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Seven Sisters/ Eade Road

Energy Statement

27/10/2023

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About Us

Expedition is a consultancy specialising in transformative change for sustainable development. We help organisations develop their approach to the climate and biodiversity emergency, circular economy, social value and Sustainable Development Goals.

We identify opportunities for innovation, and develop tools and guidance to support implementation. We find added value in delivering sustainable development, by providing expert independent insight in an engaging and creative manner.

We are a B Corp™, Certified Social Enterprise and employee-owned organisation, part of the Useful Simple Trust.

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1 / *Executive Summary*

This Energy Statement supports the planning application for the proposed Warehouse Living Seven Sisters/ Eade Road development, in the London Borough of Haringey. It sets out the proposed strategy for reducing the energy use of the development as well as utilising low carbon and renewable energy sources. It demonstrates how the development addresses all relevant national, regional and local energy policies. This energy statement and associated strategy has been prepared in accordance with the GLA's latest guidance on the preparation of energy statements.

The development comprises two living/working buildings:

- Block A to the east, with 8 storeys and two lower ground levels.
- Block B to the west, with 4 storeys.

The lower floor levels will be occupied by commercial and back of house areas, such as plant rooms, with living/working accommodations at upper levels. Across the site, hard and soft landscape improvements are proposed. In addition, the development includes 10 stacked shipping containers (two storeys) to provide workspace/artist studios. It should be noted that the energy strategy presented in this report covers the new build warehouse living units only.

The energy strategy for the development has been developed in line with the energy hierarchy established by Policy SI2 of the London Plan (2021):

- Be Lean: use less energy and manage demand during operation.
- Be Clean: exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly.
- Be Green: maximise opportunities for renewable energy by producing, storing and using renewable energy on site.
- Be Seen: monitor, verify and report on energy performance.

The reduction in regulated CO₂ emissions against the targets has been calculated to identify the carbon offset for the development, as set out in the GLA's guidance on preparing energy assessments (June 2022). In addition, design stage compliance with Part L2 of the Building Regulations 2021 has been verified at the pre-planning stage.

The following summarises the proposed measures:

Be Lean: energy efficient design

Compliance energy modelling has been undertaken to measure the effectiveness of passive and energy efficiency measures to inform the design. The following measures are proposed:

- Glazing size optimised to balance daylight availability and risk of overheating.
- G-value of 0.4 to all windows, with a light transmittance of 70%.

- Living/kitchen/dining rooms will be shaded via balconies, whilst bedrooms benefit from horizontal shading devices.
- All bedroom windows are also recessed, providing additional shading.
- Building envelope performance is significantly improved over Building Regulations Part L minimum standards.
- Air permeability will be no greater than 3m³/m².hr @ P50Pa, to limit heat loss and gain from air leakage.
- Ambient temperature heating distribution system to minimise heat losses within the distribution network.
- Use of mechanical ventilation with heat recovery (MVHR) with low specific fan powers and high heat recovery efficiencies.
- High efficiency lighting and lighting controls where relevant.

Be Clean: heating infrastructure

Whilst there are no existing heat networks within close proximity of the application site, it is located near the Woodberry Down opportunity area. Presently, Hackney Council, where the opportunity area is located, states that viability testing suggests that the area may be suitable for a heat network and further analysis at detailed feasibility stage will be carried out. As such, the development will be future proofed for connection to a district heating network.

A communal ambient loop heat network is proposed for the development. The network will comprise of roof mounted air source heat pumps providing water at ambient temperature to individual water source heat pumps located on each floor. These water source heat pumps will uplift the low grade heat from the network and provide space heating and domestic hot water to each floor. With the decarbonisation of the grid, this technology offers the best long-term carbon emissions savings for the development.

Be Green: renewable energy

In addition to the communal and localised heat pumps, the buildings will benefit from approximately 131 m² of roof-mounted photovoltaic panels, that will serve the landlord areas.

Be Seen: monitor and optimise energy performance

The development will incorporate monitoring and metering in line with the GLA's Energy Monitoring Guidance (September/2021) to enable in use performance to be monitored and optimised. This will include the use of open protocol systems that allow devices to be connected without having to use proprietary systems.

Carbon Emissions Savings

The proposed development meets the London Plan CO₂ savings target of 35%. Carbon emissions and cash in-lieu contributions have been calculated using the GLA's Carbon Emissions Reporting Spreadsheet.

Figure 1 overleaf shows the total carbon emissions savings associated with the development, where:

- A 15% carbon emissions reduction is achieved (compared to a Part L2 2021 compliant development) through passive and energy efficiency measures only, meeting the minimum 15% required by the GLA.
- A total 43% carbon emissions reduction is achieved after demand reduction, energy efficient supply, and incorporation of renewable technologies, exceeding the minimum 35% required by the GLA.
- Remaining regulated emissions will be offset through a cash in-lieu payment to the London Borough of Haringey offset fund. At the concept design stage this amounts to a total sum of £20,838, calculated based on a carbon price of £95 per tonne over 30 years.

Risk of overheating

All occupied spaces meet the CIBSE TM59 criteria under the DSY 1 2020s High emissions 50th percentile weather scenario.

Living rooms and kitchens pass the naturally ventilated criteria. Whereas bedrooms comply with the mechanical ventilation criteria due to window opening restrictions at night (due to noise levels) and require limited cooling to do so. The Cooling Hierarchy has been followed to reduce both the risk of overheating and the amount of active cooling needed.

For the 2020 and 2050 weather scenarios, all the bedrooms require 35W/m² of cooling. However, to meet the conditions for 2080 weather scenario, the bedrooms would need 40W/m² of cooling.

Other rooms (living room, kitchen, and living/kitchen), which are predominantly naturally ventilated, would require additional mitigation methods to cater for extreme weather conditions in the future.

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

Carbon Dioxide Emissions (Tonnes CO ₂ per annum)		
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	12.8	21.2
After energy demand reduction (be lean)	10.8	21.2
After heat network connection (be clean)	10.8	21.2
After renewable energy (be green)	7.3	21.2

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

Regulated carbon dioxide savings		
	Tonnes CO ₂ per annum	%
Be lean: savings from energy demand reduction	1.9	15%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	3.5	27%
Total cumulative savings on-site	5.4	43%
Annual savings from off-set payment	7.3	-
	(Tonnes CO ₂)	
Cumulative savings for off-set payment	219	-
Cash in-lieu contribution (£)	20,838	-

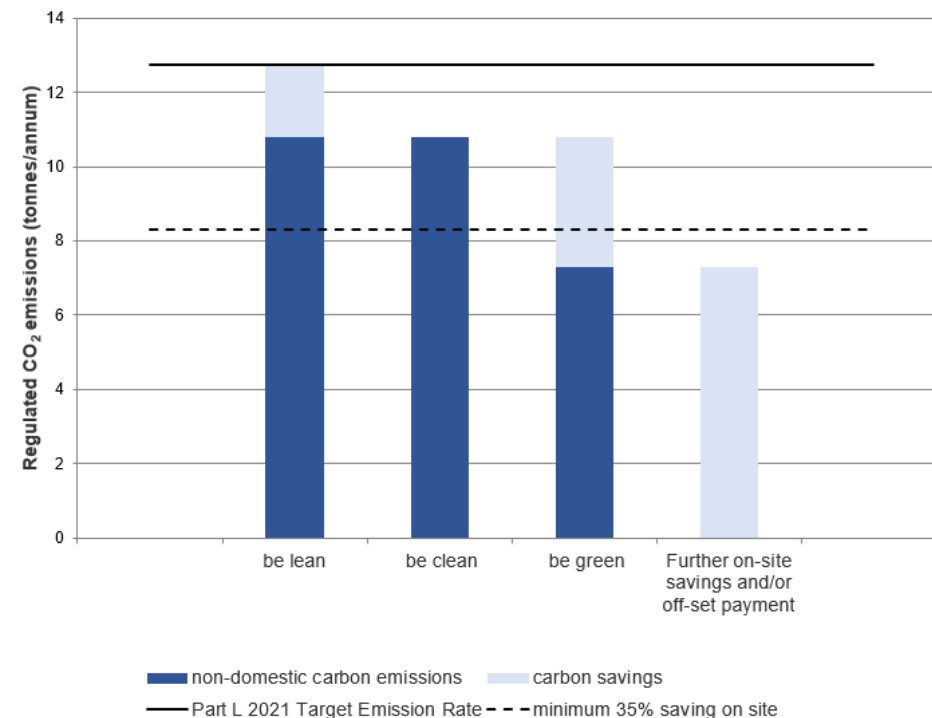


Figure 1: Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy

2 / *Introduction*

2.1 Site Location

The Haringey Warehouse District sits between the New River to the south, Seven Sisters Road to the east and the Gospel Oak to Barking branch of the London Overground to the north.

The District has a PTAL ranging from 1 to 5 and is within walking distance of a number of rail and tube stations including Haringey Green Lanes, Stamford Hill and Seven Sisters Rail Stations and Seven Sisters and Manor House Tube Station and numerous Bus routes also run along Seven Sisters Road.

The application site comprises of the vacant infill site on the corner of Eade Road and Seven Sisters Road and 2-4 Tewkesbury Road, adjacent to the existing Cara House.

The surrounding area is made up of a mix of warehouse and industrial buildings, built at different times. The warehouse has been re-purposed for warehouse living, with changes made to the façades over time, to suit the users needs.

The aspiration of the current proposals is to maximise the potential of the Seven Sister's site as a key gateway site and deliver warehouse living as part of a new build scheme, along with retrofit and improvements to the existing buildings.



Figure 2: Proposed site location (highlighted in red)

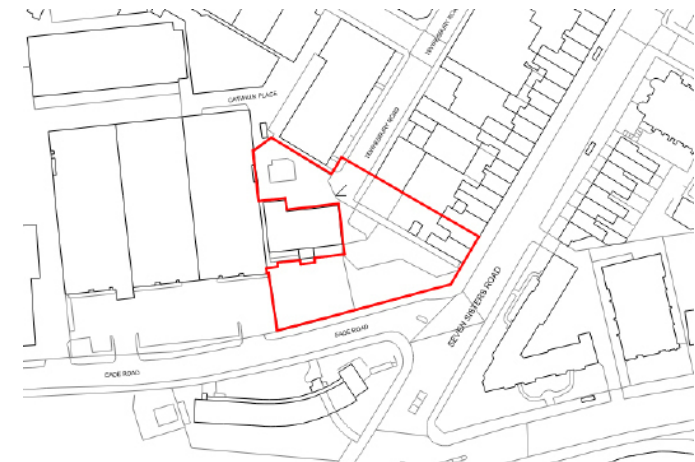


Figure 3: Proposed site boundary line

2.2 Scheme Details

The proposed development comprises the construction of two new buildings to provide:

- New warehouse living accommodation (Sui Generis (warehouse living)).
- Ground floor café/ workspace (Use Class E).
- Associated waste collection and cycle parking.
- Erection of 10 stacked shipping containers (two storeys) to provide workspace/ artist studios (Use Class E.)
- Toilet facilities and associated waste collection and cycle parking.

In addition, landscape and public realm enhancements will include the widening of and works to an existing alleyway that connects Seven Sisters and Tewkesbury Road, works to Tewkesbury Road, the creation of rain gardens, greening, seating, signage and artworks and all other associated infrastructure works, including the removal of an existing and the construction of a new substation to service the new development.

2.3 Applicant and Project Team

The planning application for the Seven Sisters/ Eade Road development is being made by Provewell Limited (the Applicant), with the support of the following design and planning team:

- Architecture – Morris and Co Architects
- Landscape design – Campbell Cady
- Sustainability – Expedition
- Building services engineering – Ingenium Consulting Engineers
- Civil and structural engineering – London Structures Lab
- Planning – Jen Ross Consulting
- Transport – Velocity
- Project management – Dakota
- Cost consultant – Hennessy Godden

2.4 Sustainability Context

Haringey Climate Change Action Plan

In March 2019, Haringey Council declared a climate emergency and in March 2021 Haringey's Climate Change Action Plan was adopted and sets out the roadmap for how the borough will become net-zero carbon by 2041.

Masterplan Framework Document

The development is located within the Haringey Warehouse District that is covered by a dedicated Masterplan Framework Document. The Framework was prepared in response to the requirements of Policy DM39 of Haringey's Development Management DPD and provides area specific planning and urban design guidance. Embedded within the Framework are the following four principles for sustainable living that will support the regeneration of the Haringey Warehouse District:

- Energy and Carbon.
- Materials and Circular Economy.
- Environmental Resilience.
- Wellbeing.

3 / *Policy and Guidance* *Overview*

This Energy Statement has been developed in line with national and local policy and guidance. The following section summarises key considerations and requirements.

National Planning Policy Framework (NPPF), 2021

The National Planning Policy Framework sets out the Government's planning policies for England. These apply to the preparation of local and neighbourhood plans by local authorities, to ensure sustainable development is delivered at a national level. The document defines the overarching objective of sustainable development as meeting the needs of the present without compromising the ability of future generations to meet their own needs. It covers social, environmental and economic needs.

Planning and Energy Act, 2008

The Planning and Energy Act (2008) allows local planning authorities to set their own requirements for energy use and energy consumption in local plans as follows:

1. a proportion of energy used in development in their area to be energy from renewable sources in the locality of the development;
2. a proportion of energy used in development in their area to be low carbon energy from sources in the locality of the development;

3. development in their area to comply with energy efficiency standards that exceed the energy requirements of building regulations.

Building Regulations Part L, 2021

This development will be subject to Approved Document L2 (Approved Document L, Conservation of fuel and power, Volume 2: Buildings other than dwellings). The Approved Document Part L considers operational energy attributed to Regulated Energy use only.

Approved Document L2

Part L2 of the Building Regulations sets out requirements for new build non-domestic buildings. Non-domestic buildings must meet Regulation 26 within the Approved Document. The Building CO₂ Emission Rate (BER) must be no worse than the Target CO₂ Emission Rate (TER), and the Building Primary Energy Rate (BPER) must be no worse than the Target Primary Energy Rate (TPER).

Building Regulations Part O, 2021

The new Approved Document Part O aims to address the issue of overheating in homes, to minimise the risk of uncomfortable internal conditions during warmer months. Compliance can be demonstrated through one of two methods:

- the simplified method for limiting solar gains and providing a means of removing excess heat; or

- The dynamic thermal modelling method.

For projects within a location determined as 'high risk', such as urban and some suburban parts of London, the following should be followed:

- Use CIBSE TM59 methodology for predicting overheating risk.
- The limits on the use of TM59 methodology as described in Part O.
- The acceptable strategies for reducing overheating risk as described in Part O.

Acceptable excess heat removal should be through one of any of the following means:

- Opening windows (the effectiveness of this method is improved by cross-ventilation).
- Ventilation louvres in external walls.
- Mechanical ventilation system.
- Mechanical cooling system.

The mitigation strategy for use to minimise overheating must take into account:

- Noise at night.
- Pollution.
- Security.
- Protection from falling.
- Protection from entrapment.

London Plan (2021)

The London Plan is the overall strategic plan for London which sets out an integrated economic, environmental, transport and social framework for the development of London over the next 20-25 years.

The plan brings together the geographic and locational aspects of the Mayor's other strategies including those dealing with:

- Transport.
- Economic development.
- Housing.
- Culture.
- Social issues.
- Environment, including climate change, air quality, noise and waste.

The following sets out a summary of the key energy and carbon reduction policies from the London Plan applicable to the site.

Policy SI2 Minimising greenhouse gas emissions

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

- be lean: use less energy and manage demand during operation
- be clean: exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly
- be green: maximise opportunities for renewable energy by producing, storing and using renewable energy on-site
- be seen: monitor, verify and report on energy performance.

Major development proposals should include a detailed energy strategy to demonstrate how the zero-carbon target will be met within the framework of the energy hierarchy.

A minimum on-site reduction of at least 35 per cent beyond Building Regulations is required for major development. Residential development should achieve 10 per cent, and non-residential development should achieve 15 per cent through energy efficiency measures. Where it is clearly demonstrated that the zero-carbon target cannot be fully achieved on-site, any shortfall should be provided, in agreement with the borough, either:

- through a cash in lieu contribution to the borough's carbon offset fund, or
- off-site provided that an alternative proposal is identified and delivery is certain.

Boroughs must establish and administer a carbon offset fund. Offset fund payments must be ring-fenced to implement projects that deliver carbon reductions. The operation of offset funds should be monitored and reported on annually.

Major development proposals should calculate and minimise carbon emissions from any other part of the development, including plant or equipment, that are not covered by Building Regulations, i.e. unregulated emissions.

Policy SI 3 Energy infrastructure

Major development proposals within Heat Network Priority Areas should have a communal low-temperature heating system:

- the heat source for the communal heating system should be selected in accordance with the following heating hierarchy:
 - connect to local existing or planned heat networks
 - use zero-emission or local secondary heat sources (in conjunction with heat pump, if required)
 - use low-emission combined heat and power (CHP) (only where there is a case for CHP to enable the delivery of an area-wide heat network, meet the development's electricity demand and provide demand response to the local electricity network)
 - use ultra-low NOx gas boilers

- CHP and ultra-low NOx gas boiler communal or district heating systems should be designed to ensure that they meet the requirements in Part B of Policy SI 1 Improving air quality
- where a heat network is planned but not yet in existence the development should be designed to allow for the cost-effective connection at a later date.

Heat networks should achieve good practice design and specification standards for primary, secondary and tertiary systems comparable to those set out in the CIBSE/ADE Code of Practice CP1 or equivalent.

Policy SI 4 Managing heat risk

Development proposals should minimise adverse impacts on the urban heat island through design, layout, orientation, materials and the incorporation of green infrastructure.

Major development proposals should demonstrate through an energy strategy how they will reduce the potential for internal overheating and reliance on air conditioning systems in accordance with the following cooling hierarchy:

- reduce the amount of heat entering a building through orientation, shading, high albedo materials, fenestration, insulation and the provision of green infrastructure
- minimise internal heat generation through energy efficient design

- manage the heat within the building through exposed internal thermal mass and high ceilings
- provide passive ventilation
- provide mechanical ventilation
- provide active cooling systems.

Haringey Local Plan Strategic Policies (2013)

The Local Plan sets out a vision and key policies for the future development of the borough. It takes forward the priorities of Haringey's Sustainable Community Strategy, highlighting the following key outcomes of that strategy:

- People at the heart of change.
- An environmentally sustainable future.
- Economic vitality and prosperity shared by all.
- Safer for all.
- Healthier people with a better quality of life.
- People and customer focused.

The Council has started work on a new local plan, which has gone through consultation and a new Draft Local Plan is expected to be issued in 2022.

Summary of targets

Energy targets have been established for the development based on the policy review carried out and are:

Energy and carbon

Develop an energy strategy which follows the GLA Energy Hierarchy: be lean, be clean, be green and be seen.

1. Achieve a minimum 15% improvement on Building Regulations Part L2 2021 from energy efficiency measures only.
2. Achieve net zero carbon target with a minimum 35% improvement on Building Regulations Part L2 2021 on site.

Overheating

3. Minimise the need for cooling following the cooling hierarchy.
4. Achieve compliance with CIBSE TM59 criteria for the DSY1 scenario - 2020s, high emissions, 50% percentile scenario weather file.
5. Test performance against TM59 criteria for the DSY2 and DSY3 weather files. If compliance is not technically feasible, demonstrate that the risk of overheating has been reduced as far as practical and that all passive measures have been explored, including reduced glazing and increased external shading. The applicant should also outline a strategy for residents to cope in extreme weather events e.g. use of fans.

4 / *Methodology*

The sections below present the methodology followed in determining the on-site and off-site carbon savings for the proposed scheme.

On-site carbon savings – the Energy Hierarchy

The methodology employed to develop the energy strategy for the scheme and achieve on-site carbon savings is in line with the GLA's Guidance on preparing energy assessments and is as follows:

- The baseline CO₂ emissions are first established, i.e. the emissions of a scheme that is compliant with Part L 2021 of the Building Regulations.
- Regulated CO₂ emissions are calculated in line with the Notional Calculation Methodology (for buildings other than dwellings in England), using IES VE 2022 approved building regulation compliance software. Calculation summary worksheets are provided in Appendix A.
- The same approach is followed to determine the energy performance and CO₂ emissions of the proposed scheme for each of the steps of the Energy Hierarchy.
- The three consecutive steps of the Energy Hierarchy are:
 - **Be Lean**, whereby the demand for energy is reduced through a range of passive and active energy efficiency measures; as part of this step the Cooling Hierarchy is implemented and measures are proposed to reduce the demand for active cooling;

- **Be Clean**, whereby as much of the remaining energy demand is supplied as efficiently as possible (e.g. connect to a local heat network or use zero-emission or local secondary heat);
- **Be Green**, whereby renewable technologies are incorporated to offset part of the carbon emissions of the development. The uptake of renewable technologies is based on feasibility and viability considerations, including their compatibility with the energy system determined in the previous steps; and
- **Be Seen**, whereby in-use energy performance is monitored, verified and reported.

The implementation of the Energy Hierarchy determines the total regulated carbon savings that can be feasibly and viably achieved on site.

The percentage improvement against the baseline emissions is compared to the relevant targets for each element and in case of a shortfall, savings through off-site measures should be achieved.

Carbon offsetting

The GLA has an established provision to ensure that any shortfall in carbon savings is met off-site; this comprises a carbon offset payment with a figure of £95/tonne for a period of 30 years.

The cash in lieu contribution for the proposal is calculated to provide the total carbon offset payment to be made to the Council.

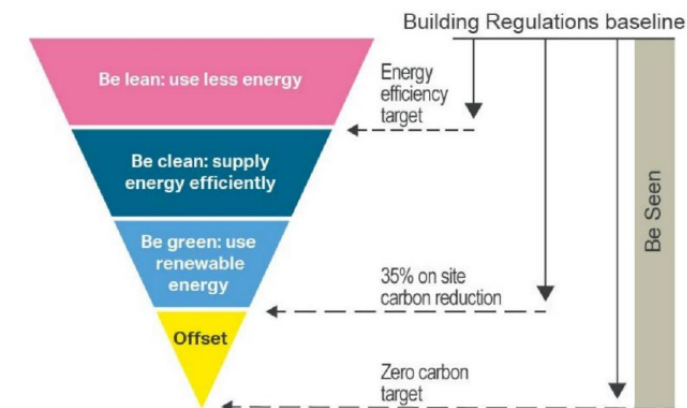


Figure 4: The London Plan energy hierarchy

Part L Energy modelling assumptions

Approved Document (Part L) defines dwellings as self contained units. These dwellings are subject to Approved Document L, Volume 1: Dwellings. It also defines buildings that contain rooms for residential purposes, as a room, or suite of rooms, which is not a dwelling-house or a flat and which is used by one or more persons to live and sleep. In such cases, these buildings should comply with Approved Document L, Volume 2: Buildings other than dwellings. The nature of the Warehouse Living proposal, with shared communal spaces falls into this second category. As such, the building energy assessment and modelling (including both the warehouse living accommodation and cafe/workspace) has been undertaken as a non dwelling and assessed in accordance with Approved Document, Volume 2 and with the GLA's non residential targets.

5 / *Energy Strategy*

5.1 Be Lean

Energy technology and policy are part of a rapidly shifting environment and there have been several recent developments which have been considered in developing the energy strategy. Most significantly is the decarbonisation of the national electricity grid, which will improve the carbon performance of electricity-led technologies. This is reflected in the Governments Clean Growth Strategy, which promotes electric heating as a way of reducing emissions in buildings and encourages cleaner heating systems, such as heat pumps.

The energy strategy has been prepared in accordance with the principles of the energy hierarchy, which takes a tiered approach to reducing carbon emissions. The first step is to use less energy (be lean), next is to supply energy efficiently (be clean) and lastly to use renewable energy (be green).

Passive design measures

Enhanced U-values

The heat loss of different building fabric elements is dependent upon their U-value. A building with low U-values provides better levels of insulation and reduced heating demand during the cooler months.

The proposed development will incorporate high levels of insulation and high-performance glazing beyond Part L 2021 targets and notional building specifications, in order to reduce the demand for space conditioning.

Air permeability

Heat loss also occurs due to air infiltration. Although this cannot be eliminated altogether, good construction detailing and the use of best practice construction techniques can minimise the amount of air infiltration.

The proposed development will aim to improve upon the Part L 2021 minimum standards for air tightness by targeting air permeability rates of $3\text{m}^3/\text{m}^2.\text{h}$ @ 50Pa.

Reducing Thermal Bridging

Carefully dealing with junctions will help to minimise cold bridging and further prevent the loss of heat. Key solutions to thermal bridging include: ensuring the building is continuously insulated externally forming a continuous thermal barrier; as well as installing windows and other envelope

components that include thermal breaks to prevent heat transfer across the building envelope.

The building will be clad with a proprietary cladding system, including thermal breaks as part of the supporting frame system. Windows are designed so that the thermal break in the window frame aligns with the building wall insulation to achieve an optimal thermally insulated envelope.

The balconies/terraces will be constructed with proprietary thermal insulated balcony connectors to reduce thermal bridging.

Maximising Thermal Mass

In addition to high thermal performance of the building fabric, the building will use the thermal mass of its structure (via exposed concrete ceilings and walls) to store heat in the winter and support free-cooling strategies in the summer. This thermal mass has been represented within the Part L energy model.

Reducing the need for artificial lighting

The development has been designed to maximise daylight (while mindful of solar gain) in all habitable spaces, helping to reduce the need for electric lighting and improve the health and wellbeing of occupants.

