	ADO.Section_26a, INTERNAL DOOR ANNUAL
05 - Studio15	19.75	0.3504, 0.3504	1.16, 1.16, 1.81	80.0, 80.0, 100.0	15.17	ADO.Section_26a, INTERNAL DOOR ANNUAL
05 - Studio14	6.87	0.3504, 0.3504	1.16, 1.16, 1.8	80.0, 80.0, 100.0	14.14	ADO.Section_26a, INTERNAL DOOR ANNUAL
05 - Lobby	9.62	0.3504	1.03, 1.03, 1.03, 1.03, 1.03	20.0, 20.0, 20.0, 20.0, 20.0	2.6	ADO.AlwaysOff
05 - Lift Lobby	N/A				0.0	
05 - Lift Lobby 2	N/A				0.0	
05 - Corridor	46.35	0.3504	1.1, 1.09	20.0, 20.0	0.45	ADO.AlwaysOff
03 - A1 B1	16.74	0.3504	0.78, 0.79, 1.79	80.0, 80.0, 100.0	22.99	INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
03 - A1 B2	16.94	0.3504	1.81, 0.78, 0.78	100.0, 80.0, 80.0	23.34	INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
03 - A1 LDK	16.07	0.3504, 0.3504	1.96, 1.27, 0.73, 0.61, 0.78, 0.79, 0.79, 0.78, 0.61, 2.29	80.0, 80.0, 20.0, 20.0, 80.0, 80.0, 80.0, 80.0, 20.0, 100.0	18.35	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually

CG15060 Blackburn Road

Room name	Window to wall ratio %	Window g-value (EN 410)	Opening gross area m²	Opening free area (avg) %	Opening free area / floor area ratio %	Opening profile(s)
03 - A2 LDK	27.64	0.3504, 0.3504	1.97, 1.27, 0.73, 0.79, 0.79, 1.78	80.0, 80.0, 20.0, 80.0, 80.0, 100.0	21.55	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
03 - A2 B1	10.88	0.3504	0.78, 0.78, 1.8	80.0, 80.0, 100.0	19.82	INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
03 - A3 B1	14.59	0.3504	0.78, 0.78, 1.79	80.0, 80.0, 100.0	20.77	INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
03 - A3 LDK	27.52	0.3504, 0.3504	1.98, 1.26, 0.73, 0.79, 0.78, 1.8	80.0, 80.0, 20.0, 80.0, 80.0, 100.0	21.52	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
03 - A4 LDK	32.04	0.3504	0.78, 0.78, 1.97, 1.25, 0.72, 1.8	80.0, 80.0, 80.0, 80.0, 20.0, 100.0	20.55	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
03 - A4 B1	8.58	0.3504	0.78, 0.78, 1.8	80.0, 80.0, 100.0	19.03	INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually

CG15060 Blackburn Road

Room name	Window to wall ratio %	Window g-value (EN 410)	Opening gross area m²	Opening free area (avg) %	Opening free area / floor area ratio %	Opening profile(s)
03 - A5 LDK	32.7	0.3504	0.78, 0.79, 1.99, 1.25, 0.72, 1.79	80.0, 80.0, 80.0, 80.0, 20.0, 100.0	21.38	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
03 - A5 B1	19.45	0.3504	1.8, 0.98, 0.39	100.0, 80.0, 20.0	30.05	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
03 - A5 B2	16.04	0.3504	1.8, 0.78, 0.77	100.0, 80.0, 80.0	22.22	INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
03 - A6 LDK	25.59	0.3504, 0.3504	0.79, 0.79, 1.98, 1.26, 0.72, 1.79	80.0, 80.0, 80.0, 80.0, 20.0, 100.0	16.18	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
03 - A6 B1	21.94	0.3504	1.8, 0.97, 0.39	100.0, 80.0, 20.0	30.3	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
03 - A6 B2	19.29	0.3504	0.78, 0.79, 1.8	80.0, 80.0, 100.0	20.35	INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually

Room name	Window to wall ratio %	Window g-value (EN 410)	Opening gross area m²	Opening free area (avg) %	Opening free area / floor area ratio %	Opening profile(s)
03 - A6 B3	14.99	0.3504	1.8, 0.78, 0.78	100.0, 80.0, 80.0	21.87	INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
03 - A7 B3	14.84	0.3504	0.79, 0.78, 1.81	80.0, 80.0, 100.0	21.78	INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
03 - A7 B2	19.82	0.3504	0.79, 0.78, 1.77	80.0, 80.0, 100.0	20.74	INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
03 - A7 B1	22.0	0.3504	0.99, 0.39, 1.81	80.0, 20.0, 100.0	30.01	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
03 - A7 LDK	29.96	0.3504, 0.3504	0.78, 0.78, 1.98, 1.26, 0.72, 1.8	80.0, 80.0, 80.0, 80.0, 20.0, 100.0	16.18	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
03 - A8 LDK	36.48	0.3504	1.8, 2.11, 1.11, 0.64	100.0, 80.0, 80.0, 20.0	12.6	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually

Room name	Window to wall ratio %	Window g-value (EN 410)	Opening gross area m²	Opening free area (avg) %	Opening free area / floor area ratio %	Opening profile(s)
03 - A8 B1	18.17	0.3504	0.78, 0.78, 1.76	80.0, 80.0, 100.0	17.27	INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
03 - A8 B2	20.28	0.3504	0.78, 0.78, 0.61, 1.8	80.0, 80.0, 20.0, 100.0	27.73	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
03 - Studio2	27.17	0.3504	1.16, 1.16	80.0, 80.0	10.5	ADO.Section_26a
03 - Studio3	27.47	0.3504	1.16, 1.15	80.0, 80.0	10.56	ADO.Section_26a
03 - Studio4	26.77	0.3504	1.16, 1.16	80.0, 80.0	10.44	ADO.Section_26a
03 - Studio5	27.4	0.3504	1.16, 1.16	80.0, 80.0	10.57	ADO.Section_26a
03 - Studio6	27.59	0.3504	1.16, 1.16	80.0, 80.0	10.61	ADO.Section_26a
03 - Studio7	27.47	0.3504	1.16, 1.15	80.0, 80.0	10.46	ADO.Section_26a
03 - Studio8	27.05	0.3504	1.16, 1.16	80.0, 80.0	10.44	ADO.Section_26a
03 - Studio9	27.7	0.3504	1.16, 1.16	80.0, 80.0	10.56	ADO.Section_26a
03 - Studio10	27.36	0.3504	1.16, 1.16	80.0, 80.0	10.48	ADO.Section_26a
03 - Studio11	27.0	0.3504	1.16, 1.16	80.0, 80.0	10.35	ADO.Section_26a
03 - Studio12	25.31	0.3504	1.16, 1.16	80.0, 80.0	10.66	ADO.Section_26a
03 - Studio13	9.88	0.3504	1.16, 1.16	80.0, 80.0	8.04	ADO.Section_26a
03 - Studio30	15.4	0.3504, 0.3504	1.16, 1.16	80.0, 80.0	10.32	ADO.Section_26a
03 - Studio29	27.35	0.3504, 0.3504	1.16, 1.15	80.0, 80.0	10.62	ADO.Section_26a
03 - Studio28	26.82	0.3504, 0.3504	1.16, 1.16	80.0, 80.0	10.61	ADO.Section_26a
03 - Studio27	27.22	0.3504, 0.3504	1.16, 1.15	80.0, 80.0	10.63	ADO.Section_26a

