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Seven Sisters/ Eade Road

Energy Statement

14/12/2022

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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.

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1 / *Executive Summary*

This Energy Statement supports the planning application for the proposed Warehouse Living - Seven Sisters 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 also 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 in each unit. These water source heat pumps will uplift the low grade heat from the network and provide space heating and domestic hot water to each unit. 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 12kWp of roof-mounted photovoltaic panels, equivalent to 31no. 390W 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 performance in use 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 27% carbon emissions reduction is achieved (compared to a Part L2 2021 compliant development) through passive and energy efficiency measures only, exceeding the minimum 15% required by the GLA.
- A total 53% 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 £13,052, calculated based on a carbon price of £95 per tonne over 30 years.

Risk of overheating

A CIBSE TM59 analysis has been undertaken for a sample of residential units considered 'worst-case' in terms of overheating. Preliminary assessment identified potential overheating risk within Living/kitchen areas due, in part, to the excess solar gains to the south façade and increased internal gains associated with kitchen operations. Through an iterative process it was possible to develop a natural ventilation strategy for these rooms that limits operative temperatures to within the TM59 overheating criteria.

Operable windows also allow natural ventilation to bedrooms overnight, minimising the risk of bedrooms overheating during their occupied hours. As a result, night-time temperatures remain within the recommended ranges.

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

Regulated CO ₂ savings (tonnes CO ₂ /yr)		
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	9.7	5.5
After energy demand reduction (be lean)	7.1	5.5
After heat network connection (be clean)	7.1	5.5
After renewable energy (be green)	4.6	5.5

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

Regulated CO ₂ savings (tonnes CO ₂ /yr)		
	Tonnes CO ₂ /yr	%
Be lean: savings from energy demand reduction	2.6	27%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	2.5	26%
Total cumulative savings on-site	5.1	53%
Annual savings from off-set payment	4.6	-
Cumulative savings for off-set payment	137	-
Cash in-lieu contribution (£)	13,052	-

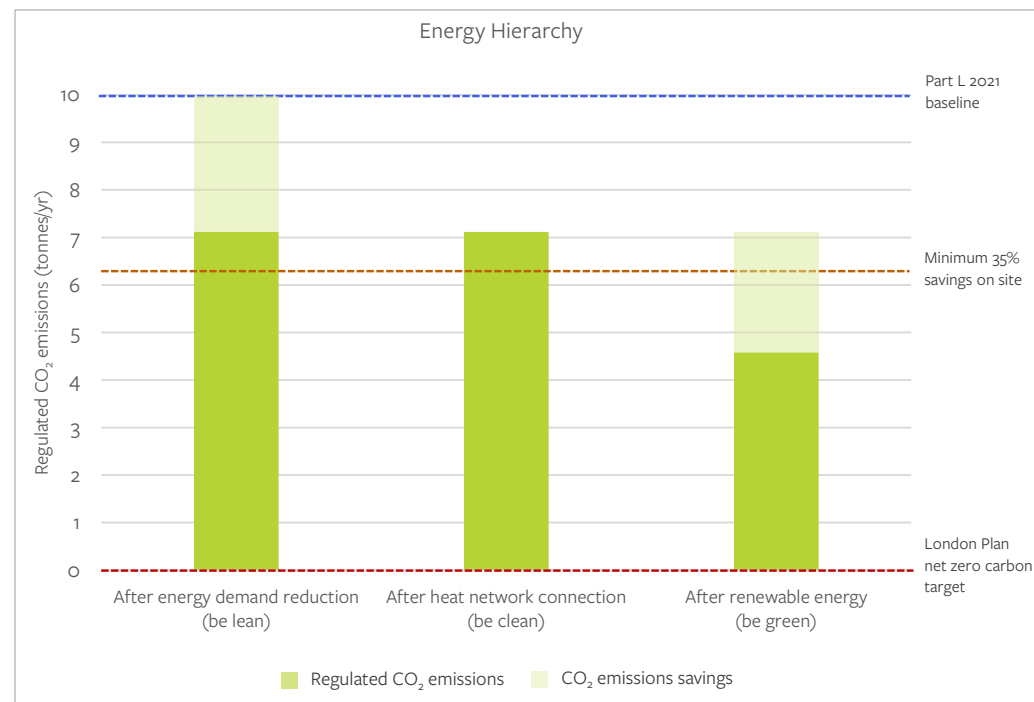


Figure 1: Anticipated savings from each step of the London Plan energy hierarchy

2 / *Introduction*

2.1 Site Location

The Harringay 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 current 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)

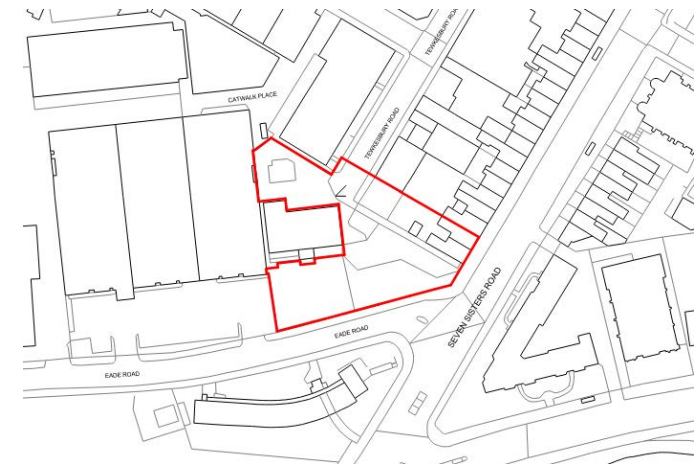


Figure 3: Proposed site boundary line

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 Harringay 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.¹⁵¹ 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.
- The software used to model and calculate the energy performance and carbon emissions is SBEM for non-domestic buildings; calculation summary worksheets are provided in Appendix B.
- 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.

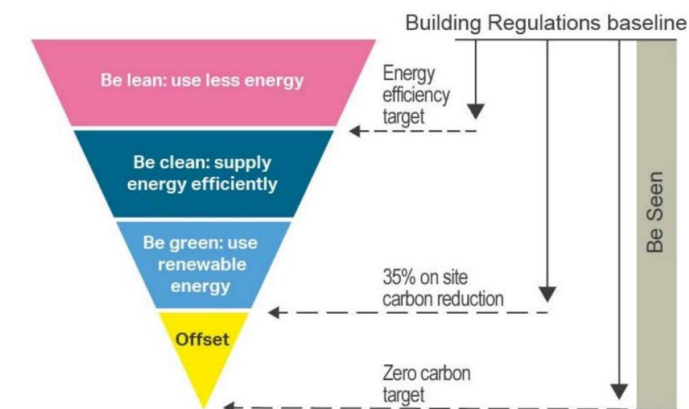


Figure 4: The London Plan energy hierarchy

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.

The table overleaf demonstrates the improved performance of the proposed building fabric beyond the Building Regulations requirements.

Air tightness improvement

Heat loss may also occur 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 $3\text{ m}^3/\text{m}^2\cdot\text{h}$ @ 50Pa.

Table 3: Thermal Envelope U-values

Building Element	Building Regulations Part L2 limiting fabric parameters	Proposed u-values
External walls	0.18 W/m ² K	0.15 W/m ² K
Ground and exposed floors	0.15 W/m ² K	0.10 W/m ² K
Roofs	0.15 W/m ² K	0.10 W/m ² K
Windows and glazed doors	1.4 W/m ² K	1.2 W/m ² K g-value 0.4 Vlt - 70%
Air tightness	3 m ³ /m ² .h @ 50Pa	3 m ³ /m ² .h @ 50Pa

Reducing the need for artificial lighting

The development has been designed to maximise daylight in all habitable spaces as a way of improving the health and wellbeing of its occupants.

All habitable areas will benefit from generous areas of glazing to increase the amount of daylight within the internal spaces where possible. This is expected to reduce the need for artificial lighting whilst delivering pleasant, healthy spaces for occupants.

Active design measures

High efficacy lighting

The development intends to incorporate low energy lighting fittings throughout, and will accommodate LED luminaires only.

Heat recovery ventilation

Mechanical ventilation heat recovery (MVHR) is proposed. The mechanical ventilation system will include heat recovery in order to achieve ventilation in the most energy-efficient way. Natural ventilation is proposed for purging purposes.

Controls

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

- For areas of infrequent use, occupant sensors will be fitted for lighting, whereas day lit areas will incorporate daylight sensors where appropriate;

- 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.

Minimising distribution losses

In order to reduce heat distribution losses, an ambient temperature circulation system is proposed. The system will provide low grade heat energy from central ASHPs, which will then be used by water source heat pumps 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. A target distribution loss of 5% will be applied.

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 undertaken for representative ‘worst case’ units in line with CIBSE TM59. Dynamic thermal modelling was conducted using three design weather years, also accounting for climate change scenarios.

Hourly simulations show that overheating criteria set out within CIBSE’s TM59 methodology will be met across the scheme through natural ventilation means, and overheating risk sufficiently mitigated.

The provision of operable windows means that indoor temperatures in occupied spaces largely track the outdoor air temperatures, when windows are open, i.e; when the space is occupied between 9:00 and 22:00 and whenever air temperature exceeds 22°C. This confirms that the spaces make best use of the natural ventilation strategy for heat rejection. High external air temperatures associated with the design summer year weather file permits minimal increases in internal operative temperatures above the outside air conditions. A summary of each tested room can be found in Table 4.

The analysis and results also demonstrate has the ability to mitigate overheating and comply with Part O of the Building Regulations 2021.

Be Lean CO₂ emissions

Table 5 and Table 6 show the carbon savings from demand reduction for the development.