Limiting Solar Gain

Areas of glazing, deep reveals and overhangs have been considered to reduce solar gain. The

Table 3: Proposed building specification against the Notional specification

Building Element	Notional Building Specification	Proposed Specification (Actual Building)	
	Part L2 2021 Buildings other than Dwellings /Notional Calculation Methodology	Warehouse Living Accommodation	Commercial / Workspace (Shell and Core)
Exposed walls (W/m²k)	0.18	0.15	
Ground and exposed floors (W/m²k)	0.15	0.10	
Roofs (W/m²k)	0.15	0.10	
Windows and glazed doors (W/m²k)	1.4	1.2	
G-value (%)	29% (side-lit)	40%	
Light transmittance (%)	60%	70%	
Personnel doors	1.9	1.6	
Air permeability (m³/hr/m²@50Pa)	3	3	
Thermal bridging (W/m²k)	Psi vales for all junctions	Default values	
Thermal mass	Notional construction types	Mediumweight	
Lighting luminaire (lm / circuit watt)	95	110	110
Occupancy and daylight control	Yes	Yes	Yes
Heating system	Same level of servicing as Actual building	Air source heat pumps provides 100% of heating (and cooling) demand	Air source heat pumps provides 100% of heating (and cooling) demand
Heating system, Electricity (heat pump) (SCoP)	264%	280%	264%
Cooling (air-conditioned) (SSEER)	4.4	4.4	4.4
Heat recovery efficiency (%)	76%	82%	76%
Central ventilation SFP (W/l/s)	1.8	1.6	1.8
Terminal unit SFP (W/l/s)	0.3	0.3	0.3
Waste water heat recovery	No	No	No
Photovoltaics	None as heat pump meets 100% of the space heating demand in the Actual building	131 m2	

glazing area for the scheme is approximately 35%. Bedrooms, which have a higher risk of overheating, have a smaller window area, approximately 25%, along with 200mm deep window reveals and 600mm horizontal solar shading.

Active design measures

High efficacy lighting

The development intends to incorporate low energy light fittings throughout, and will accommodate LED luminaires only. Occupancy and daylight sensors will be provided.

Heat recovery ventilation

Mechanical ventilation heat recovery (MVHR) is proposed. The mechanical ventilation system will include high efficiency heat recovery and low specific fan powers to counteract the energy use associated with running mechanical ventilation. Within the warehouse living accommodation local MVHR units serve clusters of bedrooms and communal spaces. The units are typically within 2m from the external wall, minimising duct runs and therefore the heat losses from the ducts (refer to Appendix E identifying location of MVHR units on a typical floor).

When conditions permit, natural ventilation via opeanable windows will be used to support free-cooling strategies and help reduce the demand for cooling.

Controls

Advanced lighting and space conditioning controls will be incorporated, specifically:

- All areas will have occupant sensors for lighting, with day lit areas also incorporate daylight sensors;
- Space conditioning will be through local time and temperature controls.

Monitoring and building management system

Apart from the above design measures, the development will incorporate monitoring equipment and systems to enable the identification of energy saving measures. Metering and sub-metering by unit will be provided and displayed publicly to raise awareness.

Minimising distribution losses

In order to reduce heat distribution losses, an ambient temperature circulation system is proposed. The system will provide low grade heat from central air source heat pumps (ASHP), which will then be used by local water source heat pumps (WSHP) to provide space heating and domestic hot water. The distribution system will be designed to meet the requirements in CIBSE Heat Networks: Code of Practice for the UK.

Be Lean CO₂ emissions

The tables below show the carbon savings from demand reduction measures for the development.

At the 'Be Lean' stage, the proposed development meets the GLA target of 15% regulated CO₂ emission reduction.

Table 4: Carbon Dioxide Emissions after Be Lean stage of the Energy Hierarchy

Carbon Dioxide Emissions (Tonnes CO ₂ per annum)		
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	12.8	21.2
After energy demand reduction (be lean)	10.8	21.2

Table 5: Carbon Dioxide savings after Be Lean stage of the Energy Hierarchy

Regulated carbon dioxide savings		
	Tonnes CO ₂ per annum	%
Be lean: savings from energy demand reduction	1.9	15%

Cooling and overheating

Minimising overheating

The potential risk of overheating will be mitigated by incorporating passive and active design measures, in line with the London Plan Policy SI4, and the Cooling Hierarchy, as follows.

- 1) Reduce the amount of heat entering a building through orientation, shading, high albedo materials, fenestration, insulation and the provision of green infrastructure.
- 2) Minimise internal heat generation through energy efficient design.
- 3) Manage the heat within the building through exposed internal thermal mass and high ceilings.
- 4) Provide passive ventilation.
- 5) Provide mechanical ventilation.
- 6) Provide active cooling systems.

Overheating risk assessment

An overheating assessment was carried out for the proposed development using CIBSE AM11-compliant dynamic thermal analysis software, IES Virtual Environment (VE), in accordance with CIBSE TM59:2017, Design Methodology for the assessment of overheating risk in homes (refer to Appendix C).

Overheating modelling was conducted using three design weather years and accounting for climate change scenarios. Rooms have been tested against Design Summer Year (DSY) weather files DSY 1, DSY2 and DSY3, for years 2020s, 2050s and 2080s.

All occupied spaces meet the CIBSE TM59 criteria under the DSY 1 2020s High emissions 50th percentile weather scenario (refer to table 6 for a summary of compliance).

Living rooms and kitchens pass the naturally ventilated criteria. Whereas bedrooms comply with the mechanical ventilation criteria due to window

opening restrictions at night (due to noise levels) and require limited cooling to do so. The Cooling Hierarchy has been followed to reduce both the risk of overheating and the amount of active cooling needed.

For the 2020 and 2050 weather scenarios, all the bedrooms require 35W/m² of cooling. However, to meet the conditions for 2080 weather scenario, the bedrooms would need 40W/m² of cooling.

Other rooms (living room, kitchen, and living/kitchen), which are predominantly naturally ventilated, would require additional mitigation methods to cater for extreme weather conditions in the future.

Table 6: TM59 DSY 1 2020s compliance rate (pass highlighted in green, with fail in red).

Scenario	Strategy		Proportion of compliant rooms		
	Ventilation	Active cooling	Criterion 1: Hours exceeding comfort range (living rooms, kitchens and bedrooms)	Criterion 2: Night hours above 26°C (bedrooms only)	Criterion 3: Fixed temperature test (predominantly mechanically ventilated)
Baseline	Natural ventilation with MVHR (minimum fresh air)	No	118/118	0/101	-
Mitigation 1	Natural ventilation with enhanced mechanical ventilation of 4ach to bedrooms	No	118/118	0/101	-
Mitigation 2	Natural vent with MVHR to living rooms and kitchens. Mechanical ventilation to bedrooms (windows closed).	Limited cooling of 35 W/m ² to bedrooms.	17/17 (living rooms and kitchens) Bedrooms predominantly mechanically ventilated under this scenario and tested against criterion 3.	-	101/101 (bedrooms)

The CIBSE's TM59 methodology for predicting overheating risk is also used by Part O of the Building Regulations to demonstrate compliance.

Active Cooling

Following the overheating assessment, and given the acoustic requirements which restrict window openings at night, limited cooling is required to bedrooms to mitigate the risk of overheating.

Active cooling will be provided by the same ambient temperature loop serving the local water source heat pumps that provide heating to spaces (refer to Section 5.3). Providing cooling in this way means the system is able to reuse the otherwise wasted heat for heating water, making this an efficient method of cooling.

The cooling strategy has also been developed in line with the Cooling Hierarchy with passive measures prioritised to reduce the installed capacity of the cooling systems:

- 1. The amount of heat entering bedrooms has been reduced through optimising the glazing area, having deep window reveals and horizontal shading.
- 2. An ambient /low temperature heat network is proposed helping minimise internal heat generation.
- 3. Exposed thermal mass will help absorb excess heat within the building and support night time purge ventilation.

- 4. All rooms have openable windows for natural ventilation (window opening in bedrooms are restricted due to noise levels).
- 5. Mechanical ventilation is provided and can be used for ‘free cooling’ during summer months.
- 6. Limited active cooling is provided with the ability to reuse the waste heat produced.

Table 7 illustrates the actual cooling demand is lower than the notional cooling demand.

Table 7: Cooling demand

	Area weighted non-residential cooling demand (MJ/m2)	Total non-residential cooling demand (MJ/year)2
Actual	55	218,548
Notional	63.3	251,528

The plant room has been adequately sized to accommodate a potential connection to a future heat network. The indicative plant room layout can be found in Appendix D. A connection point to the site will be identified and safeguarded during design development and construction.

Communal heating and hot water

Heating and domestic hot water will be provided by central air source heat pumps supplying localised water source heat pumps. Further details can be found within the Be Green section of the report.

Be Clean CO₂ emissions

In line with GLA guidance, heat pumps are categorised under the Be Green step of the energy hierarchy, unless these serve district heating networks, and the communal heating system's impact on the carbon emissions reduction have been captured in the next section. Due to this, there is no change in the carbon emissions as a result of the Be Clean step.

Table 8: Carbon Dioxide Emissions after Be Clean stage of the Energy Hierarchy

Carbon Dioxide Emissions (Tonnes CO ₂ per annum)		
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	12.8	21.2
After energy demand reduction (be lean)	10.8	21.2
After heat network connection (be clean)	10.8	21.2

Table 9: Carbon Dioxide savings after Be Clean stage of the Energy Hierarchy

Regulated carbon dioxide savings		
	Tonnes CO ₂ per annum	%
Be lean: savings from energy demand reduction	1.9	15%
Be clean: savings from heat network	0.0	0%

5.3 Be Green

Methods of generating on-site renewable energy were assessed once Be Lean and Be Clean measures were taken into account.

The development will benefit from a fabric first approach and energy efficient building services that will reduce the amount of energy needed. A range of renewable technologies were considered, and in determining the appropriate renewable technology for the site, the following factors were considered:

- CO₂ savings achieved;
- Site constraints; and
- Any potential visual impacts.

The following table provides details of each technology considered. The feasibility study demonstrates that photovoltaics and heat pumps would be the most feasible renewable technologies for the proposed development.

Table 10: Low and zero carbon technologies feasibility summary

Technology	Technical feasibility	Lifetime	Maintenance	Site feasibility
PV panels	The proposed development benefits from unshaded flat roofs, suitable for the installation of PV panels.	25 years	Low	High - adopted
Solar thermal	Solar thermal panels compete with PV panels for available roof space; as PV panels are anticipated to result in higher carbon emissions savings, solar thermal are not recommended for the development.	25 years	Low	Low - not adopted
Heat pumps	Heat pumps are considered suitable technologies for the provision of heating and hot water. As the electricity grid decarbonises, the operational carbon emissions also reduces. The communal water-based system is also recommended to facilitate future connection to a district heating network should one become available.	20 years	Medium	High - adopted
Wind turbines	Due to the site's urban location, wind turbines would need to be roof mounted. This would lead to visual impacts as well as building vibration.	25 years	Medium	Low - not adopted
Biomass	Due to its constrained site, the development cannot accommodate wood pellet storage required to support the use of biomass as fuel. In addition, the high levels of particulates and NOx emissions would be likely to cause issues with local air quality.	20 years	High	Low - not adopted
Gas CHP	The London Plan limits the role of CHP to instances where it can support the delivery of an area-wide heat network, which due to the site's size constraints would not be feasible.	20 years	Medium	Low - not adopted

Heat pumps

An ambient temperature energy loop system is proposed to provide high efficiency heating and hot water. Each block will have central air source heat pumps (ASHP) located at roof level, connecting to local water source heat pumps on each floor. This low temperature distribution system will result in very low heat losses, saving energy and reducing the risk of overheating, particularly in corridors.

Each floor will contain water source heat pumps within service cupboards, connected to the ambient temperature loop. The heat pumps will provide 100% of space heating (via underfloor heating) and domestic hot water requirements and have the flexibility to provide cooling.

PV Panels

The extent of PV panels has been determined based on available roof area, orientation, shading, visual impact as well as the need to maximise ecology and meet the urban greening targets for the site.

Suitable space for PV has been identified on the roof of Block A, with an area of approximately 131m². A green roof is proposed under the PV panles to help reduce solar heat gains and improve the efficiency of the panels.

The PV panels have been included in the Part L energy model as high efficiency monocrystalline, primarily orientated South-East and South-West with a 35deg inclination. The Part L energy model

estimates this will generate around 25,500kWh of renewable electricity a year.

The proposed PV array will connect to the landlord electricity distribution. The output of the PV array will be monitored with a meter installed in accordance with Building Regulations and the Be Seen energy monitoring guidance. The meter will connect to the BEMS for continuous monitoring of the electricity generated.

Roof space on the lower Block B was also considered for PV; however, was discounted to make way for a Biodiversity Meadow Mix to maximize ecology and meet the urban greening targets. The planting on Block B also serves as a visual amenity to neighbouring buildings and provides an undisturbed habitat for wildlife within the city.

Figure 6: Roof plan illustrating are available for PV panels

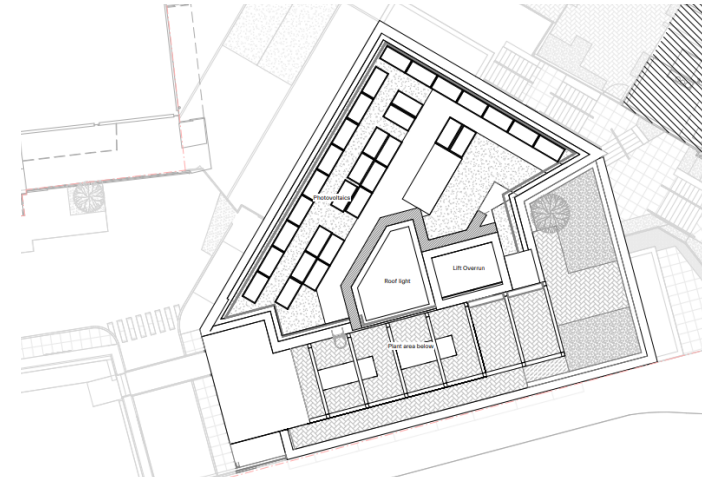
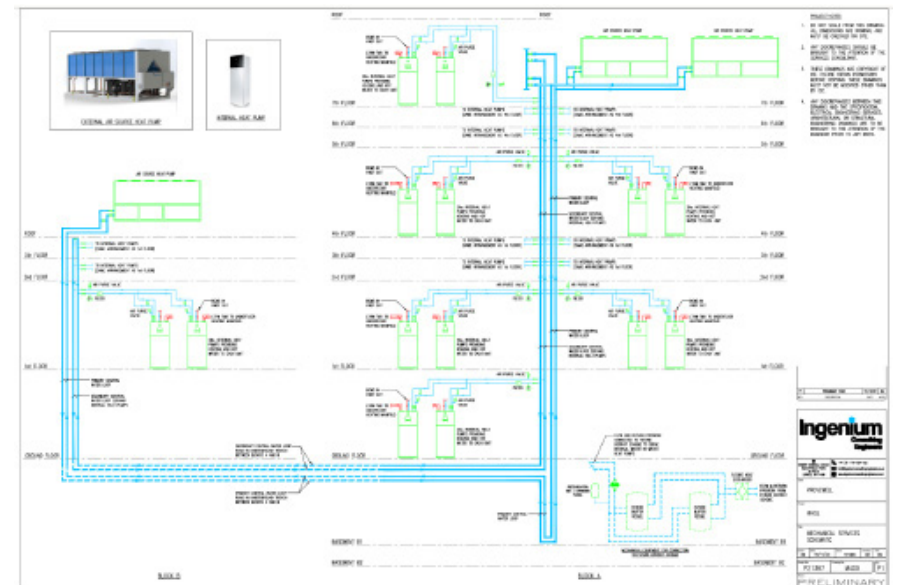


Figure 7: Proposed mechanical services distribution showing central ASHP and local water source heat pumps



Be Green CO₂ emissions

Tables below show the carbon savings from low and zero carbon technologies.

Table 11: Carbon Dioxide Emissions after Be Green stage

Carbon Dioxide Emissions (Tonnes CO ₂ per annum)		
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	12.8	21.2
After energy demand reduction (be lean)	10.8	21.2
After heat network connection (be clean)	10.8	21.2
After renewable energy (be green)	7.3	21.2

Table 12: Carbon Dioxide savings after Be Green stage

Regulated carbon dioxide savings		
	Tonnes CO ₂ per annum	%
Be lean: savings from energy demand reduction	1.9	15%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	3.5	27%

5.4 Be Seen

The sub-metering strategy will be developed further during the detailed design stages; however, the development will incorporate energy and smart meters in line with the GLA's Energy Monitoring Guidance (2021) to enable in use performance to be monitored and optimised. This will include the use of open protocol systems that allow devices to be connected without having to use proprietary systems.

A building energy management system (BEMS) will be provided to operate, control and monitor the mechanical service installations. Each meter will be connected to an automatic data retrieval system and billing will be administered by the Client or their appointed management company.

Comprehensive metering will allow performance and load monitoring of complete systems and also individual items of plant, including low and zero carbon technologies. Should there be a connection in the future, the district heating system will also be metered and monitored.

Electricity sub-meters will be installed to cover at least 90% of the annual energy consumption per fuel as follows:

- Space heating
- Domestic hot water
- Ventilation
- Pumps
- Lighting
- Small power

- Renewable or low carbon systems
- Controls
- Other major consuming systems/plant

Demand side response

The potential for configurable gateways, allowing for automated Demand Side Response (DSR) has not been fully reviewed at this stage and will be assessed during the detailed design stages. Due to the residential-led nature of the development, it is not expected that this will be feasible.

Flexibility potential

Opportunities to reduce peak heating and electricity demand of the development have been considered. Electricity energy storage is not proposed for the site as energy generation from PVs is anticipated to be fully utilised on site with little or no export.

The Be Seen planning stage webform has been submitted.

6 / *Results*

6.1 Summary of Results

The proposed development has been designed to meet energy policies set out by the GLA and the London Borough of Haringey, which demonstrates the client and the design team’s commitment to enhancing sustainability across the scheme.

On site CO₂ savings

By implementing the Energy Hierarchy as detailed in the previous sections, the Regulated CO₂ emissions for the development have been reduced against a Part L 2021 compliant scheme through on site measures alone by 43%. The proposed development complies with the London Plan CO₂ savings target of 35% overall.

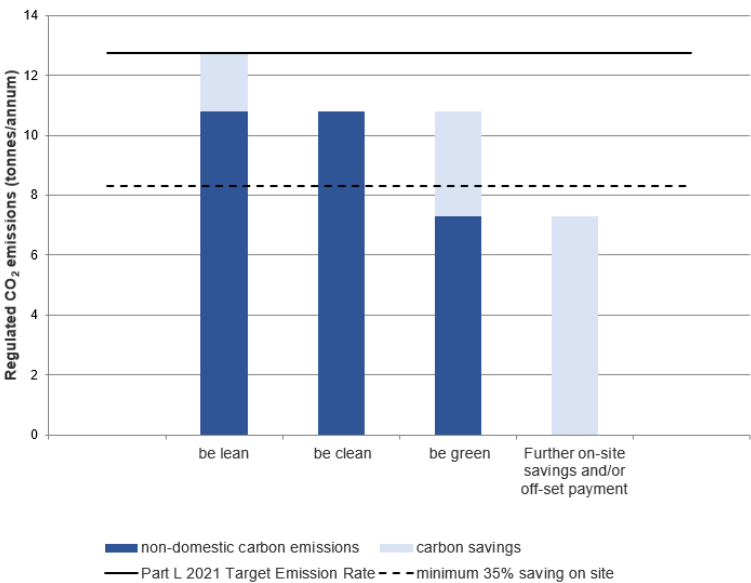


Figure 8: Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy

The following tables and graph summarises the implementation of the Energy Hierarchy for the proposed scheme and details the CO₂ emissions and savings against the baseline scheme for each step of energy the hierarchy.

Carbon offset payment

To achieve ‘zero carbon’ for the scheme, 7.3 tonnes per annum of regulated CO₂, equivalent to 219 tonnes over 30 years, should be offset. At the concept design stage this amounts to a total sum of £20,838, calculated based on a carbon price of £95 per tonne over 30 years.

Table 13: Carbon Dioxide Emissions after each stage of the Energy Hierarchy

Carbon Dioxide Emissions (Tonnes CO ₂ per annum)		
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	12.8	21.2
After energy demand reduction (be lean)	10.8	21.2
After heat network connection (be clean)	10.8	21.2
After renewable energy (be green)	7.3	21.2

Table 14: Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy

Regulated carbon dioxide savings		
	Tonnes CO ₂ per annum	%
Be lean: savings from energy demand reduction	1.9	15%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	3.5	27%
Total cumulative savings on-site	5.4	43%
Annual savings from off-set payment	7.3	-
	(Tonnes CO ₂)	
Cumulative savings for off-set payment	219	-

6.2 Primary Energy Rate

Target primary energy rate

Primary energy is ‘energy from renewable and non-renewable sources which has not undergone any conversion or transformation process’. For example, the chemical energy contained in fossil fuels is a source of primary energy. However, a unit of electricity generated by burning that fossil fuel would not be considered primary energy because it has gone through a conversion process.

The primary energy rating of the development is represented by the Building Primary Energy Rating (BPER) and in order to reach Part L2 compliance this must not exceed the Target Primary Energy Rating (TPER). Table 15 summarises the findings from the assessment, and demonstrates that the BPER does not exceed the TPER.

Table 15: Building Primary Energy Rating

Primary energy rating kWh _{pe} /m ² .year		
Building primary energy rate (BPER)	Target primary energy rate (TPER)	Improvement
19.27	34.56	44%

6.3 EUI and Space Heating Demand

Energy use intensity (EUI) and space heating demand

Energy Use Intensity (EUI) is a measure of the total energy consumed in a building annually. It includes both regulated (fixed systems for lighting, heating, hot water, air conditioning and mechanical ventilation) and unregulated (cooking and all electrical appliances, and other small power) energy. It does not include energy use from electric vehicle charging or any reduction in EUI due to renewable energy generation on-site.

Space heating demand is the amount of energy per m², over the course of an average year, which is needed to maintain a comfortable internal temperature. This is directly related to the thermal performance of the building and is therefore a good proxy for fabric efficiency.

Both EUI and space heating demand are reported as detailed in the GLA’s Energy Assessment Guidance (June/2022). The figures for the proposed

development can be found in Table 16.

The GLA also sets benchmarks for these and encourages applicants to achieve and improve on performance where possible.

Performance is as expected, with the buildings EUI lower than the non-residential benchmark. As explained above (in Section 4) our building is classified as a non dwelling and assessed in accordance with Approved Document, Volume 2 and with the GLA’s non residential targets. However, the energy use of the warehouse living accommodation is likely to be similar to that of residential building and closer to the residential benchmark of 35kWh/m2/year, as illustrated in Table 16.

Space heating demand is slightly higher than the 15kWh/m2/year benchmark. The building has prioritised a fabric first approach and has got close to the benchmark, illustrating a significant reduction in space heating demand.

Table 16: Building EUI and space heating demand

Building type	EUI (kWh/m2/year) (excluding renewable energy)	Space Heating (kWh/m2/year) (excluding renewable energy)	EUI Benchmark value (kWh/m2/year) (excluding renewable energy)	Space Heating Benchmark value (kWh/m2/year) (excluding renewable energy)	Methodology used
Non-residential	39.26	18.96	55	15	Part L2 approved DSM & CIBSE TM54

7 / *Appendix A*

BRUKL Documents

Project name

Seven Sisters_Part L_Be Lean

As designed

Date: Wed Oct 18 15:42:04 2023

Administrative information

Building Details

Address: Address 1, City, Postcode

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.17

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.17

BRUKL compliance module version: v6.1.c.0

Foundation area [m²]: 399.01The CO₂ emission and primary energy rates of the building must not exceed the targets

Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	3.21
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	2.72
Target primary energy rate (TPER), kWh/m ² .annum	34.56
Building primary energy rate (BPER), kWh/m ² .annum	29.35
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-Limit}	U _{a-Calc}	U _{i-Calc}	First surface with maximum value
Walls*	0.26	0.15	0.15	F0000013:Surf[2]
Floors	0.18	0.1	0.1	F0000006:Surf[0]
Pitched roofs	0.16	-	-	No Pitched roofs in building
Flat roofs	0.18	0.1	0.1	F0000083:Surf[0]
Windows** and roof windows	1.6	1.2	1.2	F1000001:Surf[0]
Rooflights***	2.2	1.2	1.2	F0000099:Surf[0]
Personnel doors [^]	1.6	1.6	1.6	F0000098:Surf[1]
Vehicle access & similar large doors	1.3	-	-	No Vehicle access doors in building
High usage entrance doors	3	-	-	No High usage entrance doors in building

U_{a-Limit} = Limiting area-weighted average U-values [W/(m²K)]U_{a-Calc} = Calculated area-weighted average U-values [W/(m²K)]U_{i-Calc} = Calculated maximum individual element U-values [W/(m²K)]

* 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/m²K

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	3.08

Building services

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

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

1- Residential with cooling

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.64	4.4	0	1.6	0.82
Standard value	2.5*	4.5**	N/A	2^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					
** Standard shown is for air-cooled chillers >=400 kW. For chillers <400 kW, limiting SEER is 4.					
^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.					

2- Residential

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.64	-	0.2	-	0.82
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

3- Commercial Shell and Core

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.64	4.4	0	1.8	0.76
Standard value	2.5*	4.5**	N/A	2^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					
** Standard shown is for air-cooled chillers >=400 kW. For chillers <400 kW, limiting SEER is 4.					
^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.					