CG15060 Blackburn Road

Room name	Window to wall ratio %	Window g-value (EN 410)	Opening gross area m²	Opening free area (avg) %	Opening free area / floor area ratio %	Opening profile(s)
03 - Studio26	25.38	0.3504, 0.3504	1.16, 1.16	80.0, 80.0	10.57	ADO.Section_26a
03 - Studio25	24.62	0.3504, 0.3504	1.16, 1.16	80.0, 80.0	10.26	ADO.Section_26a
03 - Studio24	27.95	0.3504, 0.3504	1.16, 1.16	80.0, 80.0	10.85	ADO.Section_26a
03 - Studio23	27.42	0.3504, 0.3504	1.16, 1.16	80.0, 80.0	10.67	ADO.Section_26a
03 - Studio22	27.03	0.3504, 0.3504	1.16, 1.15	80.0, 80.0	10.53	ADO.Section_26a
03 - Studio21	27.63	0.3504, 0.3504	1.16, 1.16	80.0, 80.0	10.7	ADO.Section_26a
03 - Studio20	27.61	0.3504, 0.3504	1.16, 1.16	80.0, 80.0	10.69	ADO.Section_26a
03 - Studio19	19.21	0.3504, 0.3504	1.16, 1.16	80.0, 80.0	8.6	ADO.Section_26a
03 - Studio18	27.64	0.3504, 0.3504	1.16, 1.16	80.0, 80.0	8.63	ADO.Section_26a
03 - Studio17	26.97	0.3504, 0.3504	1.16, 1.16	80.0, 80.0	8.57	ADO.Section_26a
03 - Studio16	27.57	0.3504, 0.3504	1.16, 1.16	80.0, 80.0	8.64	ADO.Section_26a
03 - Studio15	19.75	0.3504, 0.3504	1.16, 1.16	80.0, 80.0	7.68	ADO.Section_26a
03 - Studio14	6.87	0.3504, 0.3504	1.16, 1.16	80.0, 80.0	7.18	ADO.Section_26a
03 - Lobby	9.62	0.3504	1.03, 1.03, 1.03, 1.03, 1.03	20.0, 20.0, 20.0, 20.0, 20.0	2.6	ADO.AlwaysOff
03 - Lift Lobby	N/A				0.0	
03 - Lift Lobby 2	N/A				0.0	
03 - Corridor	46.35	0.3504	1.1, 1.09	20.0, 20.0	0.45	ADO.AlwaysOff
04 - A1 B1	16.74	0.3504	0.78, 0.79, 1.79	80.0, 80.0, 100.0	22.99	INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
04 - A1 B2	16.94	0.3504	1.81, 0.78, 0.78	100.0, 80.0, 80.0	23.34	INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually

CG15060 Blackburn Road

Room name	Window to wall ratio %	Window g-value (EN 410)	Opening gross area m²	Opening free area (avg) %	Opening free area / floor area ratio %	Opening profile(s)
04 - A1 LDK	16.07	0.3504, 0.3504	1.96, 1.27, 0.73, 0.61, 0.78, 0.79, 0.79, 0.78, 0.61, 2.29	80.0, 80.0, 20.0, 20.0, 80.0, 80.0, 80.0, 80.0, 20.0, 100.0	18.35	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
04 - A2 LDK	27.64	0.3504, 0.3504	1.97, 1.27, 0.73, 0.79, 0.79, 1.78	80.0, 80.0, 20.0, 80.0, 80.0, 100.0	21.55	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
04 - A2 B1	10.88	0.3504	0.78, 0.78, 1.8	80.0, 80.0, 100.0	19.82	INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
04 - A3 B1	14.59	0.3504	0.78, 0.78, 1.79	80.0, 80.0, 100.0	20.77	INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
04 - A3 LDK	27.52	0.3504, 0.3504	1.98, 1.26, 0.73, 0.79, 0.78, 1.8	80.0, 80.0, 20.0, 80.0, 80.0, 100.0	21.52	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
04 - A4 LDK	32.04	0.3504	0.78, 0.78, 1.97, 1.25, 0.72, 1.8	80.0, 80.0, 80.0, 80.0, 20.0, 100.0	20.55	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually

CG15060 Blackburn Road

Room name	Window to wall ratio %	Window g-value (EN 410)	Opening gross area m²	Opening free area (avg) %	Opening free area / floor area ratio %	Opening profile(s)
04 - A4 B1	8.58	0.3504	0.78, 0.78, 1.8	80.0, 80.0, 100.0	19.03	INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
04 - A5 LDK	32.7	0.3504	0.78, 0.79, 1.99, 1.25, 0.72, 1.79	80.0, 80.0, 80.0, 80.0, 20.0, 100.0	21.38	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
04 - A5 B1	19.45	0.3504	1.8, 0.98, 0.39	100.0, 80.0, 20.0	30.05	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
04 - A5 B2	16.04	0.3504	1.8, 0.78, 0.77	100.0, 80.0, 80.0	22.22	INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
04 - A6 LDK	25.59	0.3504, 0.3504	0.79, 0.79, 1.98, 1.26, 0.72, 1.79	80.0, 80.0, 80.0, 80.0, 20.0, 100.0	16.18	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
04 - A6 B1	21.94	0.3504	1.8, 0.97, 0.39	100.0, 80.0, 20.0	30.3	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually

CG15060 Blackburn Road

Room name	Window to wall ratio %	Window g-value (EN 410)	Opening gross area m²	Opening free area (avg) %	Opening free area / floor area ratio %	Opening profile(s)
04 - A6 B2	19.29	0.3504	0.78, 0.79, 1.8	80.0, 80.0, 100.0	20.35	INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
04 - A6 B3	14.99	0.3504	1.8, 0.78, 0.78	100.0, 80.0, 80.0	21.87	INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
04 - A7 B3	14.84	0.3504	0.79, 0.78, 1.81	80.0, 80.0, 100.0	21.78	INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
04 - A7 B2	19.82	0.3504	0.79, 0.78, 1.77	80.0, 80.0, 100.0	20.74	INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
04 - A7 B1	22.0	0.3504	0.99, 0.39, 1.81	80.0, 20.0, 100.0	30.01	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
04 - A7 LDK	29.96	0.3504, 0.3504	0.78, 0.78, 1.98, 1.26, 0.72, 1.8	80.0, 80.0, 80.0, 80.0, 20.0, 100.0	16.18	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually

CG15060 Blackburn Road

Room name	Window to wall ratio %	Window g-value (EN 410)	Opening gross area m²	Opening free area (avg) %	Opening free area / floor area ratio %	Opening profile(s)
04 - A8 LDK	36.48	0.3504	1.8, 2.11, 1.11, 0.64	100.0, 80.0, 80.0, 20.0	12.6	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
04 - A8 B1	18.17	0.3504	0.78, 0.78, 1.76	80.0, 80.0, 100.0	17.27	INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
04 - A8 B2	20.28	0.3504	0.78, 0.78, 0.61, 1.8	80.0, 80.0, 20.0, 100.0	27.73	ADO.AlwaysOff, INTERNAL DOOR ANNUAL, Window Opening Profile ah Annually
04 - Studio2	27.17	0.3504	1.16, 1.16	80.0, 80.0	10.5	ADO.Section_26a
04 - Studio3	27.47	0.3504	1.16, 1.15	80.0, 80.0	10.56	ADO.Section_26a
04 - Studio4	26.77	0.3504	1.16, 1.16	80.0, 80.0	10.44	ADO.Section_26a
04 - Studio5	27.4	0.3504	1.16, 1.16	80.0, 80.0	10.57	ADO.Section_26a
04 - Studio6	27.59	0.3504	1.16, 1.16	80.0, 80.0	10.61	ADO.Section_26a
04 - Studio7	27.47	0.3504	1.16, 1.15	80.0, 80.0	10.46	ADO.Section_26a
04 - Studio8	27.05	0.3504	1.16, 1.16	80.0, 80.0	10.44	ADO.Section_26a
04 - Studio9	27.7	0.3504	1.16, 1.16	80.0, 80.0	10.56	ADO.Section_26a
04 - Studio10	27.36	0.3504	1.16, 1.16	80.0, 80.0	10.48	ADO.Section_26a
04 - Studio11	27.0	0.3504	1.16, 1.16	80.0, 80.0	10.35	ADO.Section_26a
04 - Studio12	25.31	0.3504	1.16, 1.16	80.0, 80.0	10.66	ADO.Section_26a
04 - Studio13	9.88	0.3504	1.16, 1.16	80.0, 80.0	8.04	ADO.Section_26a