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

Table 4: Summary of overheating CIBSE TM59 analysis

Representative spaces	Criterion A - % hours above the comfort threshold (target: 3%)	Criterion B – Number of hours between 22:00-07:00 above 26°C threshold (target < 32hrs)
Bedroom 1 (East block)	2.3%	21
Kitchen/living (East block)	2.8%	-
Bedroom 2 (West block)	0.6%%	15
Kitchen/living (West block)	2.6%	-

Table 5: CO₂ Emissions after Lean stage

Regulated CO ₂ savings (tonnes CO ₂ /yr)		
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	9.7	5.5
After energy demand reduction (be lean)	7.1	5.5

Table 6: CO₂ savings after Lean Stage

Regulated CO ₂ savings (tonnes CO ₂ /yr)		
	Tonnes CO ₂ /yr	%
Be lean: savings from energy demand reduction	2.6	27%

5.2 Be Clean

The heating systems have been selected following the hierarchy set in Policy SI3 of the London Plan and the GLA's Energy Assessment Guidance (2022) as detailed below.

Connect to existing or planned heat networks

According to the London Heat map (Figure 3), there are no existing heating networks within close proximity of the development site. However, the site 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 to detailed feasibility stage will be carried out. As such, the development will be future proofed for connection to a district heating network should one become available.

Enable future connection

The development will be serviced by a centralised ambient/neutral temperature strategy, which is compatible with heat networks that operate at higher temperatures. Interface with a higher temperature network can be achieved by applying a step down in temperature across a plate heat exchanger. This may also provide an improvement to the heat network viability as return temperatures can be much lower, increasing the temperature difference across the generation plant and increasing system efficiency.



Figure 5: London Heat Map, showing proposed site location, planned Woodberry Down, Stamford Hill and Stoke Newington network and indicative energy centre location

A connection point to the site will be identified and safeguarded during design development and construction; the indicative plant room layout showing the connection point can be found in Appendix C.

Communal heating and hot water

Heating and domestic hot water will be provided by centralised water-based air source heat pumps which will then feed into 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, 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.

5.3 Be Green

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

The development of will benefit from an energy efficient building fabric which will reduce the energy consumption of the proposed development in the first instance. A range of renewable technologies were subsequently 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 for its appropriateness to the Warehouse Living development. The feasibility study demonstrates that photovoltaics and heat pumps would be the most feasible renewable technologies for the proposed development.

Table 7: 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 solution is proposed, which will provide high efficiency heating and hot water. Each block will have central air source heat pumps (ASHP) located at roof level, connecting to water source heat pumps in each unit. This low temperature distribution system will result in very low heat losses, also reducing the risk of overheating particularly in corridors.

Each unit will contain water source heat pumps within service cupboards, connected to the ambient temperature loop. The heat pumps will generate heat energy for both space heating, via underfloor heating systems, and domestic hot water.

PV Panels

The location for PV panels has been determined based on available roof area, orientation, shading and visual impact. Suitable space has been identified on the roof of Block A. To maximise energy yield, the panels will be high efficiency monocrystalline ones, achieving 390kW. The proposed array will total 8kWp, and 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.

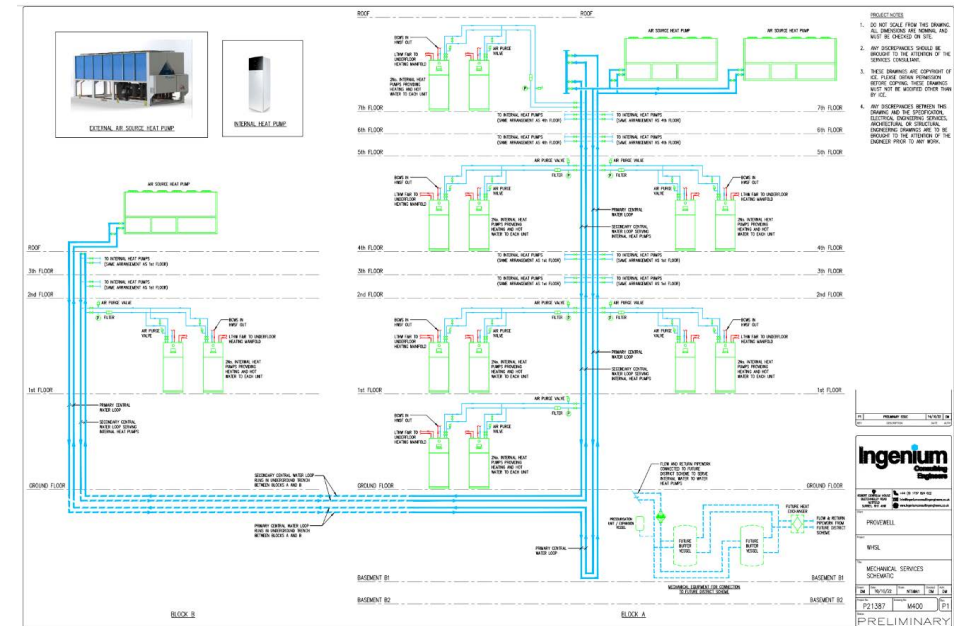


Figure 6: Proposed mechanical services distribution showing central ASHP and localised water source heat pump

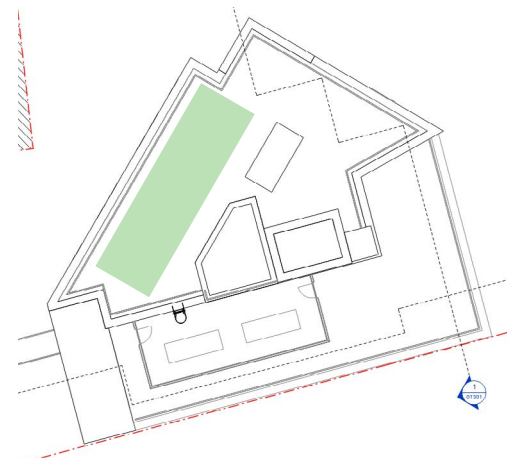


Figure 7: Indicative roof space available for PV panels

Be Green CO₂ emissions

Table 9 and Table 10 show the carbon savings from low and zero carbon technologies.

Table 8: Carbon Dioxide Emissions after Be Green stage

Regulated CO ₂ savings (tonnes CO ₂ /yr)		
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	9.7	5.5
After energy demand reduction (be lean)	7.1	5.5
After heat network connection (be clean)	7.1	5.5
After renewable energy (be green)	4.6	5.5

Table 9: Carbon Dioxide savings after Be Green stage

Regulated CO ₂ savings (tonnes CO ₂ /yr)		
	Tonnes CO ₂ /yr	%
Be lean: savings from energy demand reduction	2.6	27%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	2.5	26%
Total Cumulative Savings	5.1	53%

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 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.

5.5 Summary of carbon reduction

The following tables and graph summarise the carbon reduction performance of the development. The carbon offset contribution of the development has been calculated based on the New London Plan target of net zero and a carbon offset price of £95 per tonne of CO₂ over 30 years, amounting to a total of £13,052.

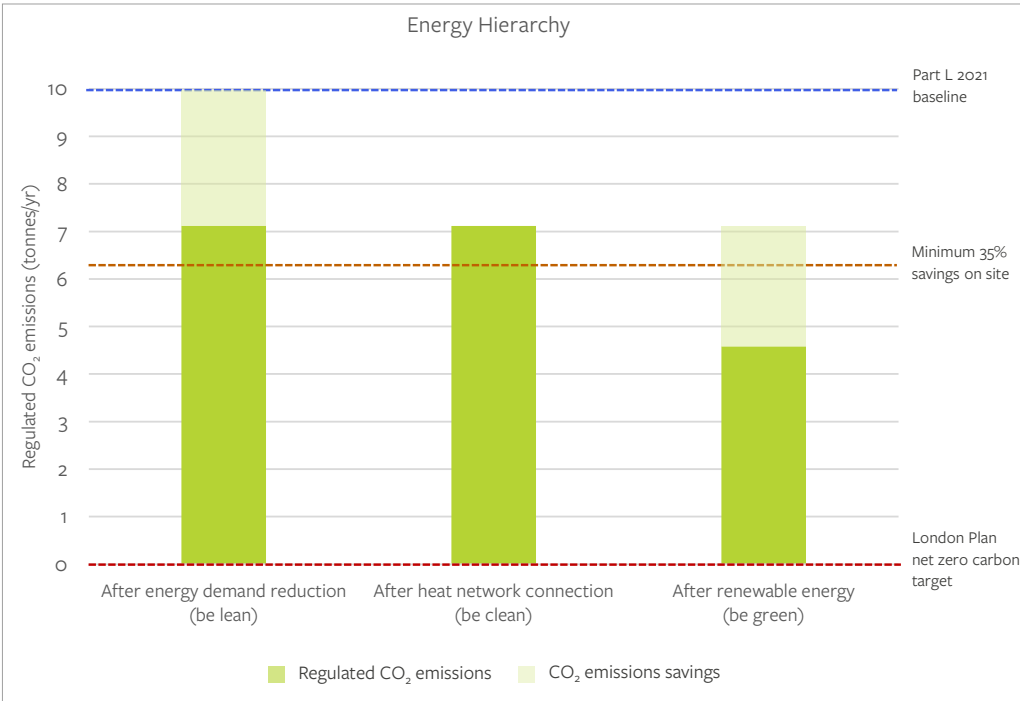


Figure 8: Anticipated savings from each step of the London Plan energy hierarchy

Table 10: Carbon Dioxide Emissions after each stage of the Energy Hierarchy

Regulated CO ₂ savings (tonnes CO ₂ /yr)		
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	9.7	5.5
After energy demand reduction (be lean)	7.1	5.5
After heat network connection (be clean)	7.1	5.5
After renewable energy (be green)	4.6	5.5

Table 11: Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy

Regulated CO ₂ savings (tonnes CO ₂ /yr)		
	Tonnes CO ₂ /yr	%
Be lean: savings from energy demand reduction	2.6	27%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	2.5	26%
Total Cumulative Savings	5.1	53%

6 / *Conclusion*

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 53%.