"No HWS in project, or hot water is provided by HVAC system"

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	Zone	Standard
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1		
F00L1_B_Single bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L1_B_Accessible bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L1_B_Accessible bedroom 2	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L1_B_Single bedroom 2	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L1_B_Living Room/Kitchen 1	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L1_B_Double bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L1_B_single bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L1_B_Accessible bedroom 3	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L1_B_Bathroom 1	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L1_A_Double bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L1_A_Double bedroom 2	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L1_A_Single bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L1_A_Single bedroom 2	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L1_A_Single bedroom 3	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L1_A_Single bedroom 4	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L1_A_bathroom 1	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L1_A_bathroom 2	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L1_A_bathroom 3	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L1_A_Accessible bedroom 2	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L1_A_Accessible bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L1_A_Single bedroom 6	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L1_A_Single bedroom 7	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L1_A_Single bedroom 8	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L1_A_Double bedroom 3	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L1_A_Living Room/Kitchen 2	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L1_A_WC	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L1_A_Single bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L1_A_Living Room	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L2_B_Single bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L2_B_Accessible bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L2_B_Accessible bedroom 2	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L2_B_Single bedroom 2	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L2_B_Living Room/Kitchen 1	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L2_B_Double bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L2_B_single bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L2_B_Accessible bedroom 3	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L2_B_Bathroom 1	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L2_A_Double bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L2_A_Double bedroom 2	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L2_A_Single bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L2_A_Single bedroom 2	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L2_A_Single bedroom 3	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L2_A_Single bedroom 4	-	-	-	-	-	-	-	0.3	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I	Zone	Standard
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1		
F00L2_A_bathroom 1	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L2_A_bathroom 2	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L2_A_bathroom 3	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L2_A_Accessible bedroom 2	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L2_A_Accessible bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L2_A_Single bedroom 6	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L2_A_Single bedroom 7	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L2_A_Single bedroom 8	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L2_A_Double bedroom 3	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L2_A_Living Room/Kitchen 2	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L2_A_WC	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L2_A_Single bedroom 5	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L2_A_Kitchen	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L3_B_Single bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L3_B_Accessible bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L3_B_Accessible bedroom 2	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L3_B_Single bedroom 2	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L3_B_Living Room/Kitchen 1	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L3_B_Double bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L3_B_single bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L3_B_Accessible bedroom 3	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L3_B_Bathroom 1	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L3_A_Double bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L3_A_Double bedroom 2	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L3_A_Single bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L3_A_Single bedroom 2	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L3_A_Single bedroom 3	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L3_A_Single bedroom 4	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L3_A_bathroom 1	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L3_A_bathroom 2	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L3_A_bathroom 3	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L3_A_Accessible bedroom 2	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L3_A_Accessible bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L3_A_Single bedroom 6	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L3_A_Single bedroom 7	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L3_A_Single bedroom 8	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L3_A_Double bedroom 3	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L3_A_Living Room/Kitchen 2	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L3_A_WC	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L3_A_Single bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L3_A_Living Room	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L5_A_Double bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L5_A_Double bedroom 2	-	-	-	-	-	-	-	0.3	-	-	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
F00L5_A_ Single bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L5_A_ Single bedroom 2	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L5_A_ Single bedroom 3	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L5_A_ Single bedroom 4	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L5_A_ bathroom 1	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L5_A_ bathroom 2	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L5_A_ bathroom 3	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L5_A_ Accessible bedroom 2	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L5_A_ Accessible bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L5_A_ Single bedroom 6	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L5_A_ Single bedroom 7	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L5_A_ Single bedroom 8	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L5_A_ Double bedroom 3	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L5_A_ Living Room/Kitchen 2	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L5_A_ WC	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L5_A_ Single bedroom 5	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L5_A_ Living Room	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L6_A_ bathroom 1	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L6_A_ bathroom 2	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L6_A_ WC	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L6_A_ Kitchen	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L6_A_ Living Room	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L6_A_ Single bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L6_A_ Single bedroom 2	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L6_A_ Single bedroom 8	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L6_A_ Bathroom 1	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L6_A_ Single bedroom 6	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L6_A_ Bathroom 2	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L6_A_ Single bedroom 9	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L7_A__Kitchen	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L7_A_ Single bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L7_A_ Single bedroom 2	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L7_A_ Single bedroom 3	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L7_A_ Bathroom	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L7_A_ Single bedroom 6	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L7_A_ Bathroom	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L7_A_ Single bedroom 5	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L4_A_ Double bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L4_A_ Double bedroom 2	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L4_A_ Single bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L4_A_ Single bedroom 2	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L4_A_ Single bedroom 3	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L4_A_ Single bedroom 4	-	-	-	-	-	-	-	0.3	-	-	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	
F00L4_A_bathroom 1	-	-	-	1.6	-	-	-	-	-	-	N/A	
F00L4_A_bathroom 2	-	-	-	1.6	-	-	-	-	-	-	N/A	
F00L4_A_bathroom 3	-	-	-	1.6	-	-	-	-	-	-	N/A	
F00L4_A_Accessible bedroom 2	-	-	-	-	-	-	-	0.3	-	-	N/A	
F00L4_A_Accessible bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A	
F00L4_A_Single bedroom 6	-	-	-	-	-	-	-	0.3	-	-	N/A	
F00L4_A_Single bedroom 7	-	-	-	-	-	-	-	0.3	-	-	N/A	
F00L4_A_Single bedroom 8	-	-	-	-	-	-	-	0.3	-	-	N/A	
F00L4_A_Double bedroom 3	-	-	-	-	-	-	-	0.3	-	-	N/A	
F00L4_A_Living Room/Kitchen 2	-	-	-	1.6	-	-	-	-	-	-	N/A	
F00L4_A_WC	-	-	-	1.6	-	-	-	-	-	-	N/A	
F00L4_A_Single bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A	
F00L4_A_Kitchen	-	-	-	1.6	-	-	-	-	-	-	N/A	
F00L6_A_Double bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A	
F00L6_A_Double bedroom 2	-	-	-	-	-	-	-	0.3	-	-	N/A	
F00L6_A_Single bedroom 5	-	-	-	-	-	-	-	0.3	-	-	N/A	
F00L6_A_Single bedroom 7	-	-	-	-	-	-	-	0.3	-	-	N/A	
F00L6_A_Single bedroom 3	-	-	-	-	-	-	-	0.3	-	-	N/A	
F00L6_A_Single bedroom 4	-	-	-	-	-	-	-	0.3	-	-	N/A	
F00L6_A_Single bedroom 10	-	-	-	-	-	-	-	0.3	-	-	N/A	
F00L7_A_Single Bedroom 4	-	-	-	-	-	-	-	0.3	-	-	N/A	
F00L6_A_Single bedroom 11	-	-	-	-	-	-	-	0.3	-	-	N/A	
F00GL_A_Bathroom2	-	-	-	1.6	-	-	-	-	-	-	N/A	
F00GL_A_doubleBedroom1	-	-	-	-	-	-	-	0.3	-	-	N/A	
F00GL_A_SingleBedroom3	-	-	-	-	-	-	-	0.3	-	-	N/A	
F00GL_A_SingleBedroom 2	-	-	-	-	-	-	-	0.3	-	-	N/A	
F00GL_A_Bathroom1	-	-	-	1.6	-	-	-	-	-	-	N/A	
F00GL_A_SingleBedroom1	-	-	-	-	-	-	-	0.3	-	-	N/A	
F00GL_A_Living Room/kitchen	-	-	-	1.6	-	-	-	-	-	-	N/A	
F00GL_B_Commerical Unit 1	-	-	-	-	-	-	-	0.3	-	-	N/A	
F00GL_B_Commerical Unit 2	-	-	-	-	-	-	-	0.3	-	-	N/A	
F00GL_A_Commerical Unit	-	-	-	-	-	-	-	0.3	-	-	N/A	
F00UG_A_Workshop	-	-	-	-	-	-	-	0.3	-	-	N/A	
F00UG_A_Switch Room	-	-	-	-	-	-	-	0.3	-	-	N/A	
F00LG_A_Workshop	-	-	-	-	-	-	-	0.3	-	-	N/A	
F00LG_A_Life Safety Room	-	-	-	-	-	-	-	0.3	-	-	N/A	
F00UG_A_Plant	-	-	-	-	-	-	-	0.3	-	-	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
F00L1_B_Single bedroom 1		110	-	-
F00L1_B_Accessible bedroom 1		110	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
F00L1_B_Accessible bedroom 2		110	-	-
F00L1_B_Single bedroom 2		110	-	-
F00L1_B_Living Room/Kitchen 1		110	-	-
F00L1_B_Double bedroom 1		110	-	-
F00L1_B_single bedroom 1		110	-	-
F00L1_B_Accessible bedroom 3		110	-	-
F00L1_B_Bathroom 1		110	-	-
F00L1_B_Lobby 1		110	-	-
F00L1_B_Lift Lobby		110	-	-
F00L1_B_Hallway 1		110	-	-
F00L1_A_Double bedroom 1		110	-	-
F00L1_A_Double bedroom 2		110	-	-
F00L1_A_Single bedroom 1		110	-	-
F00L1_A_Single bedroom 2		110	-	-
F00L1_A_Single bedroom 3		110	-	-
F00L1_A_Single bedroom 4		110	-	-
F00L1_A_bathroom 1		110	-	-
F00L1_A_bathroom 2		110	-	-
F00L1_A_bathroom 3		110	-	-
F00L1_A_Accessible bedroom 2		110	-	-
F00L1_A_Accessible bedroom 1		110	-	-
F00L1_A_Single bedroom 6		110	-	-
F00L1_A_Single bedroom 7		110	-	-
F00L1_A_Single bedroom 8		110	-	-
F00L1_A_Double bedroom 3		110	-	-
F00L1_A_Living Room/Kitchen 2		110	-	-
F00L1_A_Hallway 1		110	-	-
F00L1_A_Lift Lobby		110	-	-
F00L1_A_Lobby 1		110	-	-
F00L1_A_Lobby 2		110	-	-
F00L1_A_Stair room		110	-	-
F00L1_A_WC		110	-	-
F00L1_A_Single bedroom 1		110	-	-
F00L1_A_Living Room		110	-	-
F00L1_A_Stair room 2		110	-	-
F00L2_B_Single bedroom 1		110	-	-
F00L2_B_Accessible bedroom 1		110	-	-
F00L2_B_Accessible bedroom 2		110	-	-
F00L2_B_Single bedroom 2		110	-	-
F00L2_B_Living Room/Kitchen 1		110	-	-
F00L2_B_Double bedroom 1		110	-	-
F00L2_B_single bedroom 1		110	-	-
F00L2_B_Accessible bedroom 3		110	-	-

General lighting and display lighting		General luminaire		Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80		0.3
F00L2_B_Bathroom 1		110	-		-
F00L2_B_Lobby 1		110	-		-
F00L2_B_Lift Lobby		110	-		-
F00L2_B_Hallway 1		110	-		-
F00L2_A_Double bedroom 1		110	-		-
F00L2_A_Double bedroom 2		110	-		-
F00L2_A_Single bedroom 1		110	-		-
F00L2_A_Single bedroom 2		110	-		-
F00L2_A_Single bedroom 3		110	-		-
F00L2_A_Single bedroom 4		110	-		-
F00L2_A_bathroom 1		110	-		-
F00L2_A_bathroom 2		110	-		-
F00L2_A_bathroom 3		110	-		-
F00L2_A_Accessible bedroom 2		110	-		-
F00L2_A_Accessible bedroom 1		110	-		-
F00L2_A_Single bedroom 6		110	-		-
F00L2_A_Single bedroom 7		110	-		-
F00L2_A_Single bedroom 8		110	-		-
F00L2_A_Double bedroom 3		110	-		-
F00L2_A_Living Room/Kitchen 2		110	-		-
F00L2_A_Hallway 1		110	-		-
F00L2_A_Hallway 2		110	-		-
F00L2_A_Lift Lobby		110	-		-
F00L2_A_Lobby 1		110	-		-
F00L2_A_Lobby 2		110	-		-
F00L2_A_Stair room		110	-		-
F00L2_A_WC		110	-		-
F00L2_A_Single bedroom 5		110	-		-
F00L2_A_Kitchen		110	-		-
F00L2_A_Stair room 2		110	-		-
F00L3_B_Single bedroom 1		110	-		-
F00L3_B_Accessible bedroom 1		110	-		-
F00L3_B_Accessible bedroom 2		110	-		-
F00L3_B_Single bedroom 2		110	-		-
F00L3_B_Living Room/Kitchen 1		110	-		-
F00L3_B_Double bedroom 1		110	-		-
F00L3_B_single bedroom 1		110	-		-
F00L3_B_Accessible bedroom 3		110	-		-
F00L3_B_Bathroom 1		110	-		-
F00L3_B_Lobby 1		110	-		-
F00L3_B_Lift Lobby		110	-		-
F00L3_B_Hallway 1		110	-		-
F00L3_A_Double bedroom 1		110	-		-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
F00L3_A_Double bedroom 2		110	-	-
F00L3_A_Single bedroom 1		110	-	-
F00L3_A_Single bedroom 2		110	-	-
F00L3_A_Single bedroom 3		110	-	-
F00L3_A_Single bedroom 4		110	-	-
F00L3_A_bathroom 1		110	-	-
F00L3_A_bathroom 2		110	-	-
F00L3_A_bathroom 3		110	-	-
F00L3_A_Accessible bedroom 2		110	-	-
F00L3_A_Accessible bedroom 1		110	-	-
F00L3_A_Single bedroom 6		110	-	-
F00L3_A_Single bedroom 7		110	-	-
F00L3_A_Single bedroom 8		110	-	-
F00L3_A_Double bedroom 3		110	-	-
F00L3_A_Living Room/Kitchen 2		110	-	-
F00L3_A_Hallway 1		110	-	-
F00L3_A_Hallway 2		110	-	-
F00L3_A_Lift Lobby		110	-	-
F00L3_A_Lobby 1		110	-	-
F00L3_A_Lobby 2		110	-	-
F00L3_A_Stair room		110	-	-
F00L3_A_WC		110	-	-
F00L3_A_Single bedroom 1		110	-	-
F00L3_A_Living Room		110	-	-
F00L3_A_Stair room 2		110	-	-
F00L5_A_Double bedroom 1		110	-	-
F00L5_A_Double bedroom 2		110	-	-
F00L5_A_Single bedroom 1		110	-	-
F00L5_A_Single bedroom 2		110	-	-
F00L5_A_Single bedroom 3		110	-	-
F00L5_A_Single bedroom 4		110	-	-
F00L5_A_bathroom 1		110	-	-
F00L5_A_bathroom 2		110	-	-
F00L5_A_bathroom 3		110	-	-
F00L5_A_Accessible bedroom 2		110	-	-
F00L5_A_Accessible bedroom 1		110	-	-
F00L5_A_Single bedroom 6		110	-	-
F00L5_A_Single bedroom 7		110	-	-
F00L5_A_Single bedroom 8		110	-	-
F00L5_A_Double bedroom 3		110	-	-
F00L5_A_Living Room/Kitchen 2		110	-	-
F00L5_A_Hallway 2		110	-	-
F00L5_A_Lift Lobby		110	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
F00L5_A_Lobby 1		110	-	-
F00L5_A_Lobby 2		110	-	-
F00L5_A_Stair room		110	-	-
F00L5_A_WC		110	-	-
F00L5_A_Single bedroom 5		110	-	-
F00L5_A_Living Room		110	-	-
F00L5_A_Stair room 2		110	-	-
F00L6_A_bathroom 1		110	-	-
F00L6_A_bathroom 2		110	-	-
F00L6_A_Lift Lobby		110	-	-
F00L6_A_Lobby 1		110	-	-
F00L6_A_Lobby 2		110	-	-
F00L6_A_Stair room		110	-	-
F00L6_A_WC		110	-	-
F00L6_A_Kitchen		110	-	-
F00L6_A_Stair room 2		110	-	-
F00L6_A_Stair room 3		110	-	-
F00L6_A_Living Room		110	-	-
F00L6_A_Single bedroom 1		110	-	-
F00L6_A_Single bedroom 2		110	-	-
F00L6_A_Single bedroom 8		110	-	-
F00L6_A_Bathroom 1		110	-	-
F00L6_A_Single bedroom 6		110	-	-
F00L6_A_Bathroom 2		110	-	-
F00L6_A_Hallway 2		110	-	-
F00L6_A_Single bedroom 9		110	-	-
F00L6_A_Hallway 1		110	-	-
F00L7_A_Lift Lobby		110	-	-
F00L7_A_Lobby 1		110	-	-
F00L7_A_Lobby 2		110	-	-
F00L7_A_Stair room		110	-	-
F00L7_A_Stair room 3		110	-	-
F00L7_A_Kitchen		110	-	-
F00L7_A_Single bedroom 1		110	-	-
F00L7_A_Single bedroom 2		110	-	-
F00L7_A_Single bedroom 3		110	-	-
F00L7_A_Bathroom		110	-	-
F00L7_A_Single bedroom 6		110	-	-
F00L7_A_Bathroom		110	-	-
F00L7_A_Hallway 1		110	-	-
F00L7_A_Single bedroom 5		110	-	-
F00L4_A_Double bedroom 1		110	-	-
F00L4_A_Double bedroom 2		110	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
F00L4_A_Single bedroom 1		110	-	-
F00L4_A_Single bedroom 2		110	-	-
F00L4_A_Single bedroom 3		110	-	-
F00L4_A_Single bedroom 4		110	-	-
F00L4_A_bathroom 1		110	-	-
F00L4_A_bathroom 2		110	-	-
F00L4_A_bathroom 3		110	-	-
F00L4_A_Accessible bedroom 2		110	-	-
F00L4_A_Accessible bedroom 1		110	-	-
F00L4_A_Single bedroom 6		110	-	-
F00L4_A_Single bedroom 7		110	-	-
F00L4_A_Single bedroom 8		110	-	-
F00L4_A_Double bedroom 3		110	-	-
F00L4_A_Living Room/Kitchen 2		110	-	-
F00L4_A_Hallway 1		110	-	-
F00L4_A_Hallway 2		110	-	-
F00L4_A_Lift Lobby		110	-	-
F00L4_A_Lobby 1		110	-	-
F00L4_A_Lobby 2		110	-	-
F00L4_A_Stair room		110	-	-
F00L4_A_WC		110	-	-
F00L4_A_Single bedroom 1		110	-	-
F00L4_A_Kitchen		110	-	-
F00L4_A_Stair room 2		110	-	-
F00L6_A_Double bedroom 1		110	-	-
F00L6_A_Double bedroom 2		110	-	-
F00L6_A_Single bedroom 5		110	-	-
F00L6_A_Single bedroom 7		110	-	-
F00L6_A_Single bedroom 3		110	-	-
F00L6_A_Single bedroom 4		110	-	-
F00L6_A_Single bedroom 10		110	-	-
F00L5_A_Hallway 1		110	-	-
F00L7_A_Single Bedroom 4		110	-	-
F00L6_A_Single bedroom 11		110	-	-
F00GL_A_Service Riser 2		104	-	-
F00GL_A_Entrance 1		110	-	-
F00GL_A_Fire Fighting Corridor1		110	-	-
F00GL_A_Commercial Refuse		104	-	-
F00GL_A_Bathroom2		110	-	-
F00GL_A_doubleBedroom1		110	-	-
F00GL_A_SingleBedroom3		110	-	-
F00GL_A_SingleBedroom 2		110	-	-
F00GL_A_Lobby		110	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
F00GL_A_Lift Lobby		110	-	-
F00GL_A_Bathroom1		110	-	-
F00GL_A_SingleBedroom1		110	-	-
F00GL_A_Living Room/kitchen		110	-	-
F00GL_A_Refuse Store 1		104	-	-
F00GL_B_Commerical Unit 1		110	15	10
F00GL_B_Commerical Unit 2		110	15	10
F00GL_B_switch Room		104	-	-
F00LG_B_Post Room		104	-	-
F00LG_A_Bike Store		104	-	-
00LG_B_Refuse Store		104	-	-
F00GL_B_Entrance 1		110	-	-
F00GL_B_stair Room		110	-	-
F00GL_B_Lift Lobby		110	-	-
F00GL_B_Entrance		110	-	-
F00LG_A_Stair Lobby		110	-	-
F00GL_A_Commerical Unit		110	15	10
F00L1_B_stair Room		110	-	-
F00L2_B_stair Room		110	-	-
F00L3_B_stair Room		110	-	-
F00GL_A_Hallway		110	-	-
F00L1_A_Hallway 2		110	-	-
F00UG_A_Workshop		104	-	-
F00UG_A_Switch Room		104	-	-
F00LG_A_Workshop		104	-	-
F00LG_A_Life Safety Room		104	-	-
F00LG_A_Plant		104	-	-
F00UG_A_Plant		104	-	-

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?
F00L1_B_Single bedroom 1	NO (-38.4%)	NO
F00L1_B_Accessible bedroom 1	NO (-52.9%)	NO
F00L1_B_Accessible bedroom 2	NO (-52.1%)	NO
F00L1_B_Single bedroom 2	NO (-67.6%)	NO
F00L1_B_Living Room/Kitchen 1	NO (-44.5%)	NO
F00L1_B_Double bedroom 1	NO (-69.6%)	NO
F00L1_B_single bedroom 1	NO (-59.9%)	NO
F00L1_B_Accessible bedroom 3	NO (-59.8%)	NO
F00L1_A_Double bedroom 1	NO (-84.5%)	NO
F00L1_A_Double bedroom 2	NO (-40.5%)	NO
F00L1_A_Single bedroom 1	NO (-40.7%)	NO
F00L1_A_Single bedroom 2	NO (-40.9%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
F00L1_A_Single bedroom 3	NO (-40.9%)	NO
F00L1_A_Single bedroom 4	NO (-40.9%)	NO
F00L1_A_Accessible bedroom 2	NO (-53%)	NO
F00L1_A_Accessible bedroom 1	NO (-84.4%)	NO
F00L1_A_Single bedroom 6	NO (-48.5%)	NO
F00L1_A_Single bedroom 7	NO (-48.4%)	NO
F00L1_A_Single bedroom 8	NO (-45.8%)	NO
F00L1_A_Double bedroom 3	NO (-73.6%)	NO
F00L1_A_Living Room/Kitchen 2	NO (-28.1%)	NO
F00L1_A_Single bedroom 1	NO (-71%)	NO
F00L1_A_Living Room	NO (-26.3%)	NO
F00L2_B_Single bedroom 1	NO (-38.4%)	NO
F00L2_B_Accessible bedroom 1	NO (-52.9%)	NO
F00L2_B_Accessible bedroom 2	NO (-52.1%)	NO
F00L2_B_Single bedroom 2	NO (-69%)	NO
F00L2_B_Living Room/Kitchen 1	NO (-44.5%)	NO
F00L2_B_Double bedroom 1	NO (-69.6%)	NO
F00L2_B_single bedroom 1	NO (-59.9%)	NO
F00L2_B_Accessible bedroom 3	NO (-59.8%)	NO
F00L2_A_Double bedroom 1	NO (-84.5%)	NO
F00L2_A_Double bedroom 2	NO (-40.5%)	NO
F00L2_A_Single bedroom 1	NO (-40.7%)	NO
F00L2_A_Single bedroom 2	NO (-40.9%)	NO
F00L2_A_Single bedroom 3	NO (-40.9%)	NO
F00L2_A_Single bedroom 4	NO (-40.9%)	NO
F00L2_A_Accessible bedroom 2	NO (-53%)	NO
F00L2_A_Accessible bedroom 1	NO (-84.4%)	NO
F00L2_A_Single bedroom 6	NO (-48.5%)	NO
F00L2_A_Single bedroom 7	NO (-48.4%)	NO
F00L2_A_Single bedroom 8	NO (-45.8%)	NO
F00L2_A_Double bedroom 3	NO (-73.6%)	NO
F00L2_A_Living Room/Kitchen 2	NO (-28.1%)	NO
F00L2_A_Single bedroom 5	NO (-78.6%)	NO
F00L2_A_Kitchen	NO (-12.8%)	NO
F00L3_B_Single bedroom 1	NO (-54.5%)	NO
F00L3_B_Accessible bedroom 1	NO (-65.2%)	NO
F00L3_B_Accessible bedroom 2	NO (-64.6%)	NO
F00L3_B_Single bedroom 2	NO (-76.1%)	NO
F00L3_B_Living Room/Kitchen 1	NO (-53.4%)	NO
F00L3_B_Double bedroom 1	NO (-77.5%)	NO
F00L3_B_single bedroom 1	NO (-70.4%)	NO
F00L3_B_Accessible bedroom 3	NO (-70.3%)	NO
F00L3_A_Double bedroom 1	NO (-84.5%)	NO
F00L3_A_Double bedroom 2	NO (-40.5%)	NO
F00L3_A_Single bedroom 1	NO (-40.7%)	NO
F00L3_A_Single bedroom 2	NO (-40.9%)	NO
F00L3_A_Single bedroom 3	NO (-40.9%)	NO
F00L3_A_Single bedroom 4	NO (-40.9%)	NO
F00L3_A_Accessible bedroom 2	NO (-53%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
F00L3_A_Accessible bedroom 1	NO (-84.4%)	NO
F00L3_A_Single bedroom 6	NO (-48.5%)	NO
F00L3_A_Single bedroom 7	NO (-48.4%)	NO
F00L3_A_Single bedroom 8	NO (-45.8%)	NO
F00L3_A_Double bedroom 3	NO (-73.6%)	NO
F00L3_A_Living Room/Kitchen 2	NO (-28.1%)	NO
F00L3_A_Single bedroom 1	NO (-71%)	NO
F00L3_A_Living Room	NO (-29.8%)	NO
F00L5_A_Double bedroom 1	NO (-84.5%)	NO
F00L5_A_Double bedroom 2	NO (-40.5%)	NO
F00L5_A_Single bedroom 1	NO (-40.7%)	NO
F00L5_A_Single bedroom 2	NO (-40.9%)	NO
F00L5_A_Single bedroom 3	NO (-40.9%)	NO
F00L5_A_Single bedroom 4	NO (-40.9%)	NO
F00L5_A_Accessible bedroom 2	NO (-53%)	NO
F00L5_A_Accessible bedroom 1	NO (-84.4%)	NO
F00L5_A_Single bedroom 6	NO (-48.5%)	NO
F00L5_A_Single bedroom 7	NO (-48.4%)	NO
F00L5_A_Single bedroom 8	NO (-45.8%)	NO
F00L5_A_Double bedroom 3	NO (-73.6%)	NO
F00L5_A_Living Room/Kitchen 2	NO (-28.1%)	NO
F00L5_A_Single bedroom 5	NO (-71%)	NO
F00L5_A_Living Room	NO (-31.1%)	NO
F00L6_A_Kitchen	NO (-34.4%)	NO
F00L6_A_Living Room	NO (-73.8%)	NO
F00L6_A_Single bedroom 1	NO (-85.6%)	NO
F00L6_A_Single bedroom 2	NO (-46.4%)	NO
F00L6_A_Single bedroom 8	NO (-46.4%)	NO
F00L6_A_Single bedroom 6	NO (-49.9%)	NO
F00L6_A_Single bedroom 9	NO (-50%)	NO
F00L7_A_Kitchen	NO (-91.3%)	NO
F00L7_A_Single bedroom 1	NO (-89.3%)	NO
F00L7_A_Single bedroom 2	NO (-60%)	NO
F00L7_A_Single bedroom 3	NO (-60%)	NO
F00L7_A_Single bedroom 6	NO (-62.5%)	NO
F00L7_A_Single bedroom 5	NO (-63.9%)	NO
F00L4_A_Double bedroom 1	NO (-84.5%)	NO
F00L4_A_Double bedroom 2	NO (-40.5%)	NO
F00L4_A_Single bedroom 1	NO (-40.7%)	NO
F00L4_A_Single bedroom 2	NO (-40.9%)	NO
F00L4_A_Single bedroom 3	NO (-40.9%)	NO
F00L4_A_Single bedroom 4	NO (-40.9%)	NO
F00L4_A_Accessible bedroom 2	NO (-53%)	NO
F00L4_A_Accessible bedroom 1	NO (-84.4%)	NO
F00L4_A_Single bedroom 6	NO (-48.5%)	NO
F00L4_A_Single bedroom 7	NO (-48.4%)	NO
F00L4_A_Single bedroom 8	NO (-45.8%)	NO
F00L4_A_Double bedroom 3	NO (-73.6%)	NO
F00L4_A_Living Room/Kitchen 2	NO (-28.1%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
F00L4_A_Single bedroom 1	NO (-78.6%)	NO
F00L4_A_Kitchen	NO (-13.9%)	NO
F00L6_A_Double bedroom 1	NO (-86.2%)	NO
F00L6_A_Double bedroom 2	NO (-47.1%)	NO
F00L6_A_Single bedroom 5	NO (-47.2%)	NO
F00L6_A_Single bedroom 7	NO (-47.4%)	NO
F00L6_A_Single bedroom 3	NO (-47.4%)	NO
F00L6_A_Single bedroom 4	NO (-47.4%)	NO
F00L6_A_Single bedroom 10	NO (-81%)	NO
F00L7_A_Single Bedroom 4	NO (-81.6%)	NO
F00L6_A_Single bedroom 11	NO (-73.1%)	NO
F00GL_A_doubleBedroom1	NO (-73.6%)	NO
F00GL_A_SingleBedroom3	NO (-47.6%)	NO
F00GL_A_SingleBedroom 2	NO (-48.3%)	NO
F00GL_A_SingleBedroom1	NO (-48.4%)	NO
F00GL_A_Living Room/kitchen	NO (-35.5%)	NO
F00GL_B_Commerical Unit 1	NO (-55.9%)	NO
F00GL_B_Commerical Unit 2	NO (-32.4%)	NO
F00GL_A_Commerical Unit	NO (-11.3%)	NO
F00UG_A_Workshop	N/A	N/A
F00UG_A_Switch Room	N/A	N/A
F00LG_A_Workshop	N/A	N/A
F00LG_A_Life Safety Room	N/A	N/A
F00UG_A_Plant	N/A	N/A