CG15060 Blackburn Road

Room name	Window to wall ratio %	Window g-value (EN 410)	Opening gross area m²	Opening free area (avg) %	Opening free area / floor area ratio %	Opening profile(s)
04 - Studio30	15.4	0.3504, 0.3504	1.16, 1.16	80.0, 80.0	10.32	ADO.Section_26a
04 - Studio29	27.35	0.3504, 0.3504	1.16, 1.15	80.0, 80.0	10.62	ADO.Section_26a
04 - Studio28	26.82	0.3504, 0.3504	1.16, 1.16	80.0, 80.0	10.61	ADO.Section_26a
04 - Studio27	27.22	0.3504, 0.3504	1.16, 1.15	80.0, 80.0	10.63	ADO.Section_26a
04 - Studio26	25.38	0.3504, 0.3504	1.16, 1.16	80.0, 80.0	10.57	ADO.Section_26a
04 - Studio25	24.62	0.3504, 0.3504	1.16, 1.16	80.0, 80.0	10.26	ADO.Section_26a
04 - Studio24	27.95	0.3504, 0.3504	1.16, 1.16	80.0, 80.0	10.85	ADO.Section_26a
04 - Studio23	27.42	0.3504, 0.3504	1.16, 1.16	80.0, 80.0	10.67	ADO.Section_26a
04 - Studio22	27.03	0.3504, 0.3504	1.16, 1.15	80.0, 80.0	10.53	ADO.Section_26a
04 - Studio21	27.63	0.3504, 0.3504	1.16, 1.16	80.0, 80.0	10.7	ADO.Section_26a
04 - Studio20	27.61	0.3504, 0.3504	1.16, 1.16	80.0, 80.0	10.69	ADO.Section_26a
04 - Studio19	19.21	0.3504, 0.3504	1.16, 1.16	80.0, 80.0	8.6	ADO.Section_26a
04 - Studio18	27.64	0.3504, 0.3504	1.16, 1.16	80.0, 80.0	8.63	ADO.Section_26a
04 - Studio17	26.97	0.3504, 0.3504	1.16, 1.16	80.0, 80.0	8.57	ADO.Section_26a
04 - Studio16	27.57	0.3504, 0.3504	1.16, 1.16	80.0, 80.0	8.64	ADO.Section_26a
04 - Studio15	19.75	0.3504, 0.3504	1.16, 1.16	80.0, 80.0	7.68	ADO.Section_26a
04 - Studio14	6.87	0.3504, 0.3504	1.16, 1.16	80.0, 80.0	7.18	ADO.Section_26a
04 - Lobby	9.62	0.3504	1.03, 1.03, 1.03, 1.03, 1.03	20.0, 20.0, 20.0, 20.0, 20.0	2.6	ADO.AlwaysOff
04 - Lift Lobby	N/A				0.0	
04 - Lift Lobby 2	N/A				0.0	
04 - Corridor	46.35	0.3504	1.1, 1.09	20.0, 20.0	0.45	ADO.AlwaysOff