Carbon offset payment

The proposed development complies with the London Plan CO₂ savings target of 35% overall.

To achieve 'zero carbon' for the scheme, 4.6 tonnes per annum of regulated CO₂, equivalent to 137 tonnes over 30 years, should be offset. At the concept design stage this amounts to a total sum of £13,052, calculated based on a carbon price of £95 per tonne over 30 years.

Table 12 to the right 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.

Overall, 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.

Table 12: Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy

Regulated CO ₂ savings (tonnes CO ₂ /yr)		
	Tonnes CO ₂ /yr	%
Be lean: savings from energy demand reduction	2.6	27%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	2.5	26%
Total Cumulative Savings	5.1	53%
Annual savings from off-set payment	4.6	-
Cumulative savings for off-set payment	137	-
Cash in-lieu contribution (£)	13,052	-

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 7 shows a summary of the findings from the assessment, and demonstrates that the BPER does not exceed the TPER.

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 must be reported as detailed in the GLA's Energy Assessment Guidance (June/2022). The figures for the proposed development can be found in Table 13 and Table 14; the GLA also sets benchmarks for these and encourages applicants to achieve and improve upon performance where possible.

Table 13: Building Primary Energy Rating

Primary energy rating kWh _{pe} /m ² .year		
BPER	TPER	Improvement
24.45	33.25	26%

Table 14: Building EUI and space heating demand

	Energy use intensity (kWh/m ² .yr)	Space heating (kWh/m ² .yr)
Benchmark non-residential buildings	55	15
Proposed development	34.8	17.5

7 / *Appendix A*

Overheating Risk Assessment

Seven Sisters / Eade Road – Warehouse Living

CIBSE TM59 Overheating analysis

Executive summary

To better understand the characteristics of each room for residential purposes within the proposed Haringey Warehouse Living development and the likelihood of overheating they have been analysed against CIBSE's TM59 – Design methodology for the assessment of overheating risk in residential spaces.

Preliminary assessment identified potential overheating risk within Living/kitchen areas of the units due in part to the excess solar gains to the south façade and increased internal gains associated with kitchen operations. Through an iterative process it was possible to develop a natural ventilation strategy for kitchen/living areas that was able to limit operative temperatures to within the TM59 overheating criteria.

Operable windows also allow natural ventilation to bedrooms overnight, minimising the risk of bedroom overheating during their occupied hours. As a result, night-time temperatures remain within the recommended ranges.

To achieve the necessary night-time cooling to bedrooms, opening free areas in line with minimum purge ventilation rates as set out in Approved Document Part F have been assumed. For rooms where hinge or pivot windows with an opening angle of 15 to 30 degrees are to be specified, minimum total opening area equates to ten percent of the room floor area.

Introduction

As a result of the current drive to produce living spaces with reduced heating energy requirements, building regulations necessitate both high levels of fabric insulation and air tightness. This can result in trapped during peak summer periods, elevating the risk of overheating.

To further investigate the potential overheating risk of the site and provide guidance on living space experience, CIBSE's Technical Memorandum (TM) 59 – Design methodology for assessment of overheating risk in homes has been referenced. TM59 utilises annual hourly thermal simulations for more rigorous testing, capturing frequency of overheating events with finer resolution than the regulatory requirements and procedures seen in Part L2.

Cooling hierarchy

Policy SL4 of the London Plan – Managing Heat Risk provides the following hierarchy to be considered in order to mitigate the potential for overheating and subsequent reliance on mechanical cooling systems:

- Minimise internal heat generation through energy efficient design.
- Reduce the amount of heat entering a building in summer through orientation, shading, albedo, fenestration, insulation and green roofs and walls.

- Passive ventilation.
- Mechanical ventilation.
- Active cooling systems (ensuring they are the lowest carbon options).

With 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 opening windows to eliminate the need for active cooling.

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, risk of overheating can become a problem.

The proposed scheme aims to mitigate these conflicting issues with the following measures:

- Operable windows to bedrooms and kitchen/living rooms.
- Window-to-wall ratios in bedroom and living spaces to ensure a careful balance of daylight access and reduced overheating risk is achieved.
- Glazing specifications with a g-value of 0.4, ensuring a high level of daylight entry whilst providing reasonable solar control.
- Horizontal shading elements (balcony shading).

Methodology

In order to illustrate the benefits of passive design measures and identify areas for improvement, predicted occurrences of overheating in dwellings was assessed using the methodology described in CIBSE's TM59. CIBSE AM11 compliant dynamic thermal analysis software IES Virtual Environment (VE) 2022.1.2.0 was used for this assessment.

Site location and orientation

The assessed dwellings 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.

Weather data

TM59 methodology requires the use of the design summer (DSY) 1 weather file most appropriate for the site location for the 2020s, high emissions, 50% percentile scenario. Due to the proximity to development site and similarity of the suburban development in its surroundings, weather data based on the design summer year for London Heathrow has been adopted (London_LHR_DSY1).

Assessed dwellings

Representative rooms have been selected for the analysis in order to provide an estimate of conditions likely to be experienced across the whole development (Figure 1).

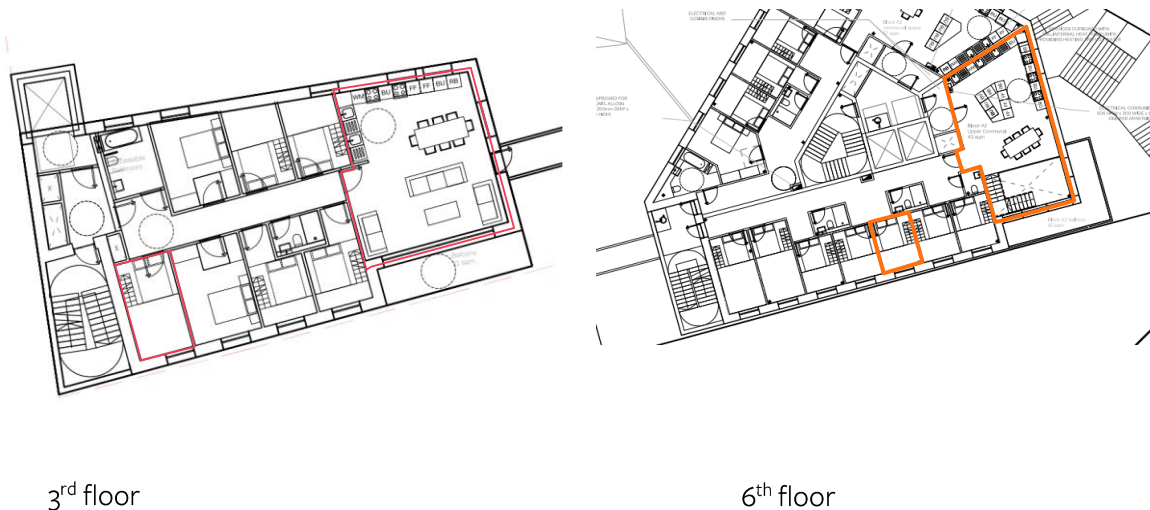


Figure 1: Internal layout of test dwellings

Construction

Informed by the need to prevent excessive heat losses during the heating period, the design considers the specification of high levels of insulation. The basis of the design performance is summarised in Table 1 and has been adopted within the assessment of overheating risk.

Table 1: Indicative performance

Building elements	Project targets	Regulatory reference
Façade element		Part L2A 2021 Limiting U-values
Roof U-value [W/(m².K)]	0.10	0.18
Wall U-value [W/(m².K)]	0.15	0.26
Floor U-value [W/(m².K)]	0.10	0.18
Party wall U-value [W/(m².K)]	1.79	-
Window U-value [W/(m².K)]	1.20	1.60
Window G-value	0.40	-
Infiltration	0.25 (ach)	8.0m³/(h.m²)@50pa

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.

Table 2: CIBSE TM59 reference load profiles and schedules

Number of people	Description	Peak load (W)		Period																											
		Sensible	Latent	Hour-ending																											
				00-01	01-02	02-03	03-04	04-05	05-06	06-07	07-08	08-09	09-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24				
				1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00	12.00	13.00	14.00	15.00	16.00	17.00	18.00	19.00	20.00	21.00	22.00	23.00	24.00				
1	Single bedroom occupancy	75	55	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.7
2	Double bedroom occupancy	150	110	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.7
2	Studio occupancy	150	110	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1-bed: living/kitchen occupancy	75	55	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
1	1-bed: living occupancy	75	55	0	0	0	0	0	0	0	0	0	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0
1	1-bed: kitchen occupancy	75	55	0	0	0	0	0	0	0	0	0	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0
2	2-bed: living/kitchen occupancy	150	110	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
2	2-bed: living occupancy	150	110	0	0	0	0	0	0	0	0	0	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0
2	2-bed: kitchen occupancy	150	110	0	0	0	0	0	0	0	0	0	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0
3	3-bed: living/kitchen occupancy	225	165	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
3	3-bed: living occupancy	225	165	0	0	0	0	0	0	0	0	0	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0
3	3-bed: kitchen occupancy	225	165	0	0	0	0	0	0	0	0	0	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0
	Single bedroom equipment	80		0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.13
	Double bedroom equipment	80		0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.13
	Studio equipment	450		0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24
	Living/kitchen equipment	450		0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24
	Living equipment	150		0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
	Kitchen equipment	300		0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
	Lighting profile		2 (W/m2)	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	0

Ventilation strategy

Service design for the dwellings includes mechanical ventilation with heat recovery unit. Background ventilation rates in line with CIBSE Guide A guidance for a 1 bed dwelling of 13l.s⁻¹ have been used. Kitchen/living room spaces included within the analysis align with current design intent and account for 60 l/s extract.