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?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m ²]	3973.6	3973.6
External area [m ²]	5312.9	5312.9
Weather	LON	LON
Infiltration [m ³ /hm ² @ 50Pa]	3	3
Average conductance [W/K]	1561.51	2506.53
Average U-value [W/m ² K]	0.29	0.47
Alpha value* [%]	25.73	10

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

Building Use

% Area	Building Type
4	Retail/Financial and Professional Services Restaurants and Cafes/Drinking Establishments/Takeaways
14	Offices and Workshop Businesses General Industrial and Special Industrial Groups Storage or Distribution Hotels Residential Institutions: Hospitals and Care Homes Residential Institutions: Residential Schools Residential Institutions: Universities and Colleges Secure Residential Institutions
82	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/m²]

	Actual	Notional
Heating	2.59	4.46
Cooling	0.51	1.52
Auxiliary	5.1	5.95
Lighting	6.26	7.27
Hot water	5.31	4.08
Equipment*	33.74	33.74
TOTAL **	19.78	23.28

* 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/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
<i>Displaced electricity</i>	<i>0</i>	<i>0</i>

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	31.06	60.12
Primary energy [kWh/m ²]	29.35	34.56
Total emissions [kg/m ²]	2.72	3.21

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 SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER	
[ST] Central heating using water: floor heating, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
Actual	28.1	0	3	0	1.5	2.64	0	2.64	0	
Notional	45.1	0	4.5	0	1.3	2.78	0	----	----	
[ST] Fan coil systems, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
Actual	14.6	52.7	1.5	4.2	8.9	2.64	3.47	2.64	4.4	
Notional	25.9	33.5	2.6	3.3	7.2	2.78	2.84	----	----	
[ST] Fan coil systems, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
Actual	25.6	2.3	2.7	0.2	10.4	2.64	3.52	2.64	4.4	
Notional	62.9	29.8	6.3	2.9	13	2.78	2.84	----	----	
[ST] No Heating or Cooling										
Actual	0	0	0	0	0	0	0	0	0	
Notional	0	0	0	0	0	0	0	----	----	

Key to terms

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

Project name

23 09 21_1499_Seven Sisters_Part L_Be Green

As designed

Date: Wed Oct 18 15:05:28 2023

Administrative information

Building Details

Address: Address 1, City, Postcode

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.17

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.17

BRUKL compliance module version: v6.1.c.0

Foundation area [m²]: 399.01The CO₂ emission and primary energy rates of the building must not exceed the targets

Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	3.21
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	1.84
Target primary energy rate (TPER), kWh/m ² .annum	34.56
Building primary energy rate (BPER), kWh/m ² .annum	19.27
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-Limit}	U _{a-Calc}	U _{i-Calc}	First surface with maximum value
Walls*	0.26	0.15	0.15	F0000013:Surf[2]
Floors	0.18	0.1	0.1	F0000006:Surf[0]
Pitched roofs	0.16	-	-	No Pitched roofs in building
Flat roofs	0.18	0.1	0.1	F0000083:Surf[0]
Windows** and roof windows	1.6	1.2	1.2	F1000001:Surf[0]
Rooflights***	2.2	1.2	1.2	F0000099:Surf[0]
Personnel doors [^]	1.6	1.6	1.6	F0000098:Surf[1]
Vehicle access & similar large doors	1.3	-	-	No Vehicle access doors in building
High usage entrance doors	3	-	-	No High usage entrance doors in building

U_{a-Limit} = Limiting area-weighted average U-values [W/(m²K)]U_{a-Calc} = Calculated area-weighted average U-values [W/(m²K)]U_{i-Calc} = Calculated maximum individual element U-values [W/(m²K)]

* 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/m²K

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	3.08

Building services

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

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

1- Residential with cooling

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.8	4.4	0	1.6	0.82
Standard value	2.5*	4.5**	N/A	2^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					
** Standard shown is for air-cooled chillers >=400 kW. For chillers <400 kW, limiting SEER is 4.					
^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.					

2- Residential

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.8	-	0.2	-	0.82
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

3- Commercial Shell and Core

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.64	4.4	0	1.8	0.76
Standard value	2.5*	4.5**	N/A	2^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					
** Standard shown is for air-cooled chillers >=400 kW. For chillers <400 kW, limiting SEER is 4.					
^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.					

"No HWS in project, or hot water is provided by HVAC system"

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	Zone	Standard
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1		
F00L1_B_Single bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L1_B_Accessible bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L1_B_Accessible bedroom 2	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L1_B_Single bedroom 2	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L1_B_Living Room/Kitchen 1	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L1_B_Double bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L1_B_single bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L1_B_Accessible bedroom 3	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L1_B_Bathroom 1	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L1_A_Double bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L1_A_Double bedroom 2	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L1_A_Single bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L1_A_Single bedroom 2	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L1_A_Single bedroom 3	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L1_A_Single bedroom 4	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L1_A_bathroom 1	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L1_A_bathroom 2	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L1_A_bathroom 3	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L1_A_Accessible bedroom 2	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L1_A_Accessible bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L1_A_Single bedroom 6	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L1_A_Single bedroom 7	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L1_A_Single bedroom 8	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L1_A_Double bedroom 3	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L1_A_Living Room/Kitchen 2	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L1_A_WC	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L1_A_Single bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L1_A_Living Room	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L2_B_Single bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L2_B_Accessible bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L2_B_Accessible bedroom 2	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L2_B_Single bedroom 2	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L2_B_Living Room/Kitchen 1	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L2_B_Double bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L2_B_single bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L2_B_Accessible bedroom 3	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L2_B_Bathroom 1	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L2_A_Double bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L2_A_Double bedroom 2	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L2_A_Single bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L2_A_Single bedroom 2	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L2_A_Single bedroom 3	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L2_A_Single bedroom 4	-	-	-	-	-	-	-	0.3	-	-	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
F00L2_A_bathroom 1	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L2_A_bathroom 2	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L2_A_bathroom 3	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L2_A_Accessible bedroom 2	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L2_A_Accessible bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L2_A_Single bedroom 6	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L2_A_Single bedroom 7	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L2_A_Single bedroom 8	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L2_A_Double bedroom 3	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L2_A_Living Room/Kitchen 2	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L2_A_WC	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L2_A_Single bedroom 5	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L2_A_Kitchen	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L3_B_Single bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L3_B_Accessible bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L3_B_Accessible bedroom 2	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L3_B_Single bedroom 2	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L3_B_Living Room/Kitchen 1	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L3_B_Double bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L3_B_single bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L3_B_Accessible bedroom 3	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L3_B_Bathroom 1	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L3_A_Double bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L3_A_Double bedroom 2	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L3_A_Single bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L3_A_Single bedroom 2	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L3_A_Single bedroom 3	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L3_A_Single bedroom 4	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L3_A_bathroom 1	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L3_A_bathroom 2	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L3_A_bathroom 3	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L3_A_Accessible bedroom 2	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L3_A_Accessible bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L3_A_Single bedroom 6	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L3_A_Single bedroom 7	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L3_A_Single bedroom 8	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L3_A_Double bedroom 3	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L3_A_Living Room/Kitchen 2	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L3_A_WC	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L3_A_Single bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L3_A_Living Room	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L5_A_Double bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L5_A_Double bedroom 2	-	-	-	-	-	-	-	0.3	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I	Zone	Standard
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1		
F00L5_A_Single bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L5_A_Single bedroom 2	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L5_A_Single bedroom 3	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L5_A_Single bedroom 4	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L5_A_bathroom 1	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L5_A_bathroom 2	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L5_A_bathroom 3	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L5_A_Accessible bedroom 2	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L5_A_Accessible bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L5_A_Single bedroom 6	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L5_A_Single bedroom 7	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L5_A_Single bedroom 8	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L5_A_Double bedroom 3	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L5_A_Living Room/Kitchen 2	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L5_A_WC	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L5_A_Single bedroom 5	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L5_A_Living Room	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L6_A_bathroom 1	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L6_A_bathroom 2	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L6_A_WC	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L6_A_Kitchen	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L6_A_Living Room	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L6_A_Single bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L6_A_Single bedroom 2	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L6_A_Single bedroom 8	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L6_A_Bathroom 1	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L6_A_Single bedroom 6	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L6_A_Bathroom 2	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L6_A_Single bedroom 9	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L7_A_Kitchen	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L7_A_Single bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L7_A_Single bedroom 2	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L7_A_Single bedroom 3	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L7_A_Bathroom	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L7_A_Single bedroom 6	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L7_A_Bathroom	-	-	-	1.6	-	-	-	-	-	-	N/A
F00L7_A_Single bedroom 5	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L4_A_Double bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L4_A_Double bedroom 2	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L4_A_Single bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L4_A_Single bedroom 2	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L4_A_Single bedroom 3	-	-	-	-	-	-	-	0.3	-	-	N/A
F00L4_A_Single bedroom 4	-	-	-	-	-	-	-	0.3	-	-	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	
F00L4_A_bathroom 1	-	-	-	1.6	-	-	-	-	-	-	N/A	
F00L4_A_bathroom 2	-	-	-	1.6	-	-	-	-	-	-	N/A	
F00L4_A_bathroom 3	-	-	-	1.6	-	-	-	-	-	-	N/A	
F00L4_A_Accessible bedroom 2	-	-	-	-	-	-	-	0.3	-	-	N/A	
F00L4_A_Accessible bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A	
F00L4_A_Single bedroom 6	-	-	-	-	-	-	-	0.3	-	-	N/A	
F00L4_A_Single bedroom 7	-	-	-	-	-	-	-	0.3	-	-	N/A	
F00L4_A_Single bedroom 8	-	-	-	-	-	-	-	0.3	-	-	N/A	
F00L4_A_Double bedroom 3	-	-	-	-	-	-	-	0.3	-	-	N/A	
F00L4_A_Living Room/Kitchen 2	-	-	-	1.6	-	-	-	-	-	-	N/A	
F00L4_A_WC	-	-	-	1.6	-	-	-	-	-	-	N/A	
F00L4_A_Single bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A	
F00L4_A_Kitchen	-	-	-	1.6	-	-	-	-	-	-	N/A	
F00L6_A_Double bedroom 1	-	-	-	-	-	-	-	0.3	-	-	N/A	
F00L6_A_Double bedroom 2	-	-	-	-	-	-	-	0.3	-	-	N/A	
F00L6_A_Single bedroom 5	-	-	-	-	-	-	-	0.3	-	-	N/A	
F00L6_A_Single bedroom 7	-	-	-	-	-	-	-	0.3	-	-	N/A	
F00L6_A_Single bedroom 3	-	-	-	-	-	-	-	0.3	-	-	N/A	
F00L6_A_Single bedroom 4	-	-	-	-	-	-	-	0.3	-	-	N/A	
F00L6_A_Single bedroom 10	-	-	-	-	-	-	-	0.3	-	-	N/A	
F00L7_A_Single Bedroom 4	-	-	-	-	-	-	-	0.3	-	-	N/A	
F00L6_A_Single bedroom 11	-	-	-	-	-	-	-	0.3	-	-	N/A	
F00GL_A_Bathroom2	-	-	-	1.6	-	-	-	-	-	-	N/A	
F00GL_A_doubleBedroom1	-	-	-	-	-	-	-	0.3	-	-	N/A	
F00GL_A_SingleBedroom3	-	-	-	-	-	-	-	0.3	-	-	N/A	
F00GL_A_SingleBedroom 2	-	-	-	-	-	-	-	0.3	-	-	N/A	
F00GL_A_Bathroom1	-	-	-	1.6	-	-	-	-	-	-	N/A	
F00GL_A_SingleBedroom1	-	-	-	-	-	-	-	0.3	-	-	N/A	
F00GL_A_Living Room/kitchen	-	-	-	1.6	-	-	-	-	-	-	N/A	
F00GL_B_Commerical Unit 1	-	-	-	-	-	-	-	0.3	-	-	N/A	
F00GL_B_Commerical Unit 2	-	-	-	-	-	-	-	0.3	-	-	N/A	
F00GL_A_Commerical Unit	-	-	-	-	-	-	-	0.3	-	-	N/A	
F00UG_A_Workshop	-	-	-	-	-	-	-	0.3	-	-	N/A	
F00UG_A_Switch Room	-	-	-	-	-	-	-	0.3	-	-	N/A	
F00LG_A_Workshop	-	-	-	-	-	-	-	0.3	-	-	N/A	
F00LG_A_Life Safety Room	-	-	-	-	-	-	-	0.3	-	-	N/A	
F00UG_A_Plant	-	-	-	-	-	-	-	0.3	-	-	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
F00L1_B_Single bedroom 1		110	-	-
F00L1_B_Accessible bedroom 1		110	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
F00L1_B_Accessible bedroom 2		110	-	-
F00L1_B_Single bedroom 2		110	-	-
F00L1_B_Living Room/Kitchen 1		110	-	-
F00L1_B_Double bedroom 1		110	-	-
F00L1_B_single bedroom 1		110	-	-
F00L1_B_Accessible bedroom 3		110	-	-
F00L1_B_Bathroom 1		110	-	-
F00L1_B_Lobby 1		110	-	-
F00L1_B_Lift Lobby		110	-	-
F00L1_B_Hallway 1		110	-	-
F00L1_A_Double bedroom 1		110	-	-
F00L1_A_Double bedroom 2		110	-	-
F00L1_A_Single bedroom 1		110	-	-
F00L1_A_Single bedroom 2		110	-	-
F00L1_A_Single bedroom 3		110	-	-
F00L1_A_Single bedroom 4		110	-	-
F00L1_A_bathroom 1		110	-	-
F00L1_A_bathroom 2		110	-	-
F00L1_A_bathroom 3		110	-	-
F00L1_A_Accessible bedroom 2		110	-	-
F00L1_A_Accessible bedroom 1		110	-	-
F00L1_A_Single bedroom 6		110	-	-
F00L1_A_Single bedroom 7		110	-	-
F00L1_A_Single bedroom 8		110	-	-
F00L1_A_Double bedroom 3		110	-	-
F00L1_A_Living Room/Kitchen 2		110	-	-
F00L1_A_Hallway 1		110	-	-
F00L1_A_Lift Lobby		110	-	-
F00L1_A_Lobby 1		110	-	-
F00L1_A_Lobby 2		110	-	-
F00L1_A_Stair room		110	-	-
F00L1_A_WC		110	-	-
F00L1_A_Single bedroom 1		110	-	-
F00L1_A_Living Room		110	-	-
F00L1_A_Stair room 2		110	-	-
F00L2_B_Single bedroom 1		110	-	-
F00L2_B_Accessible bedroom 1		110	-	-
F00L2_B_Accessible bedroom 2		110	-	-
F00L2_B_Single bedroom 2		110	-	-
F00L2_B_Living Room/Kitchen 1		110	-	-
F00L2_B_Double bedroom 1		110	-	-
F00L2_B_single bedroom 1		110	-	-
F00L2_B_Accessible bedroom 3		110	-	-

General lighting and display lighting		General luminaire		Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]	
	Standard value	95	80	0.3	
F00L2_B_Bathroom 1		110	-	-	
F00L2_B_Lobby 1		110	-	-	
F00L2_B_Lift Lobby		110	-	-	
F00L2_B_Hallway 1		110	-	-	
F00L2_A_Double bedroom 1		110	-	-	
F00L2_A_Double bedroom 2		110	-	-	
F00L2_A_Single bedroom 1		110	-	-	
F00L2_A_Single bedroom 2		110	-	-	
F00L2_A_Single bedroom 3		110	-	-	
F00L2_A_Single bedroom 4		110	-	-	
F00L2_A_bathroom 1		110	-	-	
F00L2_A_bathroom 2		110	-	-	
F00L2_A_bathroom 3		110	-	-	
F00L2_A_Accessible bedroom 2		110	-	-	
F00L2_A_Accessible bedroom 1		110	-	-	
F00L2_A_Single bedroom 6		110	-	-	
F00L2_A_Single bedroom 7		110	-	-	
F00L2_A_Single bedroom 8		110	-	-	
F00L2_A_Double bedroom 3		110	-	-	
F00L2_A_Living Room/Kitchen 2		110	-	-	
F00L2_A_Hallway 1		110	-	-	
F00L2_A_Hallway 2		110	-	-	
F00L2_A_Lift Lobby		110	-	-	
F00L2_A_Lobby 1		110	-	-	
F00L2_A_Lobby 2		110	-	-	
F00L2_A_Stair room		110	-	-	
F00L2_A_WC		110	-	-	
F00L2_A_Single bedroom 5		110	-	-	
F00L2_A_Kitchen		110	-	-	
F00L2_A_Stair room 2		110	-	-	
F00L3_B_Single bedroom 1		110	-	-	
F00L3_B_Accessible bedroom 1		110	-	-	
F00L3_B_Accessible bedroom 2		110	-	-	
F00L3_B_Single bedroom 2		110	-	-	
F00L3_B_Living Room/Kitchen 1		110	-	-	
F00L3_B_Double bedroom 1		110	-	-	
F00L3_B_single bedroom 1		110	-	-	
F00L3_B_Accessible bedroom 3		110	-	-	
F00L3_B_Bathroom 1		110	-	-	
F00L3_B_Lobby 1		110	-	-	
F00L3_B_Lift Lobby		110	-	-	
F00L3_B_Hallway 1		110	-	-	
F00L3_A_Double bedroom 1		110	-	-	

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
F00L3_A_Double bedroom 2		110	-	-
F00L3_A_Single bedroom 1		110	-	-
F00L3_A_Single bedroom 2		110	-	-
F00L3_A_Single bedroom 3		110	-	-
F00L3_A_Single bedroom 4		110	-	-
F00L3_A_bathroom 1		110	-	-
F00L3_A_bathroom 2		110	-	-
F00L3_A_bathroom 3		110	-	-
F00L3_A_Accessible bedroom 2		110	-	-
F00L3_A_Accessible bedroom 1		110	-	-
F00L3_A_Single bedroom 6		110	-	-
F00L3_A_Single bedroom 7		110	-	-
F00L3_A_Single bedroom 8		110	-	-
F00L3_A_Double bedroom 3		110	-	-
F00L3_A_Living Room/Kitchen 2		110	-	-
F00L3_A_Hallway 1		110	-	-
F00L3_A_Hallway 2		110	-	-
F00L3_A_Lift Lobby		110	-	-
F00L3_A_Lobby 1		110	-	-
F00L3_A_Lobby 2		110	-	-
F00L3_A_Stair room		110	-	-
F00L3_A_WC		110	-	-
F00L3_A_Single bedroom 1		110	-	-
F00L3_A_Living Room		110	-	-
F00L3_A_Stair room 2		110	-	-
F00L5_A_Double bedroom 1		110	-	-
F00L5_A_Double bedroom 2		110	-	-
F00L5_A_Single bedroom 1		110	-	-
F00L5_A_Single bedroom 2		110	-	-
F00L5_A_Single bedroom 3		110	-	-
F00L5_A_Single bedroom 4		110	-	-
F00L5_A_bathroom 1		110	-	-
F00L5_A_bathroom 2		110	-	-
F00L5_A_bathroom 3		110	-	-
F00L5_A_Accessible bedroom 2		110	-	-
F00L5_A_Accessible bedroom 1		110	-	-
F00L5_A_Single bedroom 6		110	-	-
F00L5_A_Single bedroom 7		110	-	-
F00L5_A_Single bedroom 8		110	-	-
F00L5_A_Double bedroom 3		110	-	-
F00L5_A_Living Room/Kitchen 2		110	-	-
F00L5_A_Hallway 2		110	-	-
F00L5_A_Lift Lobby		110	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
F00L5_A_Lobby 1		110	-	-
F00L5_A_Lobby 2		110	-	-
F00L5_A_Stair room		110	-	-
F00L5_A_WC		110	-	-
F00L5_A_Single bedroom 5		110	-	-
F00L5_A_Living Room		110	-	-
F00L5_A_Stair room 2		110	-	-
F00L6_A_bathroom 1		110	-	-
F00L6_A_bathroom 2		110	-	-
F00L6_A_Lift Lobby		110	-	-
F00L6_A_Lobby 1		110	-	-
F00L6_A_Lobby 2		110	-	-
F00L6_A_Stair room		110	-	-
F00L6_A_WC		110	-	-
F00L6_A_Kitchen		110	-	-
F00L6_A_Stair room 2		110	-	-
F00L6_A_Stair room 3		110	-	-
F00L6_A_Living Room		110	-	-
F00L6_A_Single bedroom 1		110	-	-
F00L6_A_Single bedroom 2		110	-	-
F00L6_A_Single bedroom 8		110	-	-
F00L6_A_Bathroom 1		110	-	-
F00L6_A_Single bedroom 6		110	-	-
F00L6_A_Bathroom 2		110	-	-
F00L6_A_Hallway 2		110	-	-
F00L6_A_Single bedroom 9		110	-	-
F00L6_A_Hallway 1		110	-	-
F00L7_A_Lift Lobby		110	-	-
F00L7_A_Lobby 1		110	-	-
F00L7_A_Lobby 2		110	-	-
F00L7_A_Stair room		110	-	-
F00L7_A_Stair room 3		110	-	-
F00L7_A_Kitchen		110	-	-
F00L7_A_Single bedroom 1		110	-	-
F00L7_A_Single bedroom 2		110	-	-
F00L7_A_Single bedroom 3		110	-	-
F00L7_A_Bathroom		110	-	-
F00L7_A_Single bedroom 6		110	-	-
F00L7_A_Bathroom		110	-	-
F00L7_A_Hallway 1		110	-	-
F00L7_A_Single bedroom 5		110	-	-
F00L4_A_Double bedroom 1		110	-	-
F00L4_A_Double bedroom 2		110	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
F00L4_A_Single bedroom 1		110	-	-
F00L4_A_Single bedroom 2		110	-	-
F00L4_A_Single bedroom 3		110	-	-
F00L4_A_Single bedroom 4		110	-	-
F00L4_A_bathroom 1		110	-	-
F00L4_A_bathroom 2		110	-	-
F00L4_A_bathroom 3		110	-	-
F00L4_A_Accessible bedroom 2		110	-	-
F00L4_A_Accessible bedroom 1		110	-	-
F00L4_A_Single bedroom 6		110	-	-
F00L4_A_Single bedroom 7		110	-	-
F00L4_A_Single bedroom 8		110	-	-
F00L4_A_Double bedroom 3		110	-	-
F00L4_A_Living Room/Kitchen 2		110	-	-
F00L4_A_Hallway 1		110	-	-
F00L4_A_Hallway 2		110	-	-
F00L4_A_Lift Lobby		110	-	-
F00L4_A_Lobby 1		110	-	-
F00L4_A_Lobby 2		110	-	-
F00L4_A_Stair room		110	-	-
F00L4_A_WC		110	-	-
F00L4_A_Single bedroom 1		110	-	-
F00L4_A_Kitchen		110	-	-
F00L4_A_Stair room 2		110	-	-
F00L6_A_Double bedroom 1		110	-	-
F00L6_A_Double bedroom 2		110	-	-
F00L6_A_Single bedroom 5		110	-	-
F00L6_A_Single bedroom 7		110	-	-
F00L6_A_Single bedroom 3		110	-	-
F00L6_A_Single bedroom 4		110	-	-
F00L6_A_Single bedroom 10		110	-	-
F00L5_A_Hallway 1		110	-	-
F00L7_A_Single Bedroom 4		110	-	-
F00L6_A_Single bedroom 11		110	-	-
F00GL_A_Service Riser 2		104	-	-
F00GL_A_Entrance 1		110	-	-
F00GL_A_Fire Fighting Corridor1		110	-	-
F00GL_A_Commercial Refuse		104	-	-
F00GL_A_Bathroom2		110	-	-
F00GL_A_doubleBedroom1		110	-	-
F00GL_A_SingleBedroom3		110	-	-
F00GL_A_SingleBedroom 2		110	-	-
F00GL_A_Lobby		110	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
F00GL_A_Lift Lobby		110	-	-
F00GL_A_Bathroom1		110	-	-
F00GL_A_SingleBedroom1		110	-	-
F00GL_A_Living Room/kitchen		110	-	-
F00GL_A_Refuse Store 1		104	-	-
F00GL_B_Commerical Unit 1		110	15	10
F00GL_B_Commerical Unit 2		110	15	10
F00GL_B_switch Room		104	-	-
F00LG_B_Post Room		104	-	-
F00LG_A_Bike Store		104	-	-
00LG_B_Refuse Store		104	-	-
F00GL_B_Entrance 1		110	-	-
F00GL_B_stair Room		110	-	-
F00GL_B_Lift Lobby		110	-	-
F00GL_B_Entrance		110	-	-
F00LG_A_Stair Lobby		110	-	-
F00GL_A_Commerical Unit		110	15	10
F00L1_B_stair Room		110	-	-
F00L2_B_stair Room		110	-	-
F00L3_B_stair Room		110	-	-
F00GL_A_Hallway		110	-	-
F00L1_A_Hallway 2		110	-	-
F00UG_A_Workshop		104	-	-
F00UG_A_Switch Room		104	-	-
F00LG_A_Workshop		104	-	-
F00LG_A_Life Safety Room		104	-	-
F00LG_A_Plant		104	-	-
F00UG_A_Plant		104	-	-