Modelled ventilation

Room name	Infiltration rate ACH	Mech vent flow rate ACH
01 - A1 B1	0.15	1.5
01 - A1 B2	0.15	1.51
01 - A1 LDK	0.15	0.94
01 - A2 LDK	0.15	1.97
01 - A2 B1	0.15	1.72
01 - A3 B1	0.15	1.81
01 - A3 LDK	0.15	1.96
01 - A4 LDK	0.15	1.88
01 - A4 B1	0.15	1.65
01 - A5 LDK	0.15	1.47
01 - A5 B1	0.15	2.24
01 - A5 B2	0.15	1.45
01 - A6 LDK	0.15	1.22
01 - A6 B1	0.15	1.36
01 - A6 B2	0.15	0.79
01 - A6 B3	0.15	0.85
01 - A7 B3	0.15	0.84
01 - A7 B2	0.15	0.81
01 - A7 B1	0.15	1.33
01 - A7 LDK	0.15	3.33
01 - A8 LDK	0.15	1.11
01 - A8 B1	0.15	1.14
01 - A8 B2	0.15	1.73
01 - Studio2	0.15	3.36
01 - Studio3	0.15	3.4
01 - Studio4	0.15	3.35
01 - Studio5	0.15	3.39
01 - Studio6	0.15	3.4
01 - Studio7	0.15	3.37
01 - Studio8	0.15	3.34
01 - Studio9	0.15	3.38
01 - Studio10	0.15	3.36
01 - Studio11	0.15	3.31
01 - Studio12	0.15	3.42
01 - Studio13	0.15	2.58
01 - Studio30	0.15	3.31
01 - Studio29	0.15	3.42
01 - Studio28	0.15	3.4
01 - Studio27	0.15	3.42
01 - Studio26	0.15	3.38

CG15060 Blackburn Road

Room name	Infiltration rate ACH	Mech vent flow rate ACH
01 - Studio25	0.15	3.29
01 - Studio24	0.15	3.48
01 - Studio23	0.15	3.42
01 - Studio22	0.15	3.39
01 - Studio21	0.15	3.43
01 - Studio20	0.15	3.42
01 - Studio19	0.15	2.75
01 - Studio18	0.15	2.76
01 - Studio17	0.15	2.74
01 - Studio16	0.15	2.77
01 - Studio15	0.15	2.46
01 - Studio14	0.15	2.3
01 - Lobby	0.15	0
01 - Lift Lobby	0.15	0
01 - Lift Lobby 2	0.15	0
01 - Corridor	0.15	0
02 - A1 B1	0.15	1.5
02 - A1 B2	0.15	1.51
02 - A1 LDK	0.15	2.81
02 - A2 LDK	0.15	1.97
02 - A2 B1	0.15	1.72
02 - A3 B1	0.15	1.81
02 - A3 LDK	0.15	1.96
02 - A4 LDK	0.15	1.88
02 - A4 B1	0.15	1.65
02 - A5 LDK	0.15	4.4
02 - A5 B1	0.15	2.24
02 - A5 B2	0.15	1.45
02 - A6 LDK	0.15	1.22
02 - A6 B1	0.15	1.36
02 - A6 B2	0.15	0.79
02 - A6 B3	0.15	0.85
02 - A7 B3	0.15	0.84
02 - A7 B2	0.15	0.81
02 - A7 B1	0.15	1.33
02 - A7 LDK	0.15	1.22
02 - A8 LDK	0.15	1.11
02 - A8 B1	0.15	1.14
02 - A8 B2	0.15	1.73
02 - Studio2	0.15	3.36
02 - Studio3	0.15	3.4
02 - Studio4	0.15	3.35