While background ventilation rates are small in comparison with air flow rates provided by operable windows, indoor conditions are improved, especially when low wind speeds are experienced in summer conditions, limiting the potential for natural ventilation. The building envelope design targets a lower air permeability of 3m³/ (hr.m²) at 50 Pascals in order to limit heat losses during the heating season.

This has been modelled using infiltration rates corresponding with those established in methodology found in CIBSE TM23.

As such, the primary mode of ventilation against overheating in the assessed dwelling is natural ventilation provided by openable side-hung windows. For openable windows, free areas in alignment with Approved Document Part F's minimum purge ventilation requirements have been assumed, which equate to 10% of the room floor area. For bedrooms and living/kitchen rooms, night-purge assumes a degree of window opening overnight.

For living/kitchens, day time operation of balcony doors is also assumed as part of the natural ventilation strategy at the hottest points throughout the year in order to achieve the necessary purge ventilation rates to comply with TM59 criteria.

CIBSE TM59 acknowledges that noise and low air quality can limit periods in which windows may be opened as a natural ventilation strategy. However, this iteration of overheating analysis follows TM59's default guidance, and assumes that windows and doors are left open whenever spaces are occupied and the indoor space temperature exceeds 22°C.

Exposure types

Exposure types and wind pressure coefficients at openings are established using the definitions in the modelling software, based on CIBSE Guide A. All openings have been treated as semi-exposed. In addition, pressure coefficients for windows are further refined based on the ratio of window height to the building height of 0.2, 0.4 or 0.8 dependent on the relative floor height of the assessed rooms.

Shading elements

Due to the nature of the façade design and massing, self-shading is achieved via balcony overhangs, providing shading to kitchen/living spaces located to the south of the scheme.

In order to better understand the impact of these shading features, further analysis on their impact should be conducted on a unit-by-unit basis using dynamic thermal modelling at the next stages of design.

Communal corridors

CIBSE TM59 advises that communal corridor's heating pipe work should be included in the overheating analysis. However, due to the limited availability of information on the heat distribution network within the building at this early design stage assessment, heat transfer between units and communal corridors has not been considered. It should be noted that 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.

Comfort criteria

As recommended within TM59, the default comfort category of 2 based on CIBSE TM52 (2013) categorisation for new buildings has been adopted. As per criteria for rooms for residential purpose that are predominantly naturally ventilated, including homes that have mechanical ventilation with heat recovery and with good opportunity for natural ventilation in the summer, the adaptive method based on CIBSE TM52 has been referenced for the assessment.

Summary of requirements are as follows.

Criterion A

Compliance with Criterion A for predominantly naturally ventilated dwellings 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 3.0% of the occupied hours.

For reference, the adopted design summer year 1 weather file includes 55 summer hours, or approximately 1.5% of all summer hours, with the outdoor air temperature exceeding the maximum adaptive temperature by at least one degree. This corresponds to 2.8% of all summer hours between 9:00 and 22:00, the period of default living room occupancy in TM59. As a result, five additional hours in living rooms with temperatures exceeding the applicable threshold leads to non-compliance. This criterion applies to living rooms, kitchens and bedrooms.

Criterion B

Compliance with Criterion B for predominantly naturally ventilated homes 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. This criterion applies to bedrooms only and aims to improve comfort during sleeping hours. 1% of annual hours between 22:00 and 7:00 for bedrooms equates to 32 hours. As a result, 33 or more hours above 26°C leads to non-compliance against this criterion. For reference, the adopted design summer year 1 weather file includes 14 hours between 22:00 and 7:00 with the outside air temperature exceeding 26°C. As a result, up to 18 additional hours above

26°C is permissible in bedrooms during this period while still maintaining compliance of this criterion.

Compliance for naturally ventilated dwellings

Predominantly naturally ventilated dwellings are considered to meet TM59 if they meet requirements in both Criterion A and Criterion B as summarised above.

Analysis

Hourly simulations show that overheating criteria set out within CIBSE's TM59 methodology will be met across the scheme through natural ventilation means, and overheating risk sufficiently mitigated.

The provision of operable windows means, indoor temperatures in occupied spaces largely track the outdoor air temperatures, when windows are open, i.e; when the space is occupied between 9:00 and 22:00 and whenever air temperature exceeds 22°C. This confirms that the spaces make best use of the natural ventilation strategy for heat rejection. High external air temperatures associated with the design summer year weather file permit minimal increases in internal operative temperatures above the outside air conditions.

Table 3. Summary of TM59 analysis results for Criteria A and B

Representative spaces	Criterion A - % hours above the comfort threshold (CIBSE TM52 Criterion 1: Hours of exceedance)	Criterion B – Number of hours above 26°C threshold (22:00 – 7:00)
Bedroom 1 (Block A)	2.3	21
Kitchen/living (Block A)	2.8	-
Bedroom 2 (Block B)	0.6	15
Kitchen/living (Block B)	2.6	-

In kitchen/living spaces, direct solar gains and high internal gains from appliances sees Criterion A, reach 2.8% of hours above the comfort threshold, remaining within CIBSE TM59 limits. In the case sample bedrooms, Criterion A and Criterion B are met in both test cases.

Conclusion

Whilst dwellings avoid “high” risk of overheating and achieve regulatory compliance as defined within the Part L2A assessment, additional testing has been conducted following CIBSE's TM59 methodology in order to better understand the performance of each test room using dynamic simulation software and suggest the scheme currently performs well against the overheating metric.

Subsequent stages of design will look to further examine overheating risk to mitigate the effect of overheating on these spaces through the provision of additional opaque elements/external shading devices as well as internal solar control blinds.

Security and rain protection should also be considered in the design, enabling residents to leave their windows partially open overnight and during unoccupied hours as a further means of reducing overheating risk.

Analysis of the representative rooms suggests the provision of active cooling will be avoided due to passive design measures that form the basis of scheme. A natural ventilation strategy will mitigate overheating risk in both bedrooms and kitchen/living areas.

8 / *Appendix B*

Part L2 - BRUKL worksheets

Project name

Seven_Sisters_Part_L_Lean

As designed

Date: Mon Nov 14 08:18:17 2022

Administrative information

Building Details

Address: 341a Eade Rd, Harringay Warehouse District,
London, N15 6RD

Certifier details

Name:

Telephone number:

Address: , ,

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.c.0

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: v7.0.17

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

Foundation area [m²]: 315.11The 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	3.14
Building CO ₂ emission rate (BER), kgCO ₂ /m ² annum	2.3
Target primary energy rate (TPER), kWh/m ² annum	33.25
Building primary energy rate (BPER), kWh/m ² annum	24.45
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	0.1	0.26	SP000016_W1
Floors	0.18	0.2	1.09	SP000014_F_A0
Pitched roofs	0.16	-	-	No heat loss pitched roofs
Flat roofs	0.18	0.1	1.09	SP000062_C_A8
Windows** and roof windows	1.6	1.21	1.21	SP000071_W2_O0
Rooflights***	2.2	-	-	No external rooflights
Personnel doors^	1.6	1	1	SP00006B_W1_O0
Vehicle access & similar large doors	1.3	-	-	No external vehicle access doors
High usage entrance doors	3	-	-	No external high usage entrance doors

U_{a-Limit} = Limiting area-weighted average U-values [W/(m²K)]U_{i-Calc} = Calculated maximum individual element U-values [W/(m²K)]U_{a-Calc} = Calculated area-weighted average 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	3.12

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- Main system

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

1- SYST0000-DHW

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

Zone-level mechanical ventilation, exhaust, and terminal units

ID	System type in the Approved Documents
A	Local supply or extract ventilation units
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal balanced supply and extract ventilation system
E	Local balanced supply and extract ventilation units
F	Other local ventilation units
G	Fan assisted terminal variable air volume units
H	Fan coil units
I	Kitchen extract with the fan remote from the zone and a grease filter
NB: Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.	