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?
F00L1_B_Single bedroom 1	NO (-38.4%)	NO
F00L1_B_Accessible bedroom 1	NO (-52.9%)	NO
F00L1_B_Accessible bedroom 2	NO (-52.1%)	NO
F00L1_B_Single bedroom 2	NO (-67.6%)	NO
F00L1_B_Living Room/Kitchen 1	NO (-44.5%)	NO
F00L1_B_Double bedroom 1	NO (-69.6%)	NO
F00L1_B_single bedroom 1	NO (-59.9%)	NO
F00L1_B_Accessible bedroom 3	NO (-59.8%)	NO
F00L1_A_Double bedroom 1	NO (-84.5%)	NO
F00L1_A_Double bedroom 2	NO (-40.5%)	NO
F00L1_A_Single bedroom 1	NO (-40.7%)	NO
F00L1_A_Single bedroom 2	NO (-40.9%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
F00L1_A_Single bedroom 3	NO (-40.9%)	NO
F00L1_A_Single bedroom 4	NO (-40.9%)	NO
F00L1_A_Accessible bedroom 2	NO (-53%)	NO
F00L1_A_Accessible bedroom 1	NO (-84.4%)	NO
F00L1_A_Single bedroom 6	NO (-48.5%)	NO
F00L1_A_Single bedroom 7	NO (-48.4%)	NO
F00L1_A_Single bedroom 8	NO (-45.8%)	NO
F00L1_A_Double bedroom 3	NO (-73.6%)	NO
F00L1_A_Living Room/Kitchen 2	NO (-28.1%)	NO
F00L1_A_Single bedroom 1	NO (-71%)	NO
F00L1_A_Living Room	NO (-26.3%)	NO
F00L2_B_Single bedroom 1	NO (-38.4%)	NO
F00L2_B_Accessible bedroom 1	NO (-52.9%)	NO
F00L2_B_Accessible bedroom 2	NO (-52.1%)	NO
F00L2_B_Single bedroom 2	NO (-69%)	NO
F00L2_B_Living Room/Kitchen 1	NO (-44.5%)	NO
F00L2_B_Double bedroom 1	NO (-69.6%)	NO
F00L2_B_single bedroom 1	NO (-59.9%)	NO
F00L2_B_Accessible bedroom 3	NO (-59.8%)	NO
F00L2_A_Double bedroom 1	NO (-84.5%)	NO
F00L2_A_Double bedroom 2	NO (-40.5%)	NO
F00L2_A_Single bedroom 1	NO (-40.7%)	NO
F00L2_A_Single bedroom 2	NO (-40.9%)	NO
F00L2_A_Single bedroom 3	NO (-40.9%)	NO
F00L2_A_Single bedroom 4	NO (-40.9%)	NO
F00L2_A_Accessible bedroom 2	NO (-53%)	NO
F00L2_A_Accessible bedroom 1	NO (-84.4%)	NO
F00L2_A_Single bedroom 6	NO (-48.5%)	NO
F00L2_A_Single bedroom 7	NO (-48.4%)	NO
F00L2_A_Single bedroom 8	NO (-45.8%)	NO
F00L2_A_Double bedroom 3	NO (-73.6%)	NO
F00L2_A_Living Room/Kitchen 2	NO (-28.1%)	NO
F00L2_A_Single bedroom 5	NO (-78.6%)	NO
F00L2_A_Kitchen	NO (-12.8%)	NO
F00L3_B_Single bedroom 1	NO (-54.5%)	NO
F00L3_B_Accessible bedroom 1	NO (-65.2%)	NO
F00L3_B_Accessible bedroom 2	NO (-64.6%)	NO
F00L3_B_Single bedroom 2	NO (-76.1%)	NO
F00L3_B_Living Room/Kitchen 1	NO (-53.4%)	NO
F00L3_B_Double bedroom 1	NO (-77.5%)	NO
F00L3_B_single bedroom 1	NO (-70.4%)	NO
F00L3_B_Accessible bedroom 3	NO (-70.3%)	NO
F00L3_A_Double bedroom 1	NO (-84.5%)	NO
F00L3_A_Double bedroom 2	NO (-40.5%)	NO
F00L3_A_Single bedroom 1	NO (-40.7%)	NO
F00L3_A_Single bedroom 2	NO (-40.9%)	NO
F00L3_A_Single bedroom 3	NO (-40.9%)	NO
F00L3_A_Single bedroom 4	NO (-40.9%)	NO
F00L3_A_Accessible bedroom 2	NO (-53%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
F00L3_A_Accessible bedroom 1	NO (-84.4%)	NO
F00L3_A_Single bedroom 6	NO (-48.5%)	NO
F00L3_A_Single bedroom 7	NO (-48.4%)	NO
F00L3_A_Single bedroom 8	NO (-45.8%)	NO
F00L3_A_Double bedroom 3	NO (-73.6%)	NO
F00L3_A_Living Room/Kitchen 2	NO (-28.1%)	NO
F00L3_A_Single bedroom 1	NO (-71%)	NO
F00L3_A_Living Room	NO (-29.8%)	NO
F00L5_A_Double bedroom 1	NO (-84.5%)	NO
F00L5_A_Double bedroom 2	NO (-40.5%)	NO
F00L5_A_Single bedroom 1	NO (-40.7%)	NO
F00L5_A_Single bedroom 2	NO (-40.9%)	NO
F00L5_A_Single bedroom 3	NO (-40.9%)	NO
F00L5_A_Single bedroom 4	NO (-40.9%)	NO
F00L5_A_Accessible bedroom 2	NO (-53%)	NO
F00L5_A_Accessible bedroom 1	NO (-84.4%)	NO
F00L5_A_Single bedroom 6	NO (-48.5%)	NO
F00L5_A_Single bedroom 7	NO (-48.4%)	NO
F00L5_A_Single bedroom 8	NO (-45.8%)	NO
F00L5_A_Double bedroom 3	NO (-73.6%)	NO
F00L5_A_Living Room/Kitchen 2	NO (-28.1%)	NO
F00L5_A_Single bedroom 5	NO (-71%)	NO
F00L5_A_Living Room	NO (-31.1%)	NO
F00L6_A_Kitchen	NO (-34.4%)	NO
F00L6_A_Living Room	NO (-73.8%)	NO
F00L6_A_Single bedroom 1	NO (-85.6%)	NO
F00L6_A_Single bedroom 2	NO (-46.4%)	NO
F00L6_A_Single bedroom 8	NO (-46.4%)	NO
F00L6_A_Single bedroom 6	NO (-49.9%)	NO
F00L6_A_Single bedroom 9	NO (-50%)	NO
F00L7_A_Kitchen	NO (-91.3%)	NO
F00L7_A_Single bedroom 1	NO (-89.3%)	NO
F00L7_A_Single bedroom 2	NO (-60%)	NO
F00L7_A_Single bedroom 3	NO (-60%)	NO
F00L7_A_Single bedroom 6	NO (-62.5%)	NO
F00L7_A_Single bedroom 5	NO (-63.9%)	NO
F00L4_A_Double bedroom 1	NO (-84.5%)	NO
F00L4_A_Double bedroom 2	NO (-40.5%)	NO
F00L4_A_Single bedroom 1	NO (-40.7%)	NO
F00L4_A_Single bedroom 2	NO (-40.9%)	NO
F00L4_A_Single bedroom 3	NO (-40.9%)	NO
F00L4_A_Single bedroom 4	NO (-40.9%)	NO
F00L4_A_Accessible bedroom 2	NO (-53%)	NO
F00L4_A_Accessible bedroom 1	NO (-84.4%)	NO
F00L4_A_Single bedroom 6	NO (-48.5%)	NO
F00L4_A_Single bedroom 7	NO (-48.4%)	NO
F00L4_A_Single bedroom 8	NO (-45.8%)	NO
F00L4_A_Double bedroom 3	NO (-73.6%)	NO
F00L4_A_Living Room/Kitchen 2	NO (-28.1%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
F00L4_A_Single bedroom 1	NO (-78.6%)	NO
F00L4_A_Kitchen	NO (-13.9%)	NO
F00L6_A_Double bedroom 1	NO (-86.2%)	NO
F00L6_A_Double bedroom 2	NO (-47.1%)	NO
F00L6_A_Single bedroom 5	NO (-47.2%)	NO
F00L6_A_Single bedroom 7	NO (-47.4%)	NO
F00L6_A_Single bedroom 3	NO (-47.4%)	NO
F00L6_A_Single bedroom 4	NO (-47.4%)	NO
F00L6_A_Single bedroom 10	NO (-81%)	NO
F00L7_A_Single Bedroom 4	NO (-81.6%)	NO
F00L6_A_Single bedroom 11	NO (-73.1%)	NO
F00GL_A_doubleBedroom1	NO (-73.6%)	NO
F00GL_A_SingleBedroom3	NO (-47.6%)	NO
F00GL_A_SingleBedroom 2	NO (-48.3%)	NO
F00GL_A_SingleBedroom1	NO (-48.4%)	NO
F00GL_A_Living Room/kitchen	NO (-35.5%)	NO
F00GL_B_Commerical Unit 1	NO (-55.9%)	NO
F00GL_B_Commerical Unit 2	NO (-32.4%)	NO
F00GL_A_Commerical Unit	NO (-11.3%)	NO
F00UG_A_Workshop	N/A	N/A
F00UG_A_Switch Room	N/A	N/A
F00LG_A_Workshop	N/A	N/A
F00LG_A_Life Safety Room	N/A	N/A
F00UG_A_Plant	N/A	N/A

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]	3973.6	3973.6
External area [m ²]	5312.9	5312.9
Weather	LON	LON
Infiltration [m ³ /hm ² @ 50Pa]	3	3
Average conductance [W/K]	1561.51	2506.53
Average U-value [W/m ² K]	0.29	0.47
Alpha value* [%]	25.73	10

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

Building Use

% Area	Building Type
4	Retail/Financial and Professional Services Restaurants and Cafes/Drinking Establishments/Takeaways
14	Offices and Workshop Businesses General Industrial and Special Industrial Groups Storage or Distribution Hotels Residential Institutions: Hospitals and Care Homes Residential Institutions: Residential Schools Residential Institutions: Universities and Colleges Secure Residential Institutions
82	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/m²]

	Actual	Notional
Heating	2.45	4.46
Cooling	0.51	1.52
Auxiliary	5.1	5.95
Lighting	6.26	7.27
Hot water	5.01	4.08
Equipment*	33.74	33.74
TOTAL **	19.34	23.28

* 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/m²]

	Actual	Notional
Photovoltaic systems	6.42	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
<i>Displaced electricity</i>	<i>6.42</i>	<i>0</i>

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	31.06	60.12
Primary energy [kWh/m ²]	19.27	34.56
Total emissions [kg/m ²]	1.84	3.21

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 SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER	
[ST] Central heating using water: floor heating, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
Actual	28.1	0	2.8	0	1.5	2.8	0	2.8	0	
Notional	45.1	0	4.5	0	1.3	2.78	0	----	----	
[ST] Fan coil systems, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
Actual	14.6	52.7	1.5	4.2	8.9	2.64	3.47	2.64	4.4	
Notional	25.9	33.5	2.6	3.3	7.2	2.78	2.84	----	----	
[ST] Fan coil systems, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
Actual	25.6	2.3	2.5	0.2	10.4	2.8	3.52	2.8	4.4	
Notional	62.9	29.8	6.3	2.9	13	2.78	2.84	----	----	
[ST] No Heating or Cooling										
Actual	0	0	0	0	0	0	0	0	0	
Notional	0	0	0	0	0	0	0	----	----	

Key to terms

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

8 / *Appendix B*

GLA Spreadsheet

GLA Carbon Emissions Reporting Spreadsheet

BACKGROUND AND PURPOSE

From **January 2023** planning applicants for new and refurbishments schemes are required to use this spreadsheet to report the anticipated carbon performance of a development. It should be used for both domestic and non-domestic uses. This spreadsheet ensures a consistent and transparent process for presenting Part L 2021 CO₂ emission performance. The GLA will not accept the use of alternative methodologies or tools. This is to ensure consistency and to minimise the need for clarifications during the planning application determination period.

Planning applicants should use Part L 2021 BRUKL and SAP outputs to fill in this spreadsheet which serves as the final step in reporting the carbon emission performance of the proposed energy strategy. **It is solely for the purpose of reporting compliance with the London Plan to the GLA and does not replace Part L calculations submitted for Building Regulations approval.**

The spreadsheet has been developed to fit as wide a range of policy compliant approaches for schemes as possible. Any planning applicants with a policy compliant approach that the spreadsheet does not serve should contact the GLA at: **ZeroCarbonPlanning@london.gov.uk**. Applicants must not amend or alter the spreadsheet to suit non-policy compliant strategies. Any unauthorised amendment to the spreadsheet will invalidate the CO₂ emission calculations.

Applicants should note that we will update the spreadsheet from time to time to ensure it remains fit for purpose. Applicants are expected to use the latest version at the time of the planning submission.

Any feedback on this spreadsheet should be sent to: ZeroCarbonPlanning@london.gov.uk.

METHODOLOGY

Applicants are required to complete **all** light blue input cells in the applicable tabs prior to submission ('Development Information', 'Part L Outputs', 'EUI & space heating demand' and 'GLA Summary Tables').

Input Data

For all applications, the input data required includes:

'Development information' tab

- Table 1. Application Completeness Check
- Table 2. Development Details
- Table 3. Bespoke District Heating Carbon Factors (if applicable)
- Table 4. Distribution loss factor (if applicable)
- Table 5. SCoP Calculation Methodology (if applicable)

'Part L Output' tab

- Type of units modelled
- Area of units modelled (m²)
- Number of units modelled
- Total area represented by model (m²)
- TER, DER and BER figures (kgCO₂/m² p.a.)
- Notional building Energy saving/generation technologies (-) for residential (kgCO₂ p.a.)
- Notional building Displaced electricity (-) for non-residential (kWh/m² p.a.)
- TFEE and DFEE figures for residential (kWh/m² p.a.)

'GLA Summary tables' tab

- Unregulated figures (tCO₂ p.a.)
- Actual and notional building cooling demand (MJ/m²)

Note: The total carbon emissions figures in the 'GLA Summary tables' tab are now calculated based on the area input for 'Total area represented by model (m²)'. This input requirement has been added to ensure that the carbon emission figures align with the development area schedule (included within the DAS) rather than the number of representative models.

'EUI & Space Heating Demand' tab

- Confirmation of building type
- Gross Internal Area (GIA) in m²
- Energy Use Intensity (EUI) per fuel type (kWh p.a.)
- Space heating demand (kWh p.a.)
- Confirmation that both regulated and unregulated energy use has been included
- Confirmation of predicted energy use methodology, including modelling software
- Notes on the assessment, including justification if expected performance differs from Table 4

Note: Applicants can use the 'be seen' methodology or an alternative predictive energy modelling methodology to fill in the required EUI & space heating demand information.

Where 'be seen' reporting is used the reported EUI and space heating demand should align with energy consumption data reported in the planning stage submission for the 'be seen' policy, submitted via the online webform.

Required Part L Outputs for the GLA spreadsheet

Domestic Part L Outputs:

For the domestic conversion applicants are required to use the outputs from the SAP TER and DER worksheets. To assist in the process the required SAP worksheet rows have been referenced in each input cell. Note: The SAP worksheet rows are based on a communal heating system in line with GLA policy and guidance. Applicants proposing individual systems must first seek confirmation from the GLA as to whether the approach will be acceptable.

Non-domestic Part L Outputs:

Regarding the non-domestic uses, the applicant can determine whether each individual unit will be modelled independently and apportioned to the entire scheme or whether a single model will be generated for the entire development. The applicant should, however, include the results from all BRUKL outputs generated for the proposed development under the "NON-RESIDENTIAL CQ ANALYSIS" sections. Applicants are generally encouraged to model each individual typology independently.

Validation Check

Applicants must ensure that the calculated TER/DER/BER in this spreadsheet matches the actual values from the Part L 2021 BRUKL and SAP worksheets. The Part L 2021 BRUKL and SAP sheet must accompany the energy assessment so that results can be validated.

TABLE 1. APPLICATION COMPLETENESS CHECK	
Development information tab (Tables 1-4) completed and included in appendix of energy strategy?	yes
Part L outputs tab completed	yes
EUI & space heating demand completed	yes
Confirmation that the planning stage webform will be completed at planning application submission and that the Be Seen process and reporting responsibilities are fully understood, including the requirement for as-built and in-use stage reporting to be undertaken (or where the legal owner changes from one reporting stage to another that the responsible party will be notified).	yes

TABLE 2. DEVELOPMENT DETAILS		Further notes	Response	Supporting comments (or signpost sections in the energy assessment)
Application details	Date of Application	Please provide the date the application was submitted to the Local Planning Authority	03/03/2023	
	Local Planning Authority	Please indicate the Local Planning Authority determining the application	Haringey London	
	Confirmed carbon offset price (£/tonne of carbon dioxide)	Please confirm the agreed carbon offset price for the Local Planning Authority. If no value is entered then the GLA's recommended price of £350 per tonne of carbon dioxide will be used.		
	Evidence of communication on the carbon offset price included in the energy assessment (Y/N).			
	Residential units number (Part L1)		n/a	
Heat risk	Non-residential floor area in m ² (Part L2)		3973.60	
	CIBSE TM59 undertaken for residential development (Y/N)		Y	
	CIBSE TM59 undertaken for non-residential development (Y/N)		N	
	All sample units meet CIBSE criteria with DSY1 another file (Y/N)		Y	
	DSY2 and DSY3 included in overheating assessments (Y/N)		Y	
	Residential g-value		0.40	
	% Glazing Ratio over façade		0.35	
Energy efficiency measures	External shading proposed (Y/N)		Y	
	Target Fabric Energy Efficiency met (Y/N)		Y	
	Mechanical Ventilation with Heat Recovery included (Y/N)		N	
	Waste Water Heat Recovery (Y/N)		N	
	Low energy lighting (Y/N)		Y	
District heating connection	Development in a Heat Network Priority Area (HNPA) (Y/N)		Y	Refer to section 5.2 in Energy Statement.
	District Heating Network connection (Y/N)		N	
	Name of District Heating Network		n/a	
	Carbon sector (kgCO ₂ /kWh)		n/a	
Site heating distribution configuration	Borough energy office and Heat Network Operator contacted and evidence of correspondence included in the energy strategy (Y/N)	Applicable to all applications.		
	Development future proofed for DHN connection (Y/N)	Note that individual heating systems would not be appropriate for developments in HNPA's.	Y	
	Drawings of communal system provided (Y/N)	Applicants should provide a drawings of the energy centre, on-site communal network with all building uses connected and future proofing arrangements detailed, including single point of connection.	Y	
	Distribution type		communal system (building level)	
	Flow temperature (°C)		TBC	
Heating system performance	Return temperature (°C)		TBC	
	Distribution losses modelled (%)	See table 4 below for details.	Y	Ambient /low temperature network proposed
	Heat Pump (Y/N)		Y	
	Heat Pump source		Air	
	Centralised Heat Pump capacity (kWth)		TBC	
	Heat Pump Seasonal Heating Efficiency (SCoP)		2.80	
	Heat Pump SCoP calculation includes heat source and heat distribution temperature and seasonal performance factor (Y/N).	See table 5 below for details.		Provided by Manufacturer.
	Fraction of heat supplied by heat pump (only for hybrid systems with boilers) (%)		100.00	
	Low-emission on-site CHP enabling an area-wide heat network (Y/N)	Only low-emission CHP is suitable and only where it is facilitating an area-wide heat network. Therefore, new gas engine CHP is not suitable for any other purpose for new developments.	N	
	CHP (kWt)		n/a	
	Estimated end user cost (pence/kWh)		n/a	All electric scheme.
	Energy assessment includes consideration of occupant running costs (Y/N)	Applicants should consider the estimated costs to occupants of the energy assessment and outline how they are committed to protecting the consumer from high prices.	Y	
	Solar PV included (Y/N)		Y	
Solar technologies	Roof layout demonstrating solar PV technologies have been maximised included in energy strategy (Y/N)		Y	
	kWh generated		25510.00	
	kWp		TBC	
	Total PV panel area (m ²) installed		N	131.00
Flexibility and peak energy demand	Solar Thermal included (Y/N)		N	
	Solar Thermal panel area (m ²) installed		n/a	
	Site-wide peak demand, capacity and flexibility potential included in energy assessment (Y/N)	Table 9 in the energy assessment guidance to be completed.	N	
	Interventions for achieving flexibility included in energy assessment (Y/N).	Table 10 in the energy assessment guidance to be completed.	N	
	Estimated peak demand (MW)		TBC	
	Electrical energy storage (kWh) capacity		n/a	
Other technologies	Heat energy storage (kWh) capacity		n/a	
	System type (e.g. wind turbine)		n/a	
	Capacity (kW)		n/a	
Cooling	Cooling proposed - Residential (Y/N)	It is not expected that 'active cooling' will be proposed for any residential developments. It will be expected that applicants can fully demonstrate that all passive design measures have been thoroughly investigated before considering 'active cooling'.	N	Refer to page 21 in Energy Statement.
	Cooling proposed - Non-residential (Y/N)		Y	
	Residential Cooling consumption (kWh p.a.)	See note in cell C60.		
	Commercial Cooling consumption (MJ p.a.)			

TABLE 3. BESPOKE DH CARBON FACTOR CALCULATION METHODOLOGY	
Please provide below details of the calculation methodology followed to establish the bespoke carbon factor, if applicable.	

TABLE 4. DISTRIBUTION LOSSES		COMMENTS	
Primary network (buried pipe)	Total pipe length (m)		
	Average heat loss rate (W/m)		
Secondary network (buried pipe)	Total pipe length (m)		
	Average heat loss rate (W/m)		
Total losses (MWh/year)			
Total heat supplied (MWh/year)			
Distribution Loss Factor (DLF)			
Calculation included in energy statement (yes/no)			

TABLE 5. SEASONAL COEFFICIENT OF PERFORMANCE (SCoP) CALCULATION METHODOLOGY	
Details of the Seasonal Coefficient of Performance (SCoP), the Seasonal Performance Factor (SPF) and Seasonal Energy Efficiency ratio (SEER), which should be used in the energy modelling. This should be based on a dynamic calculation of the system boundaries over the course of a year (i.e. incorporating variations in source temperatures and the design sink temperatures (for space heat and hot water). Details of the assumptions should be included in the energy assessment, including manufacturer datasheets showing performance under test conditions for the specific source and sink temperatures of the proposed development and assumptions for hours spent under changing source temperatures.	