CG15060 Blackburn Road

Room name	Infiltration rate ACH	Mech vent flow rate ACH
02 - Studio5	0.15	3.39
02 - Studio6	0.15	3.4
02 - Studio7	0.15	3.37
02 - Studio8	0.15	3.34
02 - Studio9	0.15	3.38
02 - Studio10	0.15	3.36
02 - Studio11	0.15	3.31
02 - Studio12	0.15	3.42
02 - Studio13	0.15	2.58
02 - Studio30	0.15	3.31
02 - Studio29	0.15	3.42
02 - Studio28	0.15	3.4
02 - Studio27	0.15	3.42
02 - Studio26	0.15	3.38
02 - Studio25	0.15	3.29
02 - Studio24	0.15	3.48
02 - Studio23	0.15	3.42
02 - Studio22	0.15	3.39
02 - Studio21	0.15	3.43
02 - Studio20	0.15	3.42
02 - Studio19	0.15	2.75
02 - Studio18	0.15	2.76
02 - Studio17	0.15	2.74
02 - Studio16	0.15	2.77
02 - Studio15	0.15	2.46
02 - Studio14	0.15	2.3
02 - Lobby	0.15	0
02 - Lift Lobby	0.15	0
02 - Lift Lobby 2	0.15	0
02 - Corridor	0.15	0
05 - A1 B1	0.15	1.5
05 - A1 B2	0.15	1.51
05 - A1 LDK	0.15	2.81
05 - A2 LDK	0.15	1.97
05 - A2 B1	0.15	1.72
05 - A3 B1	0.15	1.81
05 - A3 LDK	0.15	1.96
05 - A4 LDK	0.15	1.88
05 - A4 B1	0.15	1.65
05 - A5 LDK	0.15	4.4
05 - A5 B1	0.15	2.24
05 - A5 B2	0.15	1.45

CG15060 Blackburn Road

Room name	Infiltration rate ACH	Mech vent flow rate ACH
05 - A6 LDK	0.15	3.32
05 - A6 B1	0.15	1.36
05 - A6 B2	0.15	0.79
05 - A6 B3	0.15	0.85
05 - A7 B3	0.15	0.84
05 - A7 B2	0.15	0.81
05 - A7 B1	0.15	1.33
05 - A7 LDK	0.15	3.33
05 - A8 LDK	0.15	1.11
05 - A8 B1	0.15	1.14
05 - A8 B2	0.15	1.73
05 - Studio2	0.15	3.36
05 - Studio3	0.15	3.4
05 - Studio4	0.15	3.35
05 - Studio5	0.15	3.39
05 - Studio6	0.15	3.4
05 - Studio7	0.15	3.37
05 - Studio8	0.15	3.34
05 - Studio9	0.15	3.38
05 - Studio10	0.15	3.36
05 - Studio11	0.15	3.31
05 - Studio12	0.15	3.42
05 - Studio13	0.15	2.58
05 - Studio30	0.15	3.31
05 - Studio29	0.15	3.42
05 - Studio28	0.15	3.4
05 - Studio27	0.15	3.42
05 - Studio26	0.15	3.38
05 - Studio25	0.15	3.29
05 - Studio24	0.15	3.48
05 - Studio23	0.15	3.42
05 - Studio22	0.15	3.39
05 - Studio21	0.15	3.43
05 - Studio20	0.15	3.42
05 - Studio19	0.15	2.75
05 - Studio18	0.15	2.76
05 - Studio17	0.15	2.74
05 - Studio16	0.15	2.77
05 - Studio15	0.15	2.46
05 - Studio14	0.15	2.3
05 - Lobby	0.15	0
05 - Lift Lobby	0.15	0

CG15060 Blackburn Road

Room name	Infiltration rate ACH	Mech vent flow rate ACH
05 - Lift Lobby 2	0.15	0
05 - Corridor	0.15	0
03 - A1 B1	0.15	1.5
03 - A1 B2	0.15	1.51
03 - A1 LDK	0.15	2.81
03 - A2 LDK	0.15	1.97
03 - A2 B1	0.15	1.72
03 - A3 B1	0.15	1.81
03 - A3 LDK	0.15	1.96
03 - A4 LDK	0.15	1.88
03 - A4 B1	0.15	1.65
03 - A5 LDK	0.15	4.4
03 - A5 B1	0.15	2.24
03 - A5 B2	0.15	1.45
03 - A6 LDK	0.15	1.22
03 - A6 B1	0.15	1.36
03 - A6 B2	0.15	0.79
03 - A6 B3	0.15	0.85
03 - A7 B3	0.15	0.84
03 - A7 B2	0.15	0.81
03 - A7 B1	0.15	1.33
03 - A7 LDK	0.15	3.33
03 - A8 LDK	0.15	1.11
03 - A8 B1	0.15	1.14
03 - A8 B2	0.15	1.73
03 - Studio2	0.15	3.36
03 - Studio3	0.15	3.4
03 - Studio4	0.15	3.35
03 - Studio5	0.15	3.39
03 - Studio6	0.15	3.4
03 - Studio7	0.15	3.37
03 - Studio8	0.15	3.34
03 - Studio9	0.15	3.38
03 - Studio10	0.15	3.36
03 - Studio11	0.15	3.31
03 - Studio12	0.15	3.42
03 - Studio13	0.15	2.58
03 - Studio30	0.15	3.31
03 - Studio29	0.15	3.42
03 - Studio28	0.15	3.4
03 - Studio27	0.15	3.42
03 - Studio26	0.15	3.38