Zone name	SFP [W/(l/s)]										HR efficiency	
	ID of system type	A	B	C	D	E	F	G	H	I	Zone	Standard
	Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1		
Bedroom		-	-	-	-	0.5	-	-	-	-	0.85	N/A
Toilet		0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom		-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom		-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom		-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom		-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom		-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom		-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bathroom		0.3	-	-	-	-	-	-	-	-	-	N/A
Circulation		0.3	-	-	-	-	-	-	-	-	-	N/A
Bathroom		0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom		-	-	-	-	0.5	-	-	-	-	0.85	N/A
Circulation		0.3	-	-	-	-	-	-	-	-	-	N/A
Bathroom		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
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Commercial	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Living	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Circulation	0.3	-	-	-	-	-	-	-	-	-	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Lobby	0.3	-	-	-	-	-	-	-	-	-	N/A
Lobby	0.3	-	-	-	-	-	-	-	-	-	N/A
Living	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Circulation	0.3	-	-	-	-	-	-	-	-	-	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Lobby	0.3	-	-	-	-	-	-	-	-	-	N/A
Circulation	0.3	-	-	-	-	-	-	-	-	-	N/A
Circulation	0.3	-	-	-	-	-	-	-	-	-	N/A
Living	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Commercial	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Circulation	0.3	-	-	-	-	-	-	-	-	-	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Circulation	0.3	-	-	-	-	-	-	-	-	-	N/A
Lobby	0.3	-	-	-	-	-	-	-	-	-	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	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
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Living	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Circulation	0.3	-	-	-	-	-	-	-	-	-	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Lobby	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Living	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Circulation	0.3	-	-	-	-	-	-	-	-	-	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Lobby	0.3	-	-	-	-	-	-	-	-	-	N/A
Living	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Living	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Toilet	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Circulation	0.3	-	-	-	-	-	-	-	-	-	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Circulation	0.3	-	-	-	-	-	-	-	-	-	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	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
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Lobby	0.3	-	-	-	-	-	-	-	-	-	N/A
Living	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Living	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Toilet	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Circulation	0.3	-	-	-	-	-	-	-	-	-	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Circulation	0.3	-	-	-	-	-	-	-	-	-	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Lobby	0.3	-	-	-	-	-	-	-	-	-	N/A
Living	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Living	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Toilet	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Circulation	0.3	-	-	-	-	-	-	-	-	-	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Circulation	0.3	-	-	-	-	-	-	-	-	-	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	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
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Lobby	0.3	-	-	-	-	-	-	-	-	-	N/A
Living	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Living	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Toilet	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Circulation	0.3	-	-	-	-	-	-	-	-	-	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Circulation	0.3	-	-	-	-	-	-	-	-	-	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Lobby	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Living	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Toilet	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Circulation	0.3	-	-	-	-	-	-	-	-	-	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Circulation	0.3	-	-	-	-	-	-	-	-	-	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	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
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Lobby	0.3	-	-	-	-	-	-	-	-	-	N/A
Workshop	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Workshop	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Living	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Living	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Living	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Living	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Living	-	-	-	-	0.5	-	-	-	-	0.85	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
Bedroom		114	-	-
Toilet		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bathroom		114	-	-
Circulation		114	-	-
Bathroom		114	-	-
Bedroom		114	-	-
Circulation		114	-	-
Bathroom		114	-	-
Bedroom		114	-	-
Bathroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Commercial		114	95	1.579
Bedroom		114	-	-
Bedroom		114	-	-
Bathroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Living		114	-	-
Circulation		114	-	-
Bathroom		114	-	-
Bedroom		114	-	-

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
Bedroom		114	-	-
Bedroom		114	-	-
Lobby		114	-	-
Lobby		114	-	-
Access		114	-	-
Living		114	-	-
Bedroom		114	-	-
Circulation		114	-	-
Bathroom		114	-	-
Bedroom		114	-	-
Bathroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Lobby		114	-	-
Circulation		114	-	-
Circulation		114	-	-
Living		114	-	-
Access		114	-	-
Commercial		114	95	1.579
Circulation		114	-	-
Bathroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Circulation		114	-	-
Access		114	-	-
Lobby		114	-	-
Bathroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bathroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Living		114	-	-
Circulation		114	-	-
Bathroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Lobby		114	-	-
Bedroom		114	-	-

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
Bedroom		114	-	-
Bathroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Living		114	-	-
Circulation		114	-	-
Bathroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Lobby		114	-	-
Living		114	-	-
Bedroom		114	-	-
Living		114	-	-
Toilet		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bathroom		114	-	-
Circulation		114	-	-
Bathroom		114	-	-
Bedroom		114	-	-
Circulation		114	-	-
Bathroom		114	-	-
Bedroom		114	-	-
Bathroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Lobby		114	-	-
Access		114	-	-
Living		114	-	-
Bedroom		114	-	-
Living		114	-	-
Toilet		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-

General lighting and display lighting		General luminaire		Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m ²]	
	Standard value	95	80	0.3	
Bedroom		114	-	-	
Bathroom		114	-	-	
Circulation		114	-	-	
Bathroom		114	-	-	
Bedroom		114	-	-	
Circulation		114	-	-	
Bathroom		114	-	-	
Bedroom		114	-	-	
Bathroom		114	-	-	
Bedroom		114	-	-	
Bedroom		114	-	-	
Bedroom		114	-	-	
Lobby		114	-	-	
Access		114	-	-	
Living		114	-	-	
Bedroom		114	-	-	
Living		114	-	-	
Toilet		114	-	-	
Bedroom		114	-	-	
Bedroom		114	-	-	
Bedroom		114	-	-	
Bedroom		114	-	-	
Bedroom		114	-	-	
Bedroom		114	-	-	
Bathroom		114	-	-	
Circulation		114	-	-	
Bathroom		114	-	-	
Bedroom		114	-	-	
Circulation		114	-	-	
Bathroom		114	-	-	
Bedroom		114	-	-	
Bathroom		114	-	-	
Bedroom		114	-	-	
Bedroom		114	-	-	
Bedroom		114	-	-	
Lobby		114	-	-	
Access		114	-	-	
Living		114	-	-	
Bedroom		114	-	-	
Living		114	-	-	
Toilet		114	-	-	
Bedroom		114	-	-	
Bedroom		114	-	-	

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
Bedroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bathroom		114	-	-
Circulation		114	-	-
Bathroom		114	-	-
Bedroom		114	-	-
Circulation		114	-	-
Bathroom		114	-	-
Bedroom		114	-	-
Bathroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Lobby		114	-	-
Access		114	-	-
Bedroom		114	-	-
Living		114	-	-
Toilet		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bathroom		114	-	-
Circulation		114	-	-
Bathroom		114	-	-
Bedroom		114	-	-
Circulation		114	-	-
Bathroom		114	-	-
Bedroom		114	-	-
Bathroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Lobby		114	-	-
Access		114	-	-
Workshop		114	-	-
Workshop		114	-	-
Living		114	-	-
Living		114	-	-

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
Living		114	-	-
Living		114	-	-
Living		114	-	-

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?
Bedroom	NO (-71.6%)	NO
Bedroom	NO (-49%)	NO
Bedroom	NO (-17.5%)	NO
Bedroom	NO (-16.1%)	NO
Bedroom	NO (-17.9%)	NO
Bedroom	NO (-15.7%)	NO
Bedroom	NO (-16.1%)	NO
Bedroom	NO (-59.3%)	NO
Bedroom	NO (-44.2%)	NO
Bedroom	NO (-31%)	NO
Bedroom	NO (-33.1%)	NO
Bedroom	NO (-28.2%)	NO
Commercial	NO (-43.6%)	NO
Bedroom	NO (-69.3%)	NO
Bedroom	NO (-33.5%)	NO
Bedroom	NO (-16.3%)	NO
Bedroom	NO (-50.3%)	NO
Living	NO (-6.9%)	NO
Bedroom	NO (-53.5%)	NO
Bedroom	NO (-54.9%)	NO
Bedroom	NO (-45.9%)	NO
Living	NO (-30.5%)	NO
Bedroom	NO (-59.3%)	NO
Bedroom	NO (-44.2%)	NO
Bedroom	NO (-31%)	NO
Bedroom	NO (-33.1%)	NO
Bedroom	NO (-28.2%)	NO
Living	NO (-17.6%)	NO
Commercial	NO (-82.3%)	NO
Bedroom	NO (-28.3%)	NO
Bedroom	NO (-28%)	NO
Bedroom	NO (-57.2%)	NO
Bedroom	NO (-26%)	NO
Bedroom	NO (-69.3%)	NO
Bedroom	NO (-33.5%)	NO
Bedroom	NO (-16.3%)	NO
Bedroom	NO (-50.3%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Living	NO (-6.9%)	NO
Bedroom	NO (-53.5%)	NO
Bedroom	NO (-54.9%)	NO
Bedroom	NO (-45.9%)	NO
Bedroom	NO (-69.3%)	NO
Bedroom	NO (-33.5%)	NO
Bedroom	NO (-16.3%)	NO
Bedroom	NO (-50.3%)	NO
Living	NO (-6.9%)	NO
Bedroom	NO (-53.5%)	NO
Bedroom	NO (-54.9%)	NO
Bedroom	NO (-45.9%)	NO
Living	NO (-10%)	NO
Bedroom	NO (-70.3%)	NO
Living	YES (+25.3%)	NO
Bedroom	NO (-46.6%)	NO
Bedroom	NO (-13.6%)	NO
Bedroom	NO (-12.1%)	NO
Bedroom	NO (-14%)	NO
Bedroom	NO (-11.7%)	NO
Bedroom	NO (-12.1%)	NO
Bedroom	NO (-57.4%)	NO
Bedroom	NO (-41.6%)	NO
Bedroom	NO (-27.7%)	NO
Bedroom	NO (-29.9%)	NO
Bedroom	NO (-24.7%)	NO
Living	NO (-10%)	NO
Bedroom	NO (-70.3%)	NO
Living	YES (+9.6%)	NO
Bedroom	NO (-46.6%)	NO
Bedroom	NO (-13.6%)	NO
Bedroom	NO (-12.1%)	NO
Bedroom	NO (-14%)	NO
Bedroom	NO (-11.7%)	NO
Bedroom	NO (-12.1%)	NO
Bedroom	NO (-57.4%)	NO
Bedroom	NO (-41.6%)	NO
Bedroom	NO (-27.7%)	NO
Bedroom	NO (-29.9%)	NO
Bedroom	NO (-24.7%)	NO
Living	NO (-10%)	NO
Bedroom	NO (-70.3%)	NO
Living	YES (+25.3%)	NO
Bedroom	NO (-46.6%)	NO
Bedroom	NO (-13.6%)	NO
Bedroom	NO (-12.1%)	NO
Bedroom	NO (-14%)	NO
Bedroom	NO (-11.7%)	NO
Bedroom	NO (-12.1%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Bedroom	NO (-57.4%)	NO
Bedroom	NO (-41.6%)	NO
Bedroom	NO (-27.7%)	NO
Bedroom	NO (-29.9%)	NO
Bedroom	NO (-24.7%)	NO
Living	NO (-10%)	NO
Bedroom	NO (-70.3%)	NO
Living	YES (+9.6%)	NO
Bedroom	NO (-46.6%)	NO
Bedroom	NO (-13.6%)	NO
Bedroom	NO (-12.1%)	NO
Bedroom	NO (-14%)	NO
Bedroom	NO (-11.7%)	NO
Bedroom	NO (-12.1%)	NO
Bedroom	NO (-57.4%)	NO
Bedroom	NO (-41.6%)	NO
Bedroom	NO (-27.7%)	NO
Bedroom	NO (-29.9%)	NO
Bedroom	NO (-24.7%)	NO
Bedroom	NO (-70.3%)	NO
Living	YES (+25.3%)	NO
Bedroom	NO (-46.6%)	NO
Bedroom	NO (-13.6%)	NO
Bedroom	NO (-12.1%)	NO
Bedroom	NO (-14%)	NO
Bedroom	NO (-11.7%)	NO
Bedroom	NO (-12.1%)	NO
Bedroom	NO (-57.4%)	NO
Bedroom	NO (-41.6%)	NO
Bedroom	NO (-27.7%)	NO
Bedroom	NO (-29.9%)	NO
Bedroom	NO (-24.7%)	NO
Workshop	NO (-54.5%)	NO
Workshop	YES (+16.6%)	NO
Living	NO (-10%)	NO
Living	YES (+75.8%)	NO
Living	N/A	N/A
Living	NO (-74.6%)	NO
Living	YES (+9.1%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m ²]	3100	3100
External area [m ²]	5284.7	5284.7
Weather	LON	LON
Infiltration [m ³ /hm ² @ 50Pa]	3	3
Average conductance [W/K]	1497.76	2357.85
Average U-value [W/m ² K]	0.28	0.45
Alpha value* [%]	30.14	18.62