The applicant should complete all the light blue cells including information on the modelled units, the area per unit, the number of units, the TER/DER/BER and the TFEF/DFEE.																					
RESIDENTIAL CO ₂ ANALYSIS (PART L1)																					
Unit identifier (e.g. plot number, dwelling type etc.)	Model total floor area	Number of units	Total area represented by model	Baseline		'Be Lean'		'Be Clear'		'Be Green'		Fabric Energy Efficiency (FEE)		Baseline		'Be Lean'		'Be Clear'		'Be Green'	
				TER	Energy saving/generation technologies (+)	DER	DER	DER	DER	Fabric Fabric Energy Efficiency	Dwelling Fabric Energy Efficiency	Part L 2021 CO ₂ emissions	Energy saving/generation technologies	Part L 2021 CO ₂ emissions	Part L 2021 CO ₂ emissions with National PV savings included	'Be Lean' savings	Part L 2021 CO ₂ emissions	Part L 2021 CO ₂ emissions with National PV savings included	'Be Clear' savings	Part L 2021 CO ₂ emissions	'Be Green' savings
(m ²) (Row 4)		(n)		(kgCO ₂ / m ²) (Row 27)	(kgCO ₂ p.a.) (Row 28)	(kgCO ₂ / m ²) (Row 27 or 28)	(kgCO ₂ / m ²) (Row 27 or 28)	(kgCO ₂ / m ²) (Row 27 or 28)	(kgCO ₂ / m ²) (Row 27 or 28)	(kWh/m ²)	(kWh/m ²)	(kgCO ₂ p.a.)	(kgCO ₂ p.a.)	(kgCO ₂ p.a.)	(kgCO ₂ p.a.)	(kgCO ₂ p.a.)	(kgCO ₂ p.a.)	(kgCO ₂ p.a.)	(kgCO ₂ p.a.)	(kgCO ₂ p.a.)	
Sum		0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	
NON-RESIDENTIAL CO ₂ ANALYSIS (PART L2)																					
Building Use	Model Area	Number of units	Total area represented by model	Baseline		'Be Lean'		'Be Clear'		'Be Green'		Baseline		'Be Lean'		'Be Clear'		'Be Green'			
				BRUKL TER	BRUKL Displaced electricity (+)	BRUKL BER	BRUKL BER	BRUKL BER	BRUKL BER	Part L 2021 CO ₂ emissions	Energy saving/generation technologies	Part L 2021 CO ₂ emissions	Part L 2021 CO ₂ emissions with National PV savings included	'Be Lean' savings	Part L 2021 CO ₂ emissions	Part L 2021 CO ₂ emissions with National PV savings included	'Be Clear' savings	Part L 2021 CO ₂ emissions	'Be Green' savings		
(m ²)			(m ²)	(kgCO ₂ / m ²)	(kWh / m ²)	(kgCO ₂ / m ²)	(kgCO ₂ / m ²)	(kgCO ₂ / m ²)	(kgCO ₂ / m ²)			(kgCO ₂ p.a.)	(kgCO ₂ p.a.)	(kgCO ₂ p.a.)	(kgCO ₂ p.a.)	(kgCO ₂ p.a.)	(kgCO ₂ p.a.)	(kgCO ₂ p.a.)	(kgCO ₂ p.a.)		
	3973.8	1	3973.8	3.21	-	2.92	2.92	1.84				12,755	0.00	10,808.19	10,808	1,947	10,808	10,808	0	7,311	
Sum	1	3,974	3.2	0.0	2.7	2.7	1.8					12,755	0	10,808	10,808	1,947	10,808	10,808	0	7,311	
SITE-WIDE ENERGY CONSUMPTION AND CO ₂ ANALYSIS																					
Total Sum		3,974	-	-	-	-	-	-				12,755	0	10,808	10,808	1,947	10,808	10,808	0	7,311	

Applicants can use the 'be seen' methodology or an alternative predictive energy modeling methodology to fill in this tab.
Where 'be seen' reporting is used the reported EUI and space heating demand should align with energy consumption data reported in the planning stage submission for the 'be seen' policy, submitted via the online webform.

Residential predicted energy use

Building type	GIA (m²)	EUI & space heating demand (kWh/year)										Has the following energy use been included?		Results		Table 4 of the guidance comparison		Methodology used	
		Space heating demand	Annual Electricity Use	Annual Gas Use	Annual Oil Use	Annual Biomass Use	Annual District Htg Use	Annual District Ctg Use	Elec Generation, Gross	Solar Thermal Generation	Regulated	Unregulated	EUI (kWh/m²/year) (excluding renewable energy)	Space heating demand (kWh/m²/year) (excluding renewable energy)	EUI value from Table 4 of the guidance (kWh/m²/year) (excluding renewable energy)	Space heating demand from Table 4 of the guidance (kWh/m²/year) (excluding renewable energy)	Software	Operational energy use assessment	notes (if expected performance differs from the Table 4 values in the guidance or other software used)
Residential use (total)																			
Landlord Contribution (in Residential Blocks)																			
Total		0	0	0	0	0	0	0	0	0	0	0							

Non-residential predicted energy use	Non-residential predicted energy use	Non-residential predicted energy use	Non-residential predicted energy use	Non-residential predicted energy use

Building type	GIA (m²)	EUI & space heating demand (kWh/year)									Has the following energy use been included?		Results		Table 4 of the guidance comparison		Methodology used		
		Space heating demand	Annual Electricity Use	Annual Gas Use	Annual Oil Use	Annual Biomass Use	Annual District Htg Use	Annual District Clg Use	Elec Generation, Gross	Solar Thermal Generation	Regulated	Unregulated	EUI (kWh/m²/year) (excluding renewable energy)	Space heating demand (kWh/m²/year) (excluding renewable energy)	EU value from Table 4 of the guidance (kWh/m²/year) (excluding renewable energy)	Space heating demand from Table 4 of the guidance (kWh/m²/year) (excluding renewable energy)	Software	Operational energy use assessment	notes (if expected performance differs from the Table 4 values in the guidance or other software used)
			If applicable	If applicable	If applicable	If applicable	If applicable	If applicable	If applicable	If applicable									
All other non-residential	3973.6	75379.19	156006.119								Yes	Yes	39.2605004	18.9999995	95	15	Part L2 - approved DSM	CIBSE TM64	
Total	3973.6	75379.19	156006.119	0	0	0	0	0	0	0	0	0							

Residential

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

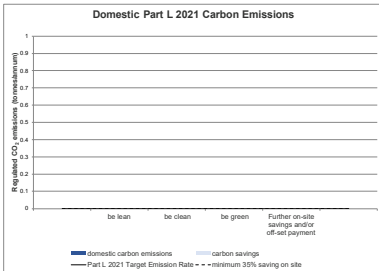
	Carbon Dioxide Emissions for residential buildings (Tonnes CO ₂ per annum)	
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	0.0	
After energy demand reduction (be lean)	0.0	
After heat network connection (be clean)	0.0	
After renewable energy (be green)	0.0	

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

	Regulated residential carbon dioxide savings	
	(tonnes CO ₂ per annum)	(%)
Be lean: savings from energy demand reduction	0.0	0%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	0.0	0%
Cumulative on site savings	0.0	0%
Annual savings from off-site payment	0.0	-
	(tonnes CO ₂)	
Cumulative savings for off-site payment	0	-
Cash in-lieu contribution (k£)	0	

Carbon price is based on OLA recommended price of £96 per tonne of carbon dioxide.
 Unless Local Planning Authority price is inputted in the "Development Information"

unless Local Planning Authority price is inputted in the 'Development Information' ti



Non-residential

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

	Carbon Dioxide Emissions for non-residential buildings (Tonnes CO ₂ per annum)	
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	12.8	21.2
After energy demand reduction (be lean)	10.8	21.2
After heat network connection (be clean)	10.8	21.2
After renewable energy (be green)	7.3	21.2

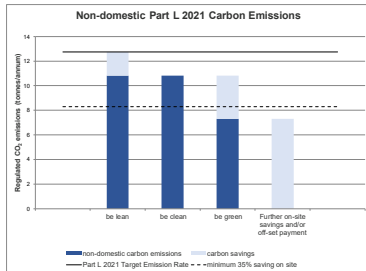
Table 4: Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for non-residential buildings

	Regulated non-residential carbon dioxide savings	
	(Tonnes CO ₂ per annum)	(%)
Be lean: savings from energy demand reduction	1.9	15%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	3.5	27%
Total Cumulative Savings	5.4	43%
Annual savings from off-set payment	6.3	-
	(Tonnes CO ₂)	
Cumulative savings for off-set payment	219	
Cash in-leak contribution (A)	20,838	

Carbon price is based on LA recommended price of £95 per tonne of carbon dioxide (CO₂)

Unless Local Planning Authority price is quoted in the 'Development Information' slot

unless Local Planning Authority price is inputted in the 'Development Information' tab



SITE-WIDE

	Total regulated emissions (Tonnes CO ₂ / year)	CO ₂ savings (Tonnes CO ₂ / year)	Percentage savings (%)
Part L 2021 baseline	12.8		
Be lean	10.8	1.9	15%
Be clean	10.8	0.0	0%
Be green	7.3	3.5	27%
Total Savings	-	5.4	43%
		CO ₂ savings off-set (Tonnes CO ₂)	-
Off-set	-	219.3	-

	Target Fabric Energy Efficiency (kWh/m ²)	Dwelling Fabric Energy Efficiency (kWh/m ²)	Improvement (%)
Development total	0.00	0.00	

	Area weighted non-residential cooling demand (MJ/hr)	Total non-residential cooling demand (MJ/year)
Actual	55	218548
Notional	63.3	251528

EUI & space heating demand (predicted energy use)

Residential

Building type	EUI (MWh/m ² year (including renewable energy))	Space heating demand (MWh/m ² year (including renewable energy))	EUI value from Table 4 of the guidance (MWh/m ² year) (including renewable energy)	Space heating demand from Table 4 of the guidance (MWh/m ² year) (including renewable energy)	Methodology used (e.g. 'be aser' methodology or an alternative predictive energy modelling methodology)	Explanatory notes (if expected performance differs from the Table 4 values in the guidance)

Non-residential

[illegible]

9 / *Appendix C*

Overheating Assessment

Seven Sisters/ Eade Road

Overheating Assessment



Contents

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	Appendix	
	Detailed overheating results	

Version	Date	Reason for issue	Produced By	Reviewed By
01	27/10/2023	Planning update	RX, GC	JS, DR

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1. Introduction

This document presents the methodology and results of the overheating risk assessment for the occupied spaces at Haringey Warehouse Living. The assessment was undertaken following CIBSE TM59: “Design methodology for the assessment of overheating risk in homes” (TM59:2017) criteria for the multi-residential spaces as per guidance from [Haringey’s Key Overheating Planning Application Requirements](#).

This document presents an update to overheating assessment undertaken for planning which considers current and future weather scenarios. The outputs of the analysis represent the assumptions included in this report, should these assumptions change, the results should be reviewed.

Policy context

The regional and local policies relevant to this document include:

- Building Regulations Approved Document Part L 2021 – Criterion 3 “Limiting the effects of heat gains in summer”;
- Building Regulations Approved Document Part O 2021;
- The London Plan Policy SI4 “Managing heat risk” - cooling hierarchy and guidance to undertake overheating analysis in line with CIBSE TM59:2017;
- Haringey’s Key Overheating Planning Application Requirements .

Proposed Development

The habitable rooms assessed are part of redevelopment of the Haringey Warehouse District within the London Borough of Haringey. The proposed site comprises the vacant infill site on the corner of Eade Road and Seven Sisters Road and 2-4 Tewkesbury Road, adjacent to the existing Cara House. The proposals include the construction of two new buildings to provide new warehouse living accommodation (Sui Generis (warehouse living)), ground floor café/ workspace (Use Class E) and associated waste collection and cycle parking, as well as landscape and public realm enhancements.

Site context

The Noise and Vibration Impact Assessment Report accompanying the planning application undertook a review of the daytime and night-time noise levels likely to be experienced by the Proposed Development. The acoustician recommends maximum opening areas in the habitable spaces for reasonable attenuation of external noise. This is expanded in section 2.3.1 of this report.

The air quality report accompanying the planning application states that mean pollutant concentrations were below the air quality objectives and that the site *does not* require the implementation of mitigation techniques for air quality. Therefore, there is no air quality constraint in relation to the ventilation strategy.

1. Introduction

1.1 Cooling hierarchy

Policy SI4 of the London Plan – “Managing Heat Risk” provides the following hierarchy to be considered to mitigate the potential for overheating and subsequent reliance on mechanical cooling systems, as illustrated opposite:

Within the hierarchy, passive measures used to prevent unnecessary internal heat gains take priority over passive measures used to manage the impact of accumulated heat. Lowest in the hierarchy are active measures that remove accumulated heat within living spaces.

All habitable rooms within the Proposed Development are designed to have openable windows to eliminate the need for active cooling. External noise conditions have been factored in the limitation to open bedroom windows at night.

In contrast to the positive effect of reducing heating energy use, the specification of high levels of insulation coupled with high solar gains, likely to be experienced during the summer months, the risk of overheating can become a problem.

Cooling Hierarchy	Proposed Development’s response
1. Reduce the amount of heat entering a building in summer through orientation, shading, albedo, fenestration, insulation and green roofs and walls.	- Window-to-wall ratio in bedroom and living spaces to ensure a careful balance of daylight and overheating. - Glazing specifications with a g-value of 0.4, ensuring a high level of daylight entry whilst providing reasonable solar control. - The design proposes window recess, horizontal brise soleil proposed above bedroom windows and balcony to shade double height living/kitchen areas. - Green roofs are proposed.
2. Minimise internal heat generation through energy efficient design.	- Energy efficient heating and ventilation systems are proposed as well as LED lighting. - Low temperature heat distribution (less than 55 degrees) infrastructure is proposed and would not contribute to overheating in corridors.
3. Manage the heat within the building through exposed internal thermal mass and high ceilings.	Medium thermal mass calculated in line with architect’s specification. Floor to ceiling heights of 3.0m.
4. Provide passive ventilation	Operable windows are proposed to all bedrooms and kitchen/living rooms.
5. Provide mechanical ventilation	Mechanical ventilation with heat recovery with summer by-pass for free cooling is proposed.
6. Provide active cooling systems	35W/m² of cooling to bedrooms due to night-time noise constraints in opening windows

1. Introduction

1.2 Overheating criteria

As the Proposed Development provides sleeping accommodation and supporting living/kitchen facilities which will be predominantly naturally ventilated. Therefore, it will be assessed against CIBSE TM59:2017 criteria, which comprise of:

For predominantly naturally ventilated spaces:

Criterion A

Compliance with Criterion A requires that the number of hours during which the temperature difference between assessed spaces and the applicable comfort threshold is not greater than or equal one degree during the period from May to September inclusive, for more than 3% of the occupied hours.

Criterion B

This criterion applies to bedrooms only and aims to improve comfort during sleeping hours. Compliance with Criterion B requires that the operative temperature in bedrooms from 22:00 to 7:00 do not exceed 26°C for more than 1% of all annual hours, which equates to 32 hours. As a result, 33 or more hours above 26°C leads to non-compliance against this criterion.

Fixed temperature method for mechanically ventilated spaces:

If habitable rooms need to be mechanically ventilated as a result of restricted openings or limitations in opening windows due to noise, security or air quality issues, the CIBSE Guide A ‘Fixed temperature method’ must be applied to assess overheating.

CIBSE Guide A fixed temperature comfort criterion

Compliance with this criterion requires that occupied rooms *do not* exceed an operative temperature of 26°C for more than 3% of the annual occupied hours.

1. Introduction

1.3 Limitations to this report

The most current CIBSE Design Summer (DSY) Weather File for London was chosen for the simulation (London Weather Central CIBSE DSY series), in accordance with CIBSE TM59:2017 guidelines. Whilst it is not mandatory to comply with future weather files, further simulations have been undertaken to assess overheating risk under heatwave or future climate scenarios using more extreme weather files, such as DSY 2 and DSY 3 for 2050s and 2080s. Please refer to Appendix A for detailed results.

The inputs used in this analysis are outlined within Section 2 – ‘Methodology’ of this report.

The following inputs will have a significant impact on the results if changed:

- The architect shall ensure that the minimum equivalent free areas for each window type are achieved to provide the air flow for thermal comfort.
- The overheating model is based on Planning drawings dated 17/02/2023. Should the internal layouts change, it is recommended for this analysis to be updated alongside to account for any changes in the overheating results.
- The building occupancy profiles and parameters are taken from CIBSE guide TM59:2017. As such, it should be noted that there is no guarantee the temperatures estimated will match the actual building temperatures. Therefore, should be noted that there is no guarantee that the thermal comfort assessment will match the occupied building.

2. Methodology

2.1 Rooms analysed and weather data

CIBSE AM11 compliant dynamic thermal analysis software IES Virtual Environment (VE) 2023.1.0.0 was used to undertake the overheating assessment in accordance with CIBSE TM59:2017.

Rooms analysed

The assessment accounted for **all** habitable rooms within the residential accommodation from ground to roof level across both blocks, see opposite image.

Number of Room included in the analysis

- Bedrooms: 101
- Living Rooms: 4
- Kitchen: 4
- Living/ Kitchen: 9

Weather data

In line with Haringey's requirement, the analysis used CIBSE TM49 Design Summer Years (DSY) London Weather Central (LWC) weather file as the most appropriate for the site location. TM59 compliance is sought for DSY 1 2020s, high emissions, 50th percentile weather file.

A range of weather files considering varying summer events and future climate projections were also tested as presented below.

- Current (2020s): DSY 1, 2, 3, high emissions, 50th percentile scenario.
- Future: (2050s): DSY 1, 2, 3, high emissions, 50th percentile scenario.
- Future: (2080s): DSY 1, 2, 3, high emissions, 50th percentile scenario.

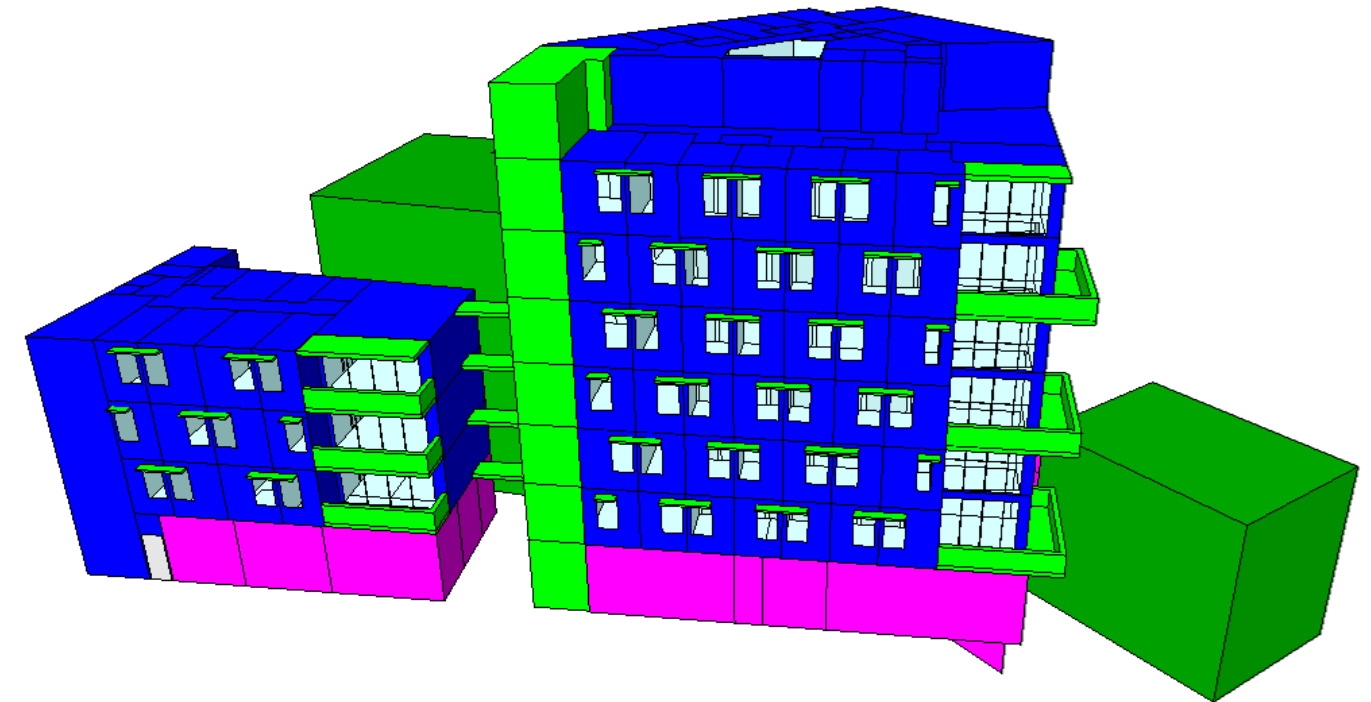


Figure 1: View of 3D model used for overheating analysis. Rooms analysed are shown in blue, shading elements are shown in green and adjacent rooms in magenta.

2. Methodology (cont.)

2.2 Parameters applied

Thermal envelope performance

The basis of the design and inputs to the overheating assessment is summarised in Table 1.

Component		Applied
Ground Floor	W/m².K	0.10
External Wall	W/m².K	0.15
Roof	W/m².K	0.10
Window	W/m².K	1.2
Doors	W/m².K	1.6
Air Permeability	m3/(h.m²)	3

Component	g-value (EN 410)	LT	Frame factor
External windows and balcony doors	0.4	60-70%	15%

Table 1: Proposed building fabric parameters

Shading devices

All windows account for a 200mm deep window recess.

Horizontal brise soleil (600mm) provide shading to all the south facing bedroom windows, whereas the communal living room and kitchens have a set-back to the south elevation and projecting balconies (see Fig. 1).

The assessment did not take into account the inclusion of internal blinds as required by Haringey's overheating planning application guidelines.

Internal gains

All internal gains and profiles, including occupancy, lighting and equipment gains have been modelled in line with the standardised profiles as described within CIBSE TM59.

As the living room and kitchen areas are communal to the residents of the warehouse living accommodation, internal gains equivalent to 3-Bed kitchen or living room profiles from TM59 were used (see table 2).

Communal corridors

CIBSE TM59 advises that communal corridor’s heating pipe work should be included in the overheating analysis. The proposed space heating and hot water strategy is based on an ambient temperature circuit, which is unlikely to contribute to overheating within communal corridors. Therefore, the risk of overheating in corridors is considered to be negligible.

2. Methodology (cont.)

2.2 Parameters applied

Mechanical ventilation strategy

Fresh air and purge ventilation will be provided in line with Part F ventilation requirement. Mechanical ventilation with heat recovery (MVHR) and summer by-pass is proposed. The following rates have been applied to the model:

- Infiltration: 0.15 air changes per hour
- Auxiliary ventilation: MVHR minimum of 0.3 L/s/m²
- Extract ventilation (kitchen): 30 L/s
- Enhanced, supplementary ventilation to bedrooms for night-time ventilation (for mitigation scenario 1): 4 air changes per hour

Active cooling systems

Cooling will be used as a last resort. Due to the noise constraints in opening windows at night, the bedrooms will require comfort cooling to comply with the overheating criteria. A limited cooling capacity of 35W/m² is estimated to be sufficient to achieve thermal comfort.

Room type	No. of people	Sensible/Latent gain, W/person	Lighting and Equipment gain, W/m ²
Single bedroom	1	75/55	Lighting: 2W/m ² Equipment: • Peak load: 80W from 8am-11pm • Baseload: 10W from 11pm-8am
Double bedroom	2	75/55	Lighting: 2W/m ² Equipment: • Peak load: 80W from 8am-11pm • Baseload: 10W from 11pm-8am
Communal living space (3-Bed unit living)	3	225/165	Lighting: 2W/m ² Equipment: • Peak load: 150W from 6pm to 10pm • 60W from 9am to 6pm and from 10pm to 12pm • Baseload: 35W for the rest of the day
Communal kitchen (3-Bed unit kitchen)	3	225/165	Lighting: 2W/m ² Equipment: • Peak load: 300W from 6pm to 8pm • Baseload: 50W for the rest of the day
Communal Living/ kitchen (3-Bed unit kitchen)	3	225/165	Lighting: 2W/m ² Equipment: • Peak load of 450 W from 6 pm to 8 pm • 200W from 8 pm to 10 pm 110 W from 9 am to 6 pm and from 10 pm to 12 pm • Base load of 85 W for the rest of the day

Table 2: Internal gains applied (based on TM59:2017)

2. Methodology (cont.)

2.3 Passive ventilation

Passive ventilation

The primary mode of ventilation against overheating in the assessed habitable rooms is natural ventilation provided by openable side-hung windows for all rooms. Windows can be fully opened for natural ventilation, when the external conditions allow.

The Noise and Vibration Impact Assessment Report accompanying the planning application sets maximum opening areas for night-time ventilation of bedrooms to comply with Part O’s internal noise level targets (see the figure 3), which can be summarized as follows:

- Windows facing south and east are restricted to open 3% of the room floor area.
- Windows facing north are restrict to open 11% of the room floor area.

The opening free areas are in alignment with Approved Document Part F’s minimum purge ventilation requirements have been assumed, which equate to 10% of the room floor area.



Figure 3: Mark-up indicating locations with restricted window openings due to external noise

2. Methodology (cont.)

2.3.1 Opening equivalent area

The adjacent table summarises the equivalent free area applied to each room for effective ventilation. The equivalent area is based on the window geometry (including fixed frame), opening angle, exposure and wind pressure coefficient.

Exposure types

Exposure types and wind pressure coefficients at openings are established using the definitions in the modelling software, based on CIBSE Guide A.

- Low-rise exposed openings for first 3 floors.
- High-rise exposed openings from 4th to 7th floor.

Opening profiles

Bedrooms, living rooms and kitchens have windows and/or balcony doors open when the room is occupied. The model assumes night-purge with a degree of window opening overnight, as per acoustician’s recommendations for internal noise levels.

Internal doors to the bedrooms and communal living/kitchen areas are assumed to be closed.