CG15060 Blackburn Road

Room name	Infiltration rate ACH	Mech vent flow rate ACH
03 - Studio25	0.15	3.29
03 - Studio24	0.15	3.48
03 - Studio23	0.15	3.42
03 - Studio22	0.15	3.39
03 - Studio21	0.15	3.43
03 - Studio20	0.15	3.42
03 - Studio19	0.15	2.75
03 - Studio18	0.15	2.76
03 - Studio17	0.15	2.74
03 - Studio16	0.15	2.77
03 - Studio15	0.15	2.46
03 - Studio14	0.15	2.3
03 - Lobby	0.15	0
03 - Lift Lobby	0.15	0
03 - Lift Lobby 2	0.15	0
03 - Corridor	0.15	0
04 - A1 B1	0.15	1.5
04 - A1 B2	0.15	1.51
04 - A1 LDK	0.15	2.81
04 - A2 LDK	0.15	1.97
04 - A2 B1	0.15	1.72
04 - A3 B1	0.15	1.81
04 - A3 LDK	0.15	1.96
04 - A4 LDK	0.15	1.88
04 - A4 B1	0.15	1.65
04 - A5 LDK	0.15	1.47
04 - A5 B1	0.15	2.24
04 - A5 B2	0.15	1.45
04 - A6 LDK	0.15	1.22
04 - A6 B1	0.15	1.36
04 - A6 B2	0.15	0.79
04 - A6 B3	0.15	0.85
04 - A7 B3	0.15	0.84
04 - A7 B2	0.15	0.81
04 - A7 B1	0.15	1.33
04 - A7 LDK	0.15	3.33
04 - A8 LDK	0.15	1.11
04 - A8 B1	0.15	1.14
04 - A8 B2	0.15	1.73
04 - Studio2	0.15	3.36
04 - Studio3	0.15	3.4
04 - Studio4	0.15	3.35

CG15060 Blackburn Road

Room name	Infiltration rate ACH	Mech vent flow rate ACH
04 - Studio5	0.15	3.39
04 - Studio6	0.15	3.4
04 - Studio7	0.15	3.37
04 - Studio8	0.15	3.34
04 - Studio9	0.15	3.38
04 - Studio10	0.15	3.36
04 - Studio11	0.15	3.31
04 - Studio12	0.15	3.42
04 - Studio13	0.15	2.58
04 - Studio30	0.15	3.31
04 - Studio29	0.15	3.42
04 - Studio28	0.15	3.4
04 - Studio27	0.15	3.42
04 - Studio26	0.15	3.38
04 - Studio25	0.15	3.29
04 - Studio24	0.15	3.48
04 - Studio23	0.15	3.42
04 - Studio22	0.15	3.39
04 - Studio21	0.15	3.43
04 - Studio20	0.15	3.42
04 - Studio19	0.15	2.75
04 - Studio18	0.15	2.76
04 - Studio17	0.15	2.74
04 - Studio16	0.15	2.77
04 - Studio15	0.15	2.46
04 - Studio14	0.15	2.3
04 - Lobby	0.15	0
04 - Lift Lobby	0.15	0
04 - Lift Lobby 2	0.15	0
04 - Corridor	0.15	0

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