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

Building Use

% Area	Building Type
5	Retail/Financial and Professional Services
	Restaurants and Cafes/Drinking Establishments/Takeaways
5	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
90	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	3.64	6.96
Cooling	0	0
Auxiliary	2.09	2.67
Lighting	5.85	6.98
Hot water	4.79	5.57
Equipment*	24.78	24.78
TOTAL **	16.37	22.19

* 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]	112.23	127.27
Primary energy [kWh/m ²]	24.45	33.25
Total emissions [kg/m ²]	2.3	3.14

HVAC Systems Performance

System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Central heating using water: floor heating, [HS] ASHP, [HFT] Electricity, [CFT] Electricity									
Actual	30.8	81.4	3.6	0	2.1	2.35	0	2.5	0
Notional	66.2	61.1	7	0	2.3	2.64	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

Seven_Sisters_Part_L_Green

As designed

Date: Mon Nov 14 08:21:25 2022

Administrative information

Building Details

Address: 341a Eade Rd, Harringay Warehouse District,
London, N15 6RD

Certifier details

Name:

Telephone number:

Address: , ,

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.c.0

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: v7.0.17

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

Foundation area [m²]: 315.11The 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	3.14
Building CO ₂ emission rate (BER), kgCO ₂ /m ² annum	1.48
Target primary energy rate (TPER), kWh/m ² annum	33.25
Building primary energy rate (BPER), kWh/m ² annum	15.6
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	0.1	0.26	SP000016_W1
Floors	0.18	0.2	1.09	SP000014_F_A0
Pitched roofs	0.16	-	-	No heat loss pitched roofs
Flat roofs	0.18	0.1	1.09	SP000062_C_A8
Windows** and roof windows	1.6	1.21	1.21	SP000071_W2_O0
Rooflights***	2.2	-	-	No external rooflights
Personnel doors^	1.6	1	1	SP00006B_W1_O0
Vehicle access & similar large doors	1.3	-	-	No external vehicle access doors
High usage entrance doors	3	-	-	No external high usage entrance doors

U_{a-Limit} = Limiting area-weighted average U-values [W/(m²K)]U_{i-Calc} = Calculated maximum individual element U-values [W/(m²K)]U_{a-Calc} = Calculated area-weighted average 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	3.12

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- Main system

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.7	-	-	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

1- SYST0000-DHW

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

Zone-level mechanical ventilation, exhaust, and terminal units

ID	System type in the Approved Documents
A	Local supply or extract ventilation units
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal balanced supply and extract ventilation system
E	Local balanced supply and extract ventilation units
F	Other local ventilation units
G	Fan assisted terminal variable air volume units
H	Fan coil units
I	Kitchen extract with the fan remote from the zone and a grease filter
NB: Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.	

Zone name	SFP [W/(l/s)]										HR efficiency	
	ID of system type	A	B	C	D	E	F	G	H	I	Zone	Standard
	Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1		
Bedroom		-	-	-	-	0.5	-	-	-	-	0.85	N/A
Toilet		0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom		-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom		-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom		-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom		-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom		-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom		-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bathroom		0.3	-	-	-	-	-	-	-	-	-	N/A
Circulation		0.3	-	-	-	-	-	-	-	-	-	N/A
Bathroom		0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom		-	-	-	-	0.5	-	-	-	-	0.85	N/A
Circulation		0.3	-	-	-	-	-	-	-	-	-	N/A
Bathroom		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
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Commercial	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Living	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Circulation	0.3	-	-	-	-	-	-	-	-	-	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Lobby	0.3	-	-	-	-	-	-	-	-	-	N/A
Lobby	0.3	-	-	-	-	-	-	-	-	-	N/A
Living	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Circulation	0.3	-	-	-	-	-	-	-	-	-	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Lobby	0.3	-	-	-	-	-	-	-	-	-	N/A
Circulation	0.3	-	-	-	-	-	-	-	-	-	N/A
Circulation	0.3	-	-	-	-	-	-	-	-	-	N/A
Living	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Commercial	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Circulation	0.3	-	-	-	-	-	-	-	-	-	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Circulation	0.3	-	-	-	-	-	-	-	-	-	N/A
Lobby	0.3	-	-	-	-	-	-	-	-	-	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	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
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Living	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Circulation	0.3	-	-	-	-	-	-	-	-	-	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Lobby	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Living	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Circulation	0.3	-	-	-	-	-	-	-	-	-	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Lobby	0.3	-	-	-	-	-	-	-	-	-	N/A
Living	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Living	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Toilet	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Circulation	0.3	-	-	-	-	-	-	-	-	-	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Circulation	0.3	-	-	-	-	-	-	-	-	-	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	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
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Lobby	0.3	-	-	-	-	-	-	-	-	-	N/A
Living	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Living	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Toilet	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Circulation	0.3	-	-	-	-	-	-	-	-	-	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Circulation	0.3	-	-	-	-	-	-	-	-	-	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Lobby	0.3	-	-	-	-	-	-	-	-	-	N/A
Living	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Living	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Toilet	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Circulation	0.3	-	-	-	-	-	-	-	-	-	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Circulation	0.3	-	-	-	-	-	-	-	-	-	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	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
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Lobby	0.3	-	-	-	-	-	-	-	-	-	N/A
Living	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Living	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Toilet	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Circulation	0.3	-	-	-	-	-	-	-	-	-	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Circulation	0.3	-	-	-	-	-	-	-	-	-	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Lobby	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Living	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Toilet	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Circulation	0.3	-	-	-	-	-	-	-	-	-	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Circulation	0.3	-	-	-	-	-	-	-	-	-	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A
Bathroom	0.3	-	-	-	-	-	-	-	-	-	N/A
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	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	
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A	
Bedroom	-	-	-	-	0.5	-	-	-	-	0.85	N/A	
Lobby	0.3	-	-	-	-	-	-	-	-	-	N/A	
Workshop	-	-	-	-	0.5	-	-	-	-	0.85	N/A	
Workshop	-	-	-	-	0.5	-	-	-	-	0.85	N/A	
Living	-	-	-	-	0.5	-	-	-	-	0.85	N/A	
Living	-	-	-	-	0.5	-	-	-	-	0.85	N/A	
Living	-	-	-	-	0.5	-	-	-	-	0.85	N/A	
Living	-	-	-	-	0.5	-	-	-	-	0.85	N/A	
Living	-	-	-	-	0.5	-	-	-	-	0.85	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
Bedroom		114	-	-
Toilet		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bathroom		114	-	-
Circulation		114	-	-
Bathroom		114	-	-
Bedroom		114	-	-
Circulation		114	-	-
Bathroom		114	-	-
Bedroom		114	-	-
Bathroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Commercial		114	95	1.579
Bedroom		114	-	-
Bedroom		114	-	-
Bathroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Living		114	-	-
Circulation		114	-	-
Bathroom		114	-	-
Bedroom		114	-	-

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
Bedroom		114	-	-
Bedroom		114	-	-
Lobby		114	-	-
Lobby		114	-	-
Access		114	-	-
Living		114	-	-
Bedroom		114	-	-
Circulation		114	-	-
Bathroom		114	-	-
Bedroom		114	-	-
Bathroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Lobby		114	-	-
Circulation		114	-	-
Circulation		114	-	-
Living		114	-	-
Access		114	-	-
Commercial		114	95	1.579
Circulation		114	-	-
Bathroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Circulation		114	-	-
Access		114	-	-
Lobby		114	-	-
Bathroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bathroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Living		114	-	-
Circulation		114	-	-
Bathroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Lobby		114	-	-
Bedroom		114	-	-