Space	Window orientation	Typical window area (m²)	Opening Eq. Area (m²)		Opening Profile
			Min.	Max.	
Bedrooms	N/NW	2.2	0.7	1.4	Windows open when rooms are occupied, and internal temperature exceeds 22°C. Night-time purge is assumed.
	S	2.2	0.2	0.4	
Living / Kitchen	E	1.4	2.9	23	
Balcony doors	S	20.8	2.6	3.2	
	E	20.8	2.6	3.2	
	N	20.8	2.6	3.2	

Table 3: Opening areas by room

3. Overheating scenario

Baseline condition

This section summarises the scenarios analysed for testing overheating against CIBSE TM59 criteria, Haringey’s specific requirements and the London Plan. The following scenarios were considered:

- **Baseline:** solar control glazing with g-value of 0.4, no blinds, windows fully open during the day, night-time opening restricted to bedrooms in line with acoustician’s specifications, minimum ventilation rates for fresh air.
- **Mitigation 1:** baseline with increased ventilation rate to 4ach to bedrooms at night to improve sleeping condition and naturally ventilated living rooms and kitchens.
- **Mitigation 2:** baseline with comfort cooling limited to 35W/m² to bedrooms and naturally ventilated living rooms and kitchens.

The following parameters were used for the comfort criteria

- Elevated air speed: 0.8 m/s
- Category II – new build

Scenario	Description	G-value (EN 410)	Ventilation strategy	
			Natural ventilation	Comfort cooling
Baseline	Windows fully open during the day and restricted at night in bedrooms	0.4	Yes	No
Mitigation 1	Supplementary ventilation to bedrooms at night		Yes, with 4ach	No
Mitigation 2	Comfort cooling limited to 30W/m ² for all bedrooms		Yes, living and kitchen	Bedrooms only

Table 4: Overheating scenarios

4. Results

4.1 DSY 1 2020s High emissions 50th percentile

Hourly data of predicted internal temperature has been collected from the dynamic simulation model. Table 5 presents the results for the current weather scenario (DSY1) to which the Proposed Development seeks compliance with.

All occupied spaces within the Proposed Development pass Criterion 1. Bedrooms fail Criterion 2, even with increased ventilation (mitigation 1). However, following the introduction of some limited cooling (mitigation 2), all bedrooms pass Criterion 3 (in line with the fixed-temperature method, which would apply to those rooms).

For reference, the adopted design summer year 1 weather file includes 19 hours between 22:00 and 7:00 with the outside air temperature exceeding 26°C. As a result, it is acceptable to have up to 13 additional hours above 26°C during this period and still maintaining compliance of criterion B is more challenging.

Scenario	Strategy		Proportion of compliant rooms		
	Ventilation	Active cooling	Criterion 1: Hours exceeding comfort range (living rooms, kitchens and bedrooms)	Criterion 2: Night hours above 26oC (bedrooms only)	Criterion 3: Fixed temperature test (predominantly mechanically ventilated)
Baseline	Natural ventilation with MVHR (minimum fresh air)	No	118/118	0/101	-
Mitigation 1	Natural ventilation with enhanced mechanical ventilation of 4ach to bedrooms	No	118/118	0/101	-
Mitigation 2	Natural vent with MVHR to living rooms and kitchens. Mechanical ventilation to bedrooms (windows closed).	Limited cooling of 35 W/m2 to bedrooms.	17/17 (living rooms and kitchens) Bedrooms predominantly mechanically ventilated under this scenario and tested against criterion 3.	-	101/101 (bedrooms)

Table 5: TM59 DSY 1 2020s compliance rate (pass highlighted in green, with fail in red)

4. Results

4.2 Future weather high emissions 50th percentile

Additional simulations assessed the overheating risk of the DSY1-compliant mitigation solution against future weather data. The results are summarised in Table 6. Detailed results can be found in the Appendix.

All occupied spaces within the Proposed Development meet criteria 1 and 3 for the DSY 1 2020s High emissions 50th percentile weather scenario. All the bedrooms require comfort cooling limited to 35W/m2.

For the 2050 and 2080 weather projections, the risk of overheating will be significantly higher than the current conditions. In 2050, 9 out of 17 living/kitchen spaces meet Criterion A for the DSY 1 weather condition, but they fail DSY 2 and 3. For the 2050 weather scenario, the bedrooms with 35W/m2 cooling are adequate. However, in order to meet the conditions for 2080, the bedrooms need 40W/m2 of cooling.

Scenario: Mitigation 2	Strategy		Proportion of compliant rooms		
	Ventilation	Active cooling	Criterion 1: Hours exceeding comfort range (living rooms, kitchens and bedrooms)	Criterion 2: Night hours above 26oC (bedrooms only)	Criterion 3: Fixed temperature test (predominantly mechanically ventilated)
DSY1 2020s	Natural vent with MVHR to living rooms and kitchens. Mechanical ventilation to bedrooms (windows closed).	Limited cooling of 35 W/m2 to bedrooms.	17/17	-	101/101 (bedrooms)
DSY2 2020s			17/17	-	101/101 (bedrooms)
DSY3 2020s			0/17	-	101/101 (bedrooms)
DSY1 2050s			9/17	-	101/101 (bedrooms)
DSY2 2050s			0/17	-	101/101 (bedrooms)
DSY3 2050s			0/17	-	101/101 (bedrooms)
DSY1 2080s		Limited cooling of 35 W/m2 to bedrooms.	0/17	-	101/101 (bedrooms)
DSY2 2080s			0/17	-	101/101 (bedrooms)
DSY3 2080s			0/17	-	101/101 (bedrooms)

Table 6: TM59 Summary of all simulations - Compliance rate (pass highlighted in green, with fail in red)

5. Conclusion

5.1 Summary

An overheating assessment was carried out for the proposed development using CIBSE AM11-compliant dynamic thermal analysis software, IES Virtual Environment (VE), in accordance with CIBSE TM59:2017, Design Methodology for the assessment of overheating risk in homes. Overheating modelling was conducted using three design weather years and accounting for climate change scenarios. Rooms have been tested against Design Summer Year (DSY) weather files DSY 1, DSY2 and DSY3, for years 2020s, 2050s and 2080s.

All occupied spaces meet the CIBSE TM59 criteria under the DSY 1 2020s High emissions 50th percentile weather. Living rooms and kitchens pass the naturally ventilated criteria. Whereas bedrooms comply with the mechanical ventilation criteria due to window opening restrictions at night (due to noise levels) and require limited cooling to do so. The Cooling Hierarchy has been followed to reduce both the risk of overheating and the amount of active cooling needed.

For the 2020 and 2050 weather scenarios, all the bedrooms require 35W/m² of cooling. However, to meet the conditions for 2080 weather scenario, the bedrooms would need 40W/m² of cooling.

Other rooms (living room, kitchen, and living/kitchen), which are predominantly naturally ventilated, would require additional mitigation methods to summarized meet DSY 3 2020 and all 2050 and 2080 requirements.

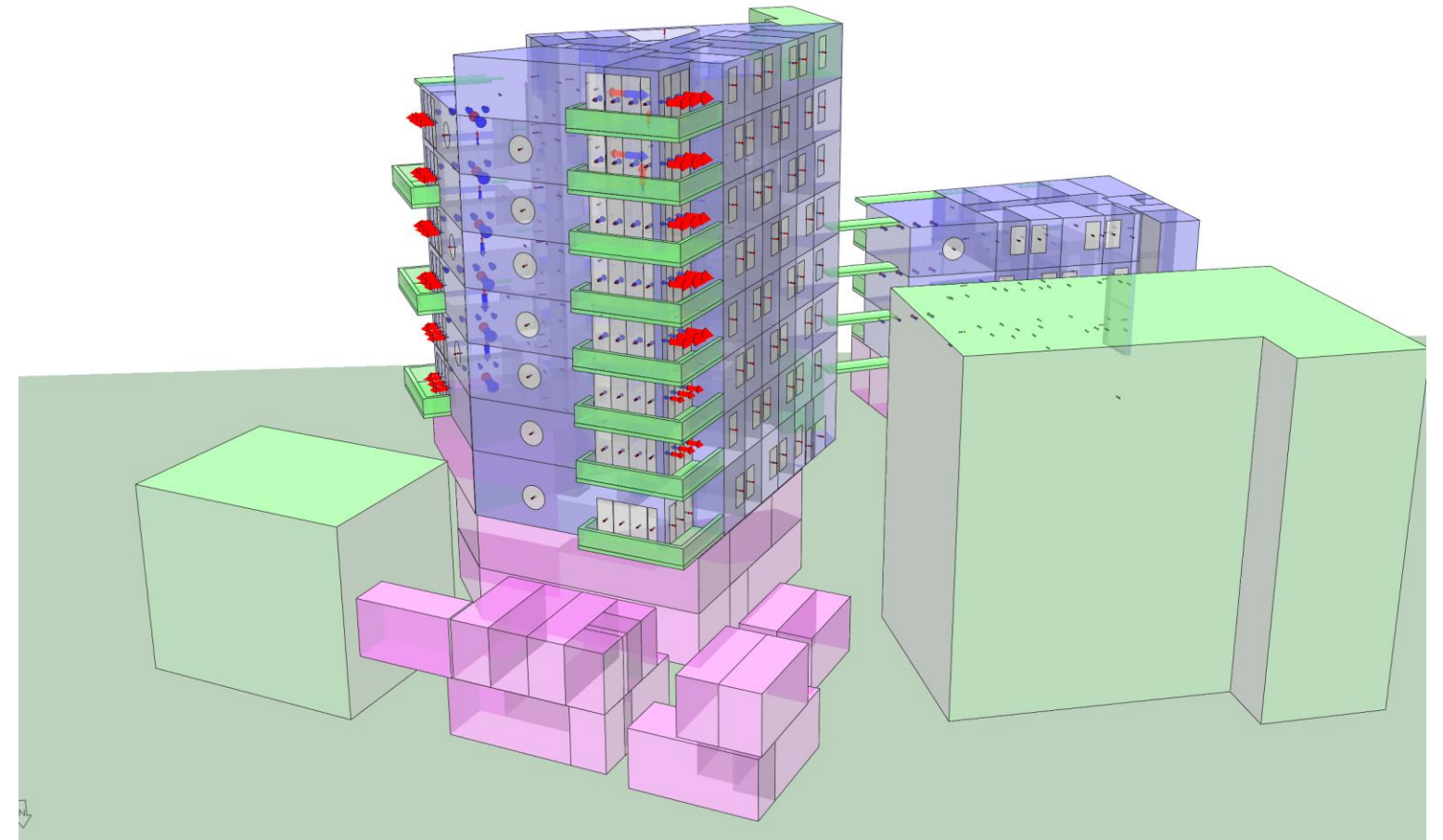


Figure 4: Images of thermal model showing arrows indicating natural ventilation.

5. Conclusion

5.1 Summary

Mitigation strategy for future

In light of future weather scenarios, the bedrooms in the Proposed Development must incorporate limited cooling at a rate of 35 W/m². However, in order to satisfy the requirements for the 2080 scenario, the bedrooms will need 40W/m² of cooling. This requirement can be met by considering when designing cooling systems so that they can cater to the needs of future scenarios.

Regarding the other rooms, including the living room, kitchen, and combined living/kitchen spaces, which predominantly depend on natural ventilation, it is essential to adopt additional mitigation methods to meet the DSY weather scenarios for both 2050 and 2080. This may involve implementing straightforward solutions such as fans, external shading, or cooling systems, in addition to other mitigation methods, to effectively address the potential challenges posed by extreme weather conditions in the future.

The building management team is responsible for overseeing day-to-day operations and maintenance, ensuring a comfortable thermal environment in the building, and managing risks effectively.

Appendix

Detailed overheating results

	Mitigation 1		Mitigation 2		Mitigation 3		
	Criterion 1 (all rooms)	Criterion 2 (bedrooms)	Criterion 1 (all rooms)	Criterion 2 (bedrooms)	Criterion 1 (all rooms)	Criterion 2 (bedrooms)	Criterion 3 (bedrooms)
DSY1 2020s 50 Percentile	% Occupied hours $\Delta T \geq 1^{\circ}\text{K}$	Total hours > 26°C	% Occupied hours $\Delta T \geq 1^{\circ}\text{K}$	Total hours > 26°C	% Occupied hours $\Delta T \geq 1^{\circ}\text{K}$	Total hours > 26°C	Percentage of hours over 26°C
00GL_A_Double Bedroom 4	0.7	60	0.8	50			0
00GL_A_Living Room/Kitchen	1.8	NA	1.8	NA	1.2		
00GL_A_Single Bedroom 1	1	58	1	50			0
00GL_A_Single Bedroom 2	0.9	59	0.9	51			0
00GL_A_Single Bedroom 3	1	57	1	51			0
00L1_A_Accessible Bedroom 2	0.7	57	0.7	51			0
00L1_A_Double Bedroom 1	0.7	101	0.6	76			0
00L1_A_Double Bedroom 2	1.1	100	1.1	71			0
00L1_A_Double Bedroom 3	0.8	60	0.8	51			0
00L1_A_Living Room	2.1	NA	2.2	NA	1.3		
00L1_A_Living Room/Kitchen	2.3	NA	2.3	NA	1.4		
00L1_A_Single Bedroom 1	1.4	88	1.4	65			0.4
00L1_A_Single Bedroom 2	1.5	87	1.4	65			0.7
00L1_A_Single Bedroom 3	1.5	87	1.4	65			0.8
00L1_A_Single Bedroom 4	1.5	88	1.4	66			0.7
00L1_A_Single Bedroom 5	1.1	54	1.2	49			0
00L1_A_Single Bedroom 6	1.1	55	1.1	51			0
00L1_A_Single Bedroom 7	1.2	54	1.2	50			0
00L1_A_Single Bedroom 8	1.3	89	1.2	68			0.5
00L1_B_Accessible bedroom 1	1.1	83	1	59			0
00L1_B_Accessible bedroom 2	1.1	83	1.1	59			0
00L1_B_Double bedroom 1	0.8	59	0.8	50			0
00L1_B_Living Room/Kitchen 1	1.9	NA	1.8	NA	1.1		
00L1_B_Single bedroom 1	1	73	1	51			0
00L1_B_Single bedroom 2	1.1	53	1.2	49			0
00L1_B_Single bedroom 3	1.1	81	1.1	62			0

Detailed overheating results

	Mitigation 1		Mitigation 2		Mitigation 3		
	Criterion 1 (all rooms)	Criterion 2 (bedrooms)	Criterion 1 (all rooms)	Criterion 2 (bedrooms)	Criterion 1 (all rooms)	Criterion 2 (bedrooms)	Criterion 3 (bedrooms)
DSY1 2020s 50 Percentile	% Occupied hours $\Delta T \geq 1^{\circ}\text{K}$	Total hours $> 26^{\circ}\text{C}$	% Occupied hours $\Delta T \geq 1^{\circ}\text{K}$	Total hours $> 26^{\circ}\text{C}$	% Occupied hours $\Delta T \geq 1^{\circ}\text{K}$	Total hours $> 26^{\circ}\text{C}$	Percentage of hours over 26°C
00L2_A_ Double bedroom 1	0.7	99	0.6	75			0
00L2_A_ Double bedroom 2	1.1	95	1.1	69			0
00L2_A_ Double bedroom 3	1	50	1	47			0
00L2_A_ Kitchen	2.1 NA		2.1 NA		1.3		
00L2_A_ Living Room/Kitchen	2.3 NA		2.3 NA		1.3		
00L2_A_ Single bedroom 1	1.5	82	1.4	64			0.7
00L2_A_ Single bedroom 2	1.4	84	1.4	64			0.4
00L2_A_ Single bedroom 3	1.5	82	1.4	64			0.7
00L2_A_ Single bedroom 4	1.4	83	1.4	65			0.5
00L2_A_ Single bedroom 5	1.3	47	1.3	42			0
00L2_A_ Single bedroom 6	1.1	48	1.1	42			0
00L2_A_ Single bedroom 7	1.3	47	1.3	42			0
00L2_A_ Single bedroom 8	1.1	96	1.1	73			0
00L2_A_Accessible bedroom 2	1	49	1	42			0
00L2_B_ Accessible bedroom 1	1.1	82	1	58			0
00L2_B_ Accessible bedroom 2	1.1	82	1	58			0
00L2_B_ Double bedroom 1	0.8	59	0.9	51			0
00L2_B_ Living Room/Kitchen 1	1.9 NA		1.8 NA		1.1		
00L2_B_ Single bedroom 1	1.1	83	1.1	62			0
00L2_B_ Single bedroom 2	1	73	1	53			0
00L2_B_ Single bedroom 3	1.2	53	1.2	48			0

Detailed overheating results

	Mitigation 1		Mitigation 2		Mitigation 3		
	Criterion 1 (all rooms)	Criterion 2 (bedrooms)	Criterion 1 (all rooms)	Criterion 2 (bedrooms)	Criterion 1 (all rooms)	Criterion 2 (bedrooms)	Criterion 3 (bedrooms)
DSY1 2020s 50 Percentile	% Occupied hours $\Delta T \geq 1^{\circ}\text{K}$	Total hours > 26°C	% Occupied hours $\Delta T \geq 1^{\circ}\text{K}$	Total hours > 26°C	% Occupied hours $\Delta T \geq 1^{\circ}\text{K}$	Total hours > 26°C	Percentage of hours over 26°C
00L3_A_Accessible bedroom 2	1	49	1	42			0
00L3_A_Double bedroom 1	0.7	94	0.7	73			0
00L3_A_Double bedroom 2	1.2	93	1.2	65			0
00L3_A_Double bedroom 3	1	51	1	47			0
00L3_A_Living Room	2.1 NA		2.1 NA		1.3		
00L3_A_Living Room/Kitchen 2	2.4 NA		2.4 NA		1.5		
00L3_A_Single bedroom 1	1.4	76	1.4	59			0.4
00L3_A_Single bedroom 2	1.5	76	1.5	57			0.7
00L3_A_Single bedroom 3	1.5	76	1.5	57			0.8
00L3_A_Single bedroom 4	1.5	76	1.4	60			0.7
00L3_A_Single bedroom 5	1.4	47	1.4	42			0
00L3_A_Single bedroom 6	1.1	49	1.2	42			0
00L3_A_Single bedroom 7	1.4	47	1.4	43			0.1
00L3_A_Single bedroom 8	1.2	78	1.2	61			0.3
00L3_B_Accessible bedroom 1	1.5	79	1.5	60			0
00L3_B_Accessible bedroom 2	1.6	79	1.6	60			0
00L3_B_Double bedroom 1	1.3	58	1.4	52			0
00L3_B_Living Room/Kitchen 1	2.4 NA		2.4 NA		1.4		
00L3_B_Single bedroom 1	1.4	66	1.5	56			0
00L3_B_Single bedroom 2	1.7	53	1.7	47			0
00L3_B_Single bedroom 3	1.5	77	1.4	60			0

Detailed overheating results

	Mitigation 1		Mitigation 2		Mitigation 3		
	Criterion 1 (all rooms)	Criterion 2 (bedrooms)	Criterion 1 (all rooms)	Criterion 2 (bedrooms)	Criterion 1 (all rooms)	Criterion 2 (bedrooms)	Criterion 3 (bedrooms)
DSY1 2020s 50 Percentile	% Occupied hours $\Delta T \geq 1^{\circ}\text{K}$	Total hours > 26°C	% Occupied hours $\Delta T \geq 1^{\circ}\text{K}$	Total hours > 26°C	% Occupied hours $\Delta T \geq 1^{\circ}\text{K}$	Total hours > 26°C	Percentage of hours over 26°C
00L4_A_ Accessible bedroom 2	1	50	1	43			0
00L4_A_ Double bedroom 1	1.2	93	1.1	65			0
00L4_A_ Double bedroom 2	1	51	1	47			0
00L4_A_ Double bedroom 3	0.7	94	0.7	73			0
00L4_A_ Kitchen	2.1	NA	2.1	NA	1.2		
00L4_A_ Living Room/Kitchen 1	2.4	NA	2.4	NA	1.5		
00L4_A_ Single bedroom 1	1.5	76	1.4	59			0.4
00L4_A_ Single bedroom 2	1.5	76	1.5	57			0.7
00L4_A_ Single bedroom 3	1.5	76	1.5	57			0.8
00L4_A_ Single bedroom 4	1.4	77	1.4	61			0.5
00L4_A_ Single bedroom 5	1.4	48	1.4	43			0
00L4_A_ Single bedroom 6	1.1	49	1.2	44			0
00L4_A_ Single bedroom 7	1.4	48	1.4	44			0.1
00L4_A_ Single bedroom 8	1.1	92	1	71			0
00L5_A_ Accessible bedroom 2	1	51	1	44			0
00L5_A_ Double bedroom 1	1.2	93	1.2	65			0
00L5_A_ Double bedroom 2	1	52	1	47			0
00L5_A_ Double bedroom 3	0.7	94	0.7	73			0
00L5_A_ Double bedroom 3	0.8	52	0.8	48			0
00L5_A_ Living Room	2	NA	2.1	NA	1.3		
00L5_A_ Living Room/Kitchen	2.5	NA	2.5	NA	1.5		
00L5_A_ Single bedroom 1	1.3	79	1.2	61			0.4
00L5_A_ Single bedroom 2	1.5	49	1.4	45			0.1
00L5_A_ Single bedroom 3	1.1	49	1.2	44			0
00L5_A_ Single bedroom 4	1.4	49	1.4	44			0.1

Detailed overheating results

	Mitigation 1		Mitigation 2		Mitigation 3		
	Criterion 1 (all rooms)	Criterion 2 (bedrooms)	Criterion 1 (all rooms)	Criterion 2 (bedrooms)	Criterion 1 (all rooms)	Criterion 2 (bedrooms)	Criterion 3 (bedrooms)
DSY1 2020s 50 Percentile	% Occupied hours $\Delta T \geq 1^{\circ}\text{K}$	Total hours > 26°C	% Occupied hours $\Delta T \geq 1^{\circ}\text{K}$	Total hours > 26°C	% Occupied hours $\Delta T \geq 1^{\circ}\text{K}$	Total hours > 26°C	Percentage of hours over 26°C
00L5_A_ Single bedroom 4	1.4	49	1.4	44			0.1
00L5_A_ Single bedroom 5	1.5	77	1.4	60			0.8
00L5_A_ Single bedroom 6	1.5	76	1.5	59			0.9
00L5_A_ Single bedroom 7	1.5	76	1.5	59			0.8
00L5_A_ Single bedroom 8	1.5	76	1.4	60			0.4
00L6_A_ Double Room 1	1.7	94	1.6	68			0
00L6_A_ Double Room 2	1	93	0.9	75			0
00L6_A_ Living Room	1.8 NA		1.8 NA		1.2		
00L6_A_ Single bedroom 1	1.4	94	1.3	71			0.3
00L6_A_ Single bedroom 10	1.6	50	1.4	46			0.1
00L6_A_ Single bedroom 11	1.6	50	1.5	46			0.1
00L6_A_ Single bedroom 12	0.8	53	0.8	48			0
00L6_A_ Single bedroom 2	1.9	81	1.9	64			1.3
00L6_A_ Single bedroom 3	2	79	1.9	64			1.7
00L6_A_ Single bedroom 4	2	79	2	64			1.7
00L6_A_ Single bedroom 5	2	80	1.9	64			1.1
00L6_A_ Single bedroom 7	1.2	49	1.2	46			0
00L6_A_ Single bedroom 8	1.2	49	1.2	46			0
00L6_A_ Single bedroom 9	1.1	49	1.1	45			0.1
00L6_A_ Kitchen	2.6 NA		2.6 NA		1.5		
00L7_A_ Kitchen	1.7 NA		1.7 NA		1.1		
00L7_A_ Single bedroom 1	2	57	2	50			0.1
00L7_A_ Single bedroom 2	2	57	2	50			0.1
00L7_A_ Single bedroom 3	1.4	52	1.4	48			0.3
00L7_A_ Single bedroom 4	2.2	54	2.1	48			0.6
00L7_A_ Single bedroom 5	2.3	54	2.2	48			0.5
00L7_A_ Single bedroom 6	0.9	55	0.8	50			0

Detailed overheating results

Guide A (bedrooms)

	Operative temperature (TM 52/CIBSE) (°C) - % hours in range								
	DSY1 2020s	DSY2 2020s	DSY3 2020s	DSY1 2050s	DSY2 2050s	DSY3 2050s	DSY1 2080s	DSY2 2080s	DSY3 2080s
Percentage of hours over	> 26.00	> 26.00	> 26.00	> 26.00	> 26.00	> 26.00	> 26.00	> 26.00	> 26.00
Bedrooms	with 35 W/m2 limited cooling			with 35 W/m2 limited cooling			with 40 W/m2 limited cooling		
00GL_A_Single Bedroom 1	0	0.1	0.1	0	0.1	0.4	0	0.1	0.4
00GL_A_Single Bedroom 2	0	0	0	0	0	0.1	0	0	0
00GL_A_Single Bedroom 3	0	0.1	0.1	0	0.1	0.4	0	0.1	0.3
00GL_A_Double Bedroom 4	0	0.3	0	0	0.3	0.5	0	0.4	0.8
00L1_B_Single bedroom 1	0	0	0	0	0	0	0	0	0
00L1_B_Accessible bedroom 2	0	0	0	0	0	0	0	0	0
00L1_B_Single bedroom 3	0	0.2	0	0	0.2	0	0	0.2	0
00L1_B_Double bedroom 1	0	0	0	0	0	0	0	0	0
00L1_B_Single bedroom 2	0	0	0	0	0	0	0	0	0
00L1_B_Accessible bedroom 3	0.1	0.6	0.2	0.1	0.6	0.9	0.3	0.7	1.2
00L1_A_Double Bedroom 1	0	0	0	0	0	0	0	0	0
00L1_A_Double Bedroom 2	0	0	0	0	0	0	0	0	0
00L1_A_Single Bedroom 1	0.4	1.1	0.1	0.4	1.1	0.7	0.3	0.9	0.3
00L1_A_Single Bedroom 2	0.7	1.6	0.4	0.7	1.6	1.2	0.6	1.3	0.8
00L1_A_Single Bedroom 3	0.8	1.7	0.5	0.8	1.7	1.3	0.7	1.5	1
00L1_A_Single Bedroom 4	0.7	1.7	0.5	0.7	1.7	1.4	0.7	1.5	1.1
00L1_A_Accessible Bedroom 1	0	0	0	0	0	0	0	0	0
00L1_A_Accessible Bedroom 2	0	0.3	0.2	0	0.3	1.2	0	0.3	1.1
00L1_A_Single Bedroom 5	0	0	0.1	0	0	0.3	0	0	0.2
00L1_A_Single Bedroom 6	0	0	0	0	0	0.1	0	0	0
00L1_A_Single Bedroom 7	0	0.1	0.2	0	0.1	0.4	0	0.1	0.3
00L1_A_Double Bedroom 3	0	0.2	0	0	0.2	0.3	0	0.3	0.4
00L1_A_Single Bedroom 8	0.5	1.6	0.5	0.5	1.6	1.7	0.7	1.8	1.9

	Operative temperature (TM 52/CIBSE) (°C) - % hours in range								
	DSY1 2020s	DSY2 2020s	DSY3 2020s	DSY1 2050s	DSY2 2050s	DSY3 2050s	DSY1 2080s	DSY2 2080s	DSY3 2080s
Percentage of hours over	> 26.00	> 26.00	> 26.00	> 26.00	> 26.00	> 26.00	> 26.00	> 26.00	> 26.00
	with 35 W/m2 limited cooling			with 35 W/m2 limited cooling			with 40 W/m2 limited cooling		
00L2_B_Single bedroom 2	0	0	0	0	0	0	0	0	0
00L2_B_Accessible bedroom 1	0	0	0	0	0	0	0	0	0
00L2_B_Single bedroom 1	0	0.2	0	0	0.2	0	0	0.1	0
00L2_B_Double bedroom 1	0	0	0	0	0	0	0	0	0
00L2_B_Single bedroom 3	0	0	0	0	0	0	0	0	0
00L2_B_Accessible bedroom 3	0.1	0.6	0.2	0.1	0.6	0.9	0.3	0.7	1.2
00L2_A_Double bedroom 1	0	0	0	0	0	0	0	0	0
00L2_A_Double bedroom 2	0	0	0	0	0	0	0	0	0
00L2_A_Single bedroom 2	0.4	1.1	0.1	0.4	1.1	0.6	0.3	0.8	0.3
00L2_A_Single bedroom 1	0.7	1.6	0.4	0.7	1.6	1.2	0.5	1.2	0.8
00L2_A_Single bedroom 3	0.7	1.6	0.4	0.7	1.6	1.3	0.6	1.3	0.9
00L2_A_Single bedroom 4	0.5	1.4	0.3	0.5	1.4	1.1	0.4	1.2	0.8
00L2_A_Accessible bedroom 2	0	0	0	0	0	0	0	0	0
00L2_A_Accessible bedroom 1	0	0.2	0.2	0	0.2	1	0	0.2	0.6
00L2_A_Single bedroom 5	0	0	0.1	0	0	0.3	0	0	0.2
00L2_A_Single bedroom 6	0	0	0	0	0	0	0	0	0
00L2_A_Single bedroom 7	0	0.1	0.1	0	0.1	0.4	0	0.1	0.3
00L2_A_Double bedroom 3	0	0.2	0	0	0.2	0.3	0	0.3	0.4
00I2_A_Single bedroom 8	0	0.8	0	0	0.8	0.7	0.1	0.9	0.6

Detailed overheating results

Guide A (bedrooms)

	Operative temperature (TM 52/CIBSE) (°C) - % hours in range								
	DSY1 2020s	DSY2 2020s	DSY3 2020s	DSY1 2050s	DSY2 2050s	DSY3 2050s	DSY1 2080s	DSY2 2080s	DSY3 2080s
Percentage of hours over	> 26.00	> 26.00	> 26.00	> 26.00	> 26.00	> 26.00	> 26.00	> 26.00	> 26.00
	with 35 W/m2 limited cooling			with 35 W/m2 limited cooling			with 40 W/m2 limited cooling		
00L3_B_ Single bedroom 1	0	0.1	0	0	0.1	0	0	0.1	0
00L3_B_ Accessible bedroom 2	0	0	0	0	0	0	0	0	0
00L3_B_ Single bedroom 3	0	0.6	0	0	0.6	0.3	0	0.7	0.2
00L3_B_ Double bedroom 1	0	0	0	0	0	0	0	0	0
00L3_B_ Single bedroom 2	0	0	0	0	0	0	0	0	0
00I3_A_ Double bedroom 1	0	0	0	0	0	0	0	0	0
00I3_A_ Double bedroom 2	0	0	0	0	0	0	0	0	0
00L3_A_ Single bedroom 1	0.4	1.1	0.1	0.4	1.1	0.6	0.3	0.8	0.3
00L3_A_ Single bedroom 2	0.7	1.6	0.4	0.7	1.6	1.2	0.5	1.2	0.8
00L3_A_ Single bedroom 3	0.8	1.7	0.5	0.8	1.7	1.3	0.6	1.4	0.9
00L3_A_ Single bedroom 4	0.7	1.6	0.5	0.7	1.6	1.3	0.7	1.4	1
00L3_A_ Accessible bedroom 2	0	0	0	0	0	0	0	0	0
00L3_A_ Accessible bedroom 1	0	0.2	0.2	0	0.2	1	0	0.2	0.6
00L3_A_ Single bedroom 5	0	0	0.1	0	0	0.3	0	0	0.2
00L3_A_ Single bedroom 6	0	0	0	0	0	0	0	0	0
00L3_A_ Single bedroom 7	0.1	0.1	0.2	0.1	0.1	0.4	0	0.1	0.3
00I3_A_ Double bedroom 3	0	0.2	0	0	0.2	0.3	0	0.3	0.4
00L3_A_ Single bedroom 8	0.3	1.4	0.4	0.3	1.4	1.6	0.6	1.6	1.7

	Operative temperature (TM 52/CIBSE) (°C) - % hours in range								
	DSY1 2020s	DSY2 2020s	DSY3 2020s	DSY1 2050s	DSY2 2050s	DSY3 2050s	DSY1 2080s	DSY2 2080s	DSY3 2080s
Percentage of hours over	> 26.00	> 26.00	> 26.00	> 26.00	> 26.00	> 26.00	> 26.00	> 26.00	> 26.00
	with 35 W/m2 limited cooling			with 35 W/m2 limited cooling			with 40 W/m2 limited cooling		
00L4_A_ Double bedroom 3	0	0	0	0	0	0	0	0	0
00L4_A_ Double bedroom 1	0	0	0	0	0	0	0	0	0
00L4_A_ Single bedroom 1	0.4	1.1	0.1	0.4	1.1	0.7	0.3	0.9	0.3
00L4_A_ Single bedroom 2	0.7	1.6	0.4	0.7	1.6	1.2	0.6	1.3	0.8
00L4_A_ Single bedroom 3	0.8	1.7	0.5	0.8	1.7	1.3	0.6	1.4	0.9
00L4_A_ Single bedroom 4	0.5	1.4	0.3	0.5	1.4	1.1	0.4	1.2	0.9
00L4_A_ Accessible bedroom 1	0	0.3	0.3	0	0.3	1.1	0	0.2	0.7
00L4_A_ Single bedroom 5	0	0	0.1	0	0	0.3	0	0	0.2
00L4_A_ Single bedroom 6	0	0	0	0	0	0.1	0	0	0
00L4_A_ Single bedroom 7	0.1	0.1	0.2	0.1	0.1	0.4	0	0.1	0.3
00L4_A_ Double bedroom 2	0	0.2	0	0	0.2	0.3	0	0.3	0.4
00L4_A_ Single bedroom 8	0	0.8	0	0	0.8	0.7	0.1	0.9	0.6

Detailed overheating results

Guide A (bedrooms)

	Operative temperature (TM 52/CIBSE) (°C) - % hours in range								
	DSY1 2020s	DSY2 2020s	DSY3 2020s	DSY1 2050s	DSY2 2050s	DSY3 2050s	DSY1 2080s	DSY2 2080s	DSY3 2080s
Percentage of hours over	> 26.00	> 26.00	> 26.00	> 26.00	> 26.00	> 26.00	> 26.00	> 26.00	> 26.00
	with 35 W/m2 limited cooling			with 35 W/m2 limited cooling			with 40 W/m2 limited cooling		
00L5_A_ Double bedroom 3	0	0	0	0	0	0	0	0	0
00L5_A_ Double bedroom 1	0	0	0	0	0	0	0	0	0
00L5_A_ Single bedroom 8	0.4	1.2	0.2	0.4	1.2	0.8	0.4	0.9	0.4
00L5_A_ Single bedroom 7	0.8	1.7	0.5	0.8	1.7	1.3	0.7	1.4	1
00L5_A_ Single bedroom 6	0.9	1.9	0.6	0.9	1.9	1.4	0.7	1.5	1.1
00L5_A_ Single bedroom 5	0.8	1.8	0.6	0.8	1.8	1.5	0.7	1.6	1.1
00L5_A_ Accessible bedroom 2	0	0	0	0	0	0	0	0	0
00L5_A_ Double bedroom 3	0	0.3	0.3	0	0.3	1.3	0	0.3	0.8
00L5_A_ Single bedroom 4	0.1	0	0.2	0.1	0	0.3	0	0	0.2
00L5_A_ Single bedroom 3	0	0	0	0	0	0.1	0	0	0
00L5_A_ Single bedroom 2	0.1	0.1	0.2	0.1	0.1	0.4	0	0.1	0.3
00L5_A_ Double bedroom 2	0	0.2	0	0	0.2	0.4	0	0.3	0.5
00L5_A_ Single bedroom 1	0.4	1.5	0.5	0.4	1.5	1.7	0.7	1.8	1.8

	Operative temperature (TM 52/CIBSE) (°C) - % hours in range								
	DSY1 2020s	DSY2 2020s	DSY3 2020s	DSY1 2050s	DSY2 2050s	DSY3 2050s	DSY1 2080s	DSY2 2080s	DSY3 2080s
Percentage of hours over	> 26.00	> 26.00	> 26.00	> 26.00	> 26.00	> 26.00	> 26.00	> 26.00	> 26.00
	with 35 W/m2 limited cooling			with 35 W/m2 limited cooling			with 40 W/m2 limited cooling		
00L6_A_ Single bedroom 12	0	0	0	0	0	0.1	0	0	0
00L6_A_ Single bedroom 11	0.1	0.1	0.2	0.1	0.1	0.4	0	0	0.3
00L6_A_ Single bedroom 10	0.1	0.2	0.3	0.1	0.2	0.5	0.1	0.2	0.4
00L6_A_ Single bedroom 9	0.1	0.4	0.3	0.1	0.4	0.9	0.1	0.6	1.1
00L6_A_ Single bedroom 8	0	0	0	0	0	0	0	0	0
00L6_A_ Single bedroom 7	0	0	0	0	0	0	0	0	0
00L7_A_ Single bedroom 6	0	0	0.1	0	0	0.4	0	0	0.2
00L7_A_ Single bedroom 5	0.5	0.7	0.6	0.5	0.7	1.1	0.5	0.6	1
00L7_A_ Single bedroom 4	0.6	0.9	0.7	0.6	0.9	1.3	0.6	0.8	1.2
00L7_A_ Single bedroom 3	0.3	0.8	0.6	0.3	0.8	1.4	0.6	1.1	1.8
00L7_A_ Single bedroom 2	0.1	0.1	0.2	0.1	0.1	0.5	0	0.1	0.3
00L7_A_ Single bedroom 1	0.1	0.1	0.2	0.1	0.1	0.4	0	0.1	0.3

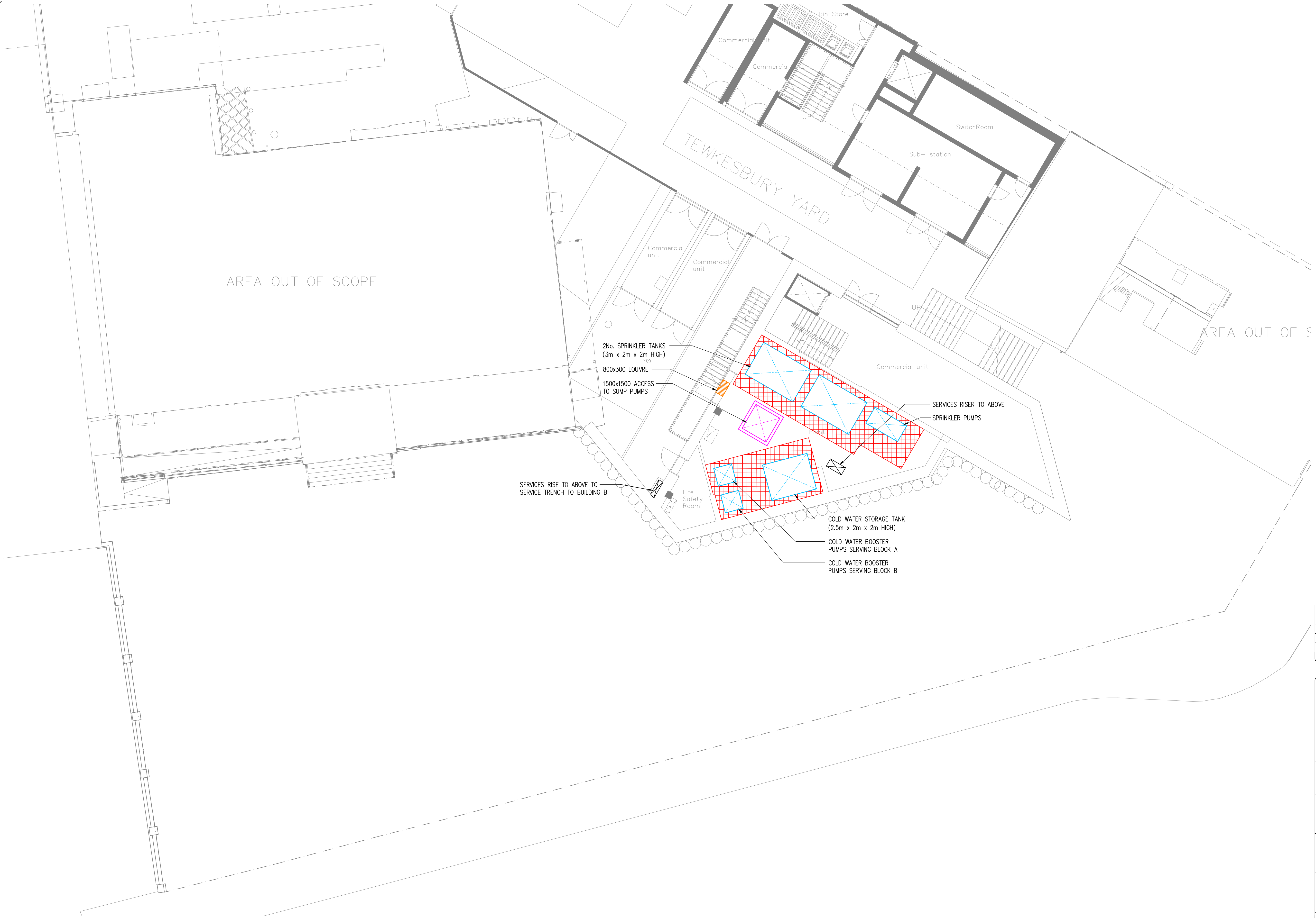
Detailed overheating results

TM 59 Criterion A (Living Room/kitchen)

	Operative temperature (TM 52/CIBSE) (°C) - % hours in range								
Room Name	2020 DSY 1	2020 DSY 2	2020 DSY 3	2050 DSY 1	2050 DSY 2	2050 DSY 3	2080 DSY 1	2080 DSY 2	2080 DSY 3
00GL_A_Living Room/Kitchen	1.2	2.7	3.9	2.4	3.8	6.2	5.6	7.6	9.6
00L1_B_Living Room/Kitchen 1	1.1	1.8	3.9	2.4	4.2	6.3	5.5	7.9	9.9
00L1_A_Living Room/Kitchen	1.4	2.3	4.2	3.2	4.6	6.8	6.3	8.2	10
00L1_A_Living Room	1.3	2	4	2.6	4.2	6.7	5.7	8	9.9
00L2_B_Living Room/Kitchen 1	1.1	1.8	3.9	2.4	4.1	6.3	5.5	7.9	9.9
00L2_A_Living Room/Kitchen	1.3	2.3	4.1	3.2	4.6	6.8	6.2	8.2	10.1
00L2_A_Kitchen	1.3	2	4.1	2.6	4.2	6.7	5.8	7.9	9.9
00L3_B_Living Room/Kitchen 1	1.4	2.4	4.3	3.1	5.3	6.9	6.9	8.7	10.8
00L3_A_Living Room/Kitchen 2	1.5	2.6	4.3	3.3	4.8	7	6.3	8.5	10.3
00L3_A_Living Room	1.3	2	3.9	2.7	4.2	6.6	5.5	8	9.9
00L5_A_Living Room/Kitchen	1.5	3	4.5	3.7	5.1	7.4	6.9	8.6	10.9
00L5_A_Living Room	1.3	2.1	3.9	2.6	4.2	6.6	5.6	8	9.9
00L6_A_Kitchen	1.5	2.4	4.4	3.3	5.2	7.1	6.6	8.7	10.7
00L6_A_Living Room	1.2	1.8	3.6	2.2	3.8	6.2	5.4	7.6	9.5
00L7_A_Kitchen	1.1	1.6	3.4	2	3.7	6.1	5.3	7.3	9.3
00L4_A_Living Room/Kitchen 1	1.5	2.6	4.3	3.3	4.8	7	6.3	8.5	10.3
00L4_A_Kitchen	1.2	2.1	4	2.6	4.3	6.7	5.7	7.9	9.9

10 / *Appendix D*

Plant Room Layout



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P2	PRELIMINARY ISSUE	14/10/22	DM
P1	PRELIMINARY ISSUE	18/08/22	DM
REV	DESCRIPTION	DATE	AUTH

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Client:
PROVEWELL

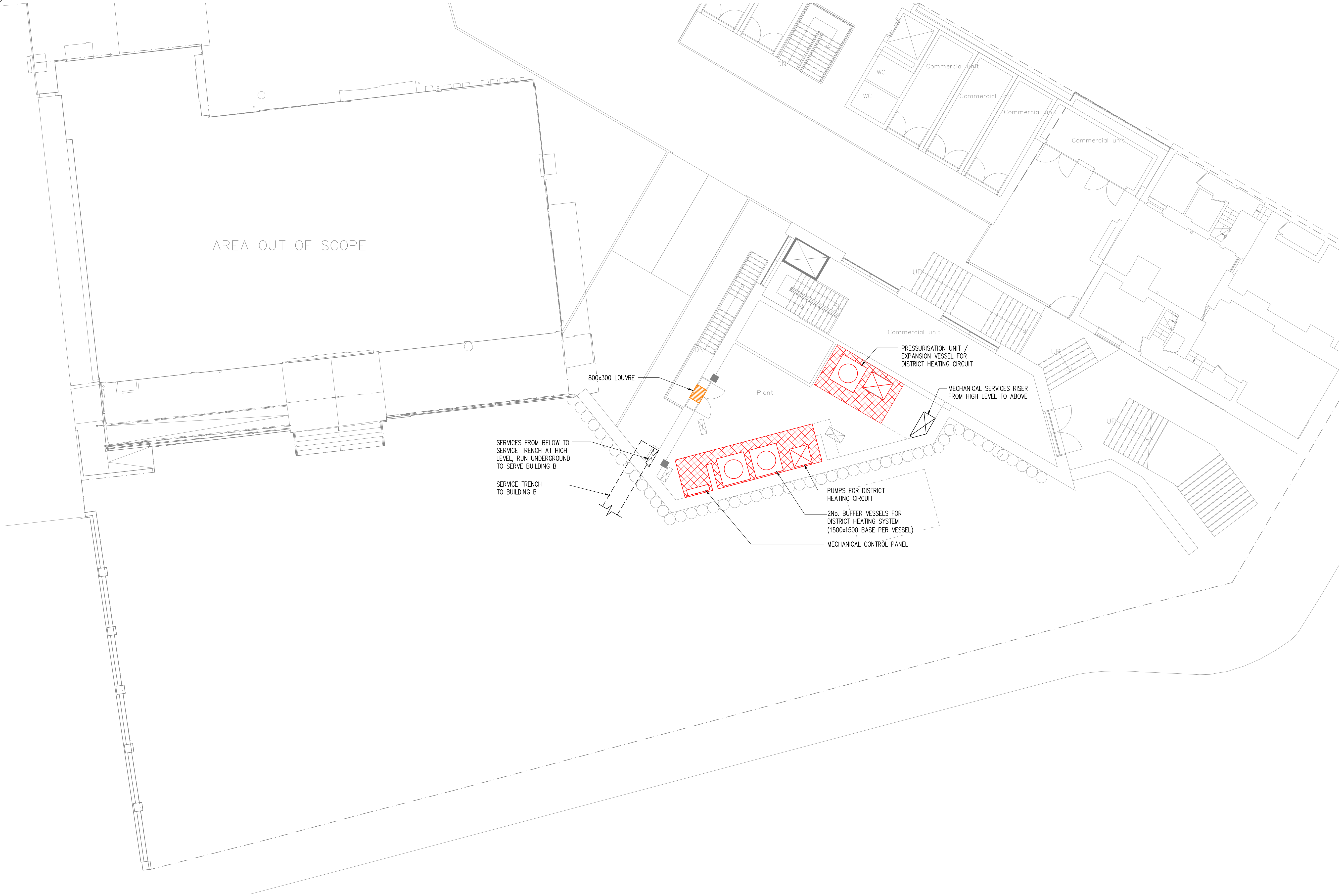
Project:
WHSL

Title:
BASEMENT LEVEL
MECHANICAL SERVICES
OUTLINE

Drawn: DM Date: 13/05/22 Scale: 1:100@A1 Checked: DM Auth: DM

Project No: P21387 Drawing No: M100 Rev: T1

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Client
PROVEWELL

Project
WHSL

Title
LOWER GROUND FLOOR
MECHANICAL SERVICES
OUTLINE

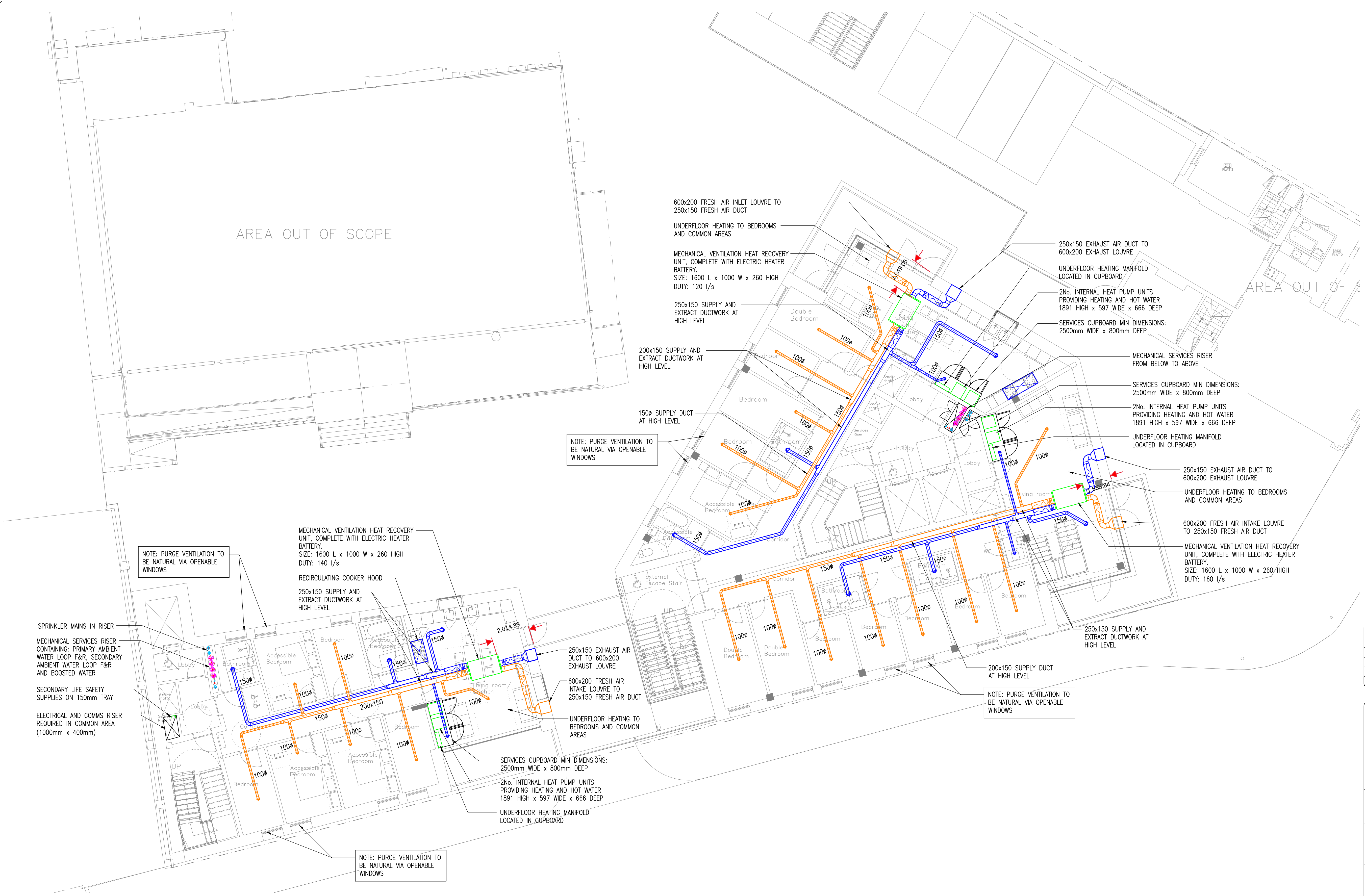
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Project No: P21387	Drawing No: M101	Rev: T1
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11 / *Appendix E*

MVHR Locations



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Client

PROVEWELL

Project

WHSL

Title

FIRST FLOOR
MECHANICAL SERVICES
OUTLINE

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Project No: P21387	Drawing No: M103	Rev: T1
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