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
Bedroom		114	-	-
Bathroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Living		114	-	-
Circulation		114	-	-
Bathroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Lobby		114	-	-
Living		114	-	-
Bedroom		114	-	-
Living		114	-	-
Toilet		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bathroom		114	-	-
Circulation		114	-	-
Bathroom		114	-	-
Bedroom		114	-	-
Circulation		114	-	-
Bathroom		114	-	-
Bedroom		114	-	-
Bathroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Lobby		114	-	-
Access		114	-	-
Living		114	-	-
Bedroom		114	-	-
Living		114	-	-
Toilet		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-

General lighting and display lighting		General luminaire		Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m ²]	
	Standard value	95	80	0.3	
Bedroom		114	-	-	
Bathroom		114	-	-	
Circulation		114	-	-	
Bathroom		114	-	-	
Bedroom		114	-	-	
Circulation		114	-	-	
Bathroom		114	-	-	
Bedroom		114	-	-	
Bathroom		114	-	-	
Bedroom		114	-	-	
Bedroom		114	-	-	
Bedroom		114	-	-	
Lobby		114	-	-	
Access		114	-	-	
Living		114	-	-	
Bedroom		114	-	-	
Living		114	-	-	
Toilet		114	-	-	
Bedroom		114	-	-	
Bedroom		114	-	-	
Bedroom		114	-	-	
Bedroom		114	-	-	
Bedroom		114	-	-	
Bedroom		114	-	-	
Bathroom		114	-	-	
Circulation		114	-	-	
Bathroom		114	-	-	
Bedroom		114	-	-	
Circulation		114	-	-	
Bathroom		114	-	-	
Bedroom		114	-	-	
Bathroom		114	-	-	
Bedroom		114	-	-	
Bedroom		114	-	-	
Bedroom		114	-	-	
Lobby		114	-	-	
Access		114	-	-	
Living		114	-	-	
Bedroom		114	-	-	
Living		114	-	-	
Toilet		114	-	-	
Bedroom		114	-	-	
Bedroom		114	-	-	

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
Bedroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bathroom		114	-	-
Circulation		114	-	-
Bathroom		114	-	-
Bedroom		114	-	-
Circulation		114	-	-
Bathroom		114	-	-
Bedroom		114	-	-
Bathroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Lobby		114	-	-
Access		114	-	-
Bedroom		114	-	-
Living		114	-	-
Toilet		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bathroom		114	-	-
Circulation		114	-	-
Bathroom		114	-	-
Bedroom		114	-	-
Circulation		114	-	-
Bathroom		114	-	-
Bedroom		114	-	-
Bathroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Bedroom		114	-	-
Lobby		114	-	-
Access		114	-	-
Workshop		114	-	-
Workshop		114	-	-
Living		114	-	-
Living		114	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m ²]
	Standard value	95	80	0.3
Living		114	-	-
Living		114	-	-
Living		114	-	-

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?
Bedroom	NO (-71.6%)	NO
Bedroom	NO (-49%)	NO
Bedroom	NO (-17.5%)	NO
Bedroom	NO (-16.1%)	NO
Bedroom	NO (-17.9%)	NO
Bedroom	NO (-15.7%)	NO
Bedroom	NO (-16.1%)	NO
Bedroom	NO (-59.3%)	NO
Bedroom	NO (-44.2%)	NO
Bedroom	NO (-31%)	NO
Bedroom	NO (-33.1%)	NO
Bedroom	NO (-28.2%)	NO
Commercial	NO (-43.6%)	NO
Bedroom	NO (-69.3%)	NO
Bedroom	NO (-33.5%)	NO
Bedroom	NO (-16.3%)	NO
Bedroom	NO (-50.3%)	NO
Living	NO (-6.9%)	NO
Bedroom	NO (-53.5%)	NO
Bedroom	NO (-54.9%)	NO
Bedroom	NO (-45.9%)	NO
Living	NO (-30.5%)	NO
Bedroom	NO (-59.3%)	NO
Bedroom	NO (-44.2%)	NO
Bedroom	NO (-31%)	NO
Bedroom	NO (-33.1%)	NO
Bedroom	NO (-28.2%)	NO
Living	NO (-17.6%)	NO
Commercial	NO (-82.3%)	NO
Bedroom	NO (-28.3%)	NO
Bedroom	NO (-28%)	NO
Bedroom	NO (-57.2%)	NO
Bedroom	NO (-26%)	NO
Bedroom	NO (-69.3%)	NO
Bedroom	NO (-33.5%)	NO
Bedroom	NO (-16.3%)	NO
Bedroom	NO (-50.3%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Living	NO (-6.9%)	NO
Bedroom	NO (-53.5%)	NO
Bedroom	NO (-54.9%)	NO
Bedroom	NO (-45.9%)	NO
Bedroom	NO (-69.3%)	NO
Bedroom	NO (-33.5%)	NO
Bedroom	NO (-16.3%)	NO
Bedroom	NO (-50.3%)	NO
Living	NO (-6.9%)	NO
Bedroom	NO (-53.5%)	NO
Bedroom	NO (-54.9%)	NO
Bedroom	NO (-45.9%)	NO
Living	NO (-10%)	NO
Bedroom	NO (-70.3%)	NO
Living	YES (+25.3%)	NO
Bedroom	NO (-46.6%)	NO
Bedroom	NO (-13.6%)	NO
Bedroom	NO (-12.1%)	NO
Bedroom	NO (-14%)	NO
Bedroom	NO (-11.7%)	NO
Bedroom	NO (-12.1%)	NO
Bedroom	NO (-57.4%)	NO
Bedroom	NO (-41.6%)	NO
Bedroom	NO (-27.7%)	NO
Bedroom	NO (-29.9%)	NO
Bedroom	NO (-24.7%)	NO
Living	NO (-10%)	NO
Bedroom	NO (-70.3%)	NO
Living	YES (+9.6%)	NO
Bedroom	NO (-46.6%)	NO
Bedroom	NO (-13.6%)	NO
Bedroom	NO (-12.1%)	NO
Bedroom	NO (-14%)	NO
Bedroom	NO (-11.7%)	NO
Bedroom	NO (-12.1%)	NO
Bedroom	NO (-57.4%)	NO
Bedroom	NO (-41.6%)	NO
Bedroom	NO (-27.7%)	NO
Bedroom	NO (-29.9%)	NO
Bedroom	NO (-24.7%)	NO
Living	NO (-10%)	NO
Bedroom	NO (-70.3%)	NO
Living	YES (+25.3%)	NO
Bedroom	NO (-46.6%)	NO
Bedroom	NO (-13.6%)	NO
Bedroom	NO (-12.1%)	NO
Bedroom	NO (-14%)	NO
Bedroom	NO (-11.7%)	NO
Bedroom	NO (-12.1%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Bedroom	NO (-57.4%)	NO
Bedroom	NO (-41.6%)	NO
Bedroom	NO (-27.7%)	NO
Bedroom	NO (-29.9%)	NO
Bedroom	NO (-24.7%)	NO
Living	NO (-10%)	NO
Bedroom	NO (-70.3%)	NO
Living	YES (+9.6%)	NO
Bedroom	NO (-46.6%)	NO
Bedroom	NO (-13.6%)	NO
Bedroom	NO (-12.1%)	NO
Bedroom	NO (-14%)	NO
Bedroom	NO (-11.7%)	NO
Bedroom	NO (-12.1%)	NO
Bedroom	NO (-57.4%)	NO
Bedroom	NO (-41.6%)	NO
Bedroom	NO (-27.7%)	NO
Bedroom	NO (-29.9%)	NO
Bedroom	NO (-24.7%)	NO
Bedroom	NO (-70.3%)	NO
Living	YES (+25.3%)	NO
Bedroom	NO (-46.6%)	NO
Bedroom	NO (-13.6%)	NO
Bedroom	NO (-12.1%)	NO
Bedroom	NO (-14%)	NO
Bedroom	NO (-11.7%)	NO
Bedroom	NO (-12.1%)	NO
Bedroom	NO (-57.4%)	NO
Bedroom	NO (-41.6%)	NO
Bedroom	NO (-27.7%)	NO
Bedroom	NO (-29.9%)	NO
Bedroom	NO (-24.7%)	NO
Workshop	NO (-54.5%)	NO
Workshop	YES (+16.6%)	NO
Living	NO (-10%)	NO
Living	YES (+75.8%)	NO
Living	N/A	N/A
Living	NO (-74.6%)	NO
Living	YES (+9.1%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m ²]	3100	3100
External area [m ²]	5284.7	5284.7
Weather	LON	LON
Infiltration [m ³ /hm ² @ 50Pa]	3	3
Average conductance [W/K]	1497.76	2357.85
Average U-value [W/m ² K]	0.28	0.45
Alpha value* [%]	30.14	18.62

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

Building Use

% Area	Building Type
5	Retail/Financial and Professional Services
	Restaurants and Cafes/Drinking Establishments/Takeaways
5	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
90	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	1.94	6.96
Cooling	0	0
Auxiliary	2.09	2.67
Lighting	5.85	6.98
Hot water	2.55	5.57
Equipment*	24.78	24.78
TOTAL **	12.42	22.19

* 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	1.98	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
<i>Displaced electricity</i>	<i>1.98</i>	<i>0</i>

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	112.23	127.27
Primary energy [kWh/m ²]	15.6	33.25
Total emissions [kg/m ²]	1.48	3.14

HVAC Systems Performance

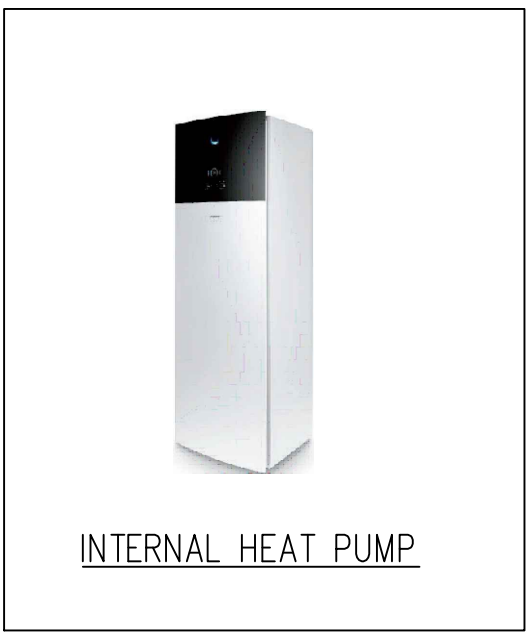
System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Central heating using water: floor heating, [HS] ASHP, [HFT] Electricity, [CFT] Electricity									
Actual	30.8	81.4	1.9	0	2.1	4.42	0	4.7	0
Notional	66.2	61.1	7	0	2.3	2.64	0	----	----

Key to terms

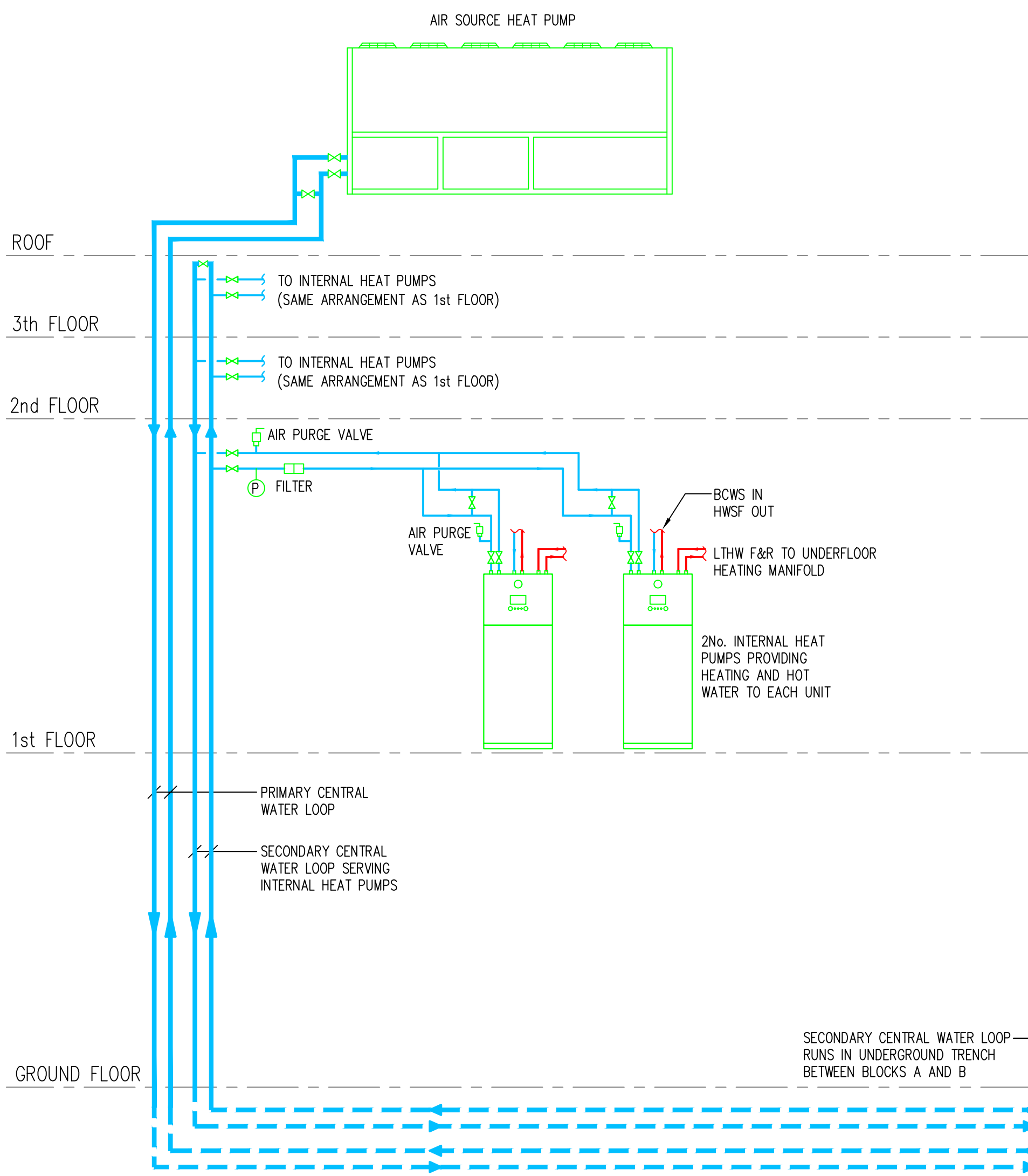
Heat dem [MJ/m2]	= Heating energy demand
Cool dem [MJ/m2]	= Cooling energy demand
Heat con [kWh/m2]	= Heating energy consumption
Cool con [kWh/m2]	= Cooling energy consumption
Aux con [kWh/m2]	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency (for notional building, value 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



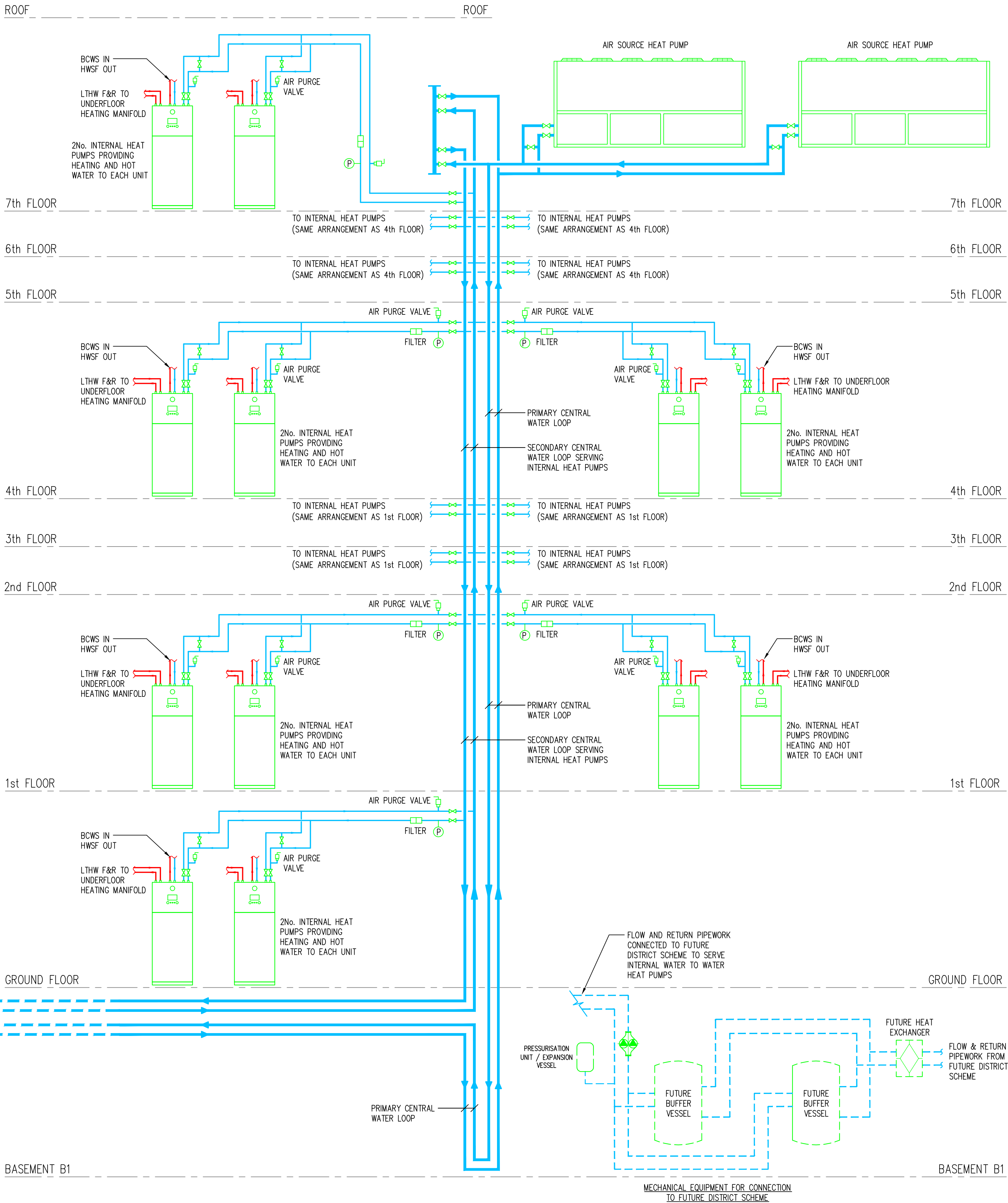
EXTERNAL AIR SOURCE HEAT PUMP



INTERNAL HEAT PUMP



BLOCK B



BLOCK A

PROJECT NOTES

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SCHEMATIC

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Project No: P21387	Drawing No: M400	Rev: P1
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Status:
PRELIMINARY

9 / *Appendix C*

Plant room layout

10 / *Appendix D*

GLA Carbon emissions reporting spreadsheet



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