Energy Strategy and Sustainability Statement

19 Charterhouse Street

19CS-SWE-XX-XX-RP-SU-000001

Contents

Revisions & Author Details

Revision no.	Date	Reason for issue	Author	Checked/Approved By	Date Approved
P03	09/04/2025	Issued for Planning	Monika Potomska	Asma Mohd Hamid	09/04/2025

1. Executive Summary

1.1 Energy & Sustainability Summary

This Energy & Sustainability Statement has been prepared on behalf of Farrview Limited (the 'Applicant') by Sweco UK for the remodelling, refurbishment and extension of 19 Charterhouse Street, London, EC1N 6RA ('the Proposed Development') in the London Borough of Camden (LBC).

The sustainability aspiration for the Proposed Development is to deliver a showcase project for sustainable refurbishment in LBC that reimagines and revitalises the existing building into a modern, futureproofed sustainable development. Maximising opportunities to retain existing structure are at the heart of the proposals, focusing on using less material in construction to deliver low carbon outcomes.

The Proposed Development will need to conform to the requirements set out in Approved Document **Part L Volume 2 (Conservation of Fuel, and Power) of the Building Regulations 2021**, and thus submit an energy assessment for the purposes of the planning application. The methodology of carrying out, and reporting predicted energy consumption, and associated carbon emissions are outlined in the Mayor's Energy Hierarchy as detailed in the Energy Assessment Guidance (June 2022).

Following the energy and carbon evaluation, it is proposed that practical energy efficiency measures along with low, and zero carbon (LZC) applications are incorporated into the design for the Proposed Development. In order to achieve this, a full façade replacement to modern high energy efficiency standards is proposed across all elevations, along with replacement and upgrade of the building services systems. The Sustainability Statement in Section 11 provides details of the overall sustainability strategy for the Proposed Development and the key features to support LBC policy requirements. The following metrics are demonstrably achieved through this report at application stage:

Application Stage achieved and targets:

- Building Regulations Part L 2021 overall site-wide carbon emissions reductions of **31%** over Part L 2021 baseline.
- Building Regulations Part L 2021 site-wide carbon emissions reductions of **8%** at 'Be Green' stage of the Energy Hierarchy.
- Building Regulations Part L 2021 site-wide carbon emissions reductions of **23%** at 'Be Lean' stage of the Energy Hierarchy.
- 70% of existing materials retained insitu, focusing on structural materials.
- An upfront embodied carbon of **907 kgCO_2e/m^2 GIA (A1-A5)** (with reported values including early-stage contingency of **+27 kgCO_2e/m^2 GIA (A1-A5).**
- 100% electric HVAC building services solution and utilising PV installation at roof level.
- Base-build operational Energy Use Intensity (EUI) of **78.93 kWh/m^2/year (GIA)**
- The Proposed Development provides additional planting across roofs and terraces, significantly improving site greening and biodiversity.
- Target of minimum BREEAM Excellent (target score of 80.89%) with aspiration for Outstanding (target score of 90.27%).
- Blue roof system is proposed at all roofs and terraces to attenuate and control surface water runoff.
- Intensive green roof or vegetation over structure alongside green walls and trees contributing to an Urban Greening Factor (UGF) of 0.3.
- Significant improvements to sustainable transport facilities with cycle spaces and showers.
- Target 95% diversion from landfill for demolition and construction waste.
- Explore opportunities for reuse of demolition materials.

The energy assessment has been carried out using the adopted methodology outlined in the "Energy Planning: Greater London Authority (GLA) guidance on preparing energy assessments" June 2022 and "The London Plan (2021)".

The concept of applying the Energy Hierarchy in relation to Part L 2021 of the Building Regulations is demonstrated in this report. The combination of contextual and practical passive design measures (informed by survey, investigation, and consultation), energy-efficient plant selection, and the heat-pump-led design result in an overall annual carbon reduction of **31%** relative to the current 2021 Part L2 target emission rate (TER) for the building.

The results align with the GLA's released cover note (15th June 2022) regarding the recent update to Part L, in which they have acknowledged the increased difficulty with achieving the improvement targets.

"Initially, non-residential developments may find it more challenging to achieve significant on-site carbon reductions beyond Part L 2021 to meet both the energy efficiency target and the minimum 35% improvement. This is because the new Part L baseline now includes low carbon heating for non-residential developments but not for residential developments."

GLA expects the performance against Part L 2021 to improve over time to enable developments achieve the energy efficiency targets and the minimum 35% on-site improvement with continuously improving technology and as costs come down. It was also positioned that these benchmarks may be updated in the future, but designers should continue to maximise on-site carbon reductions as far as possible.

LBC policy has been referenced throughout, with particular attention to the Camden Local Plan (2017) and the Energy Efficiency & Adaptability CPG (2021); Section 3.5 of this report provides guidance on how the relevant sections of this document comply with policy. Consideration has also been given to the sustainability content within the Regulation 18 Draft (Consultation Version) of the New Camden Local Plan (January 2024), although as a consultation draft it is recognised that this policy document carries limited weight at this time.

1.2 Non-Domestic Operational CO_2 Emissions

The following tables demonstrate compliance with the energy hierarchy, and the carbon targets proposed by the GLA. The carbon dioxide emissions savings shown in the tables below are matching the BRUKL outputs enclosed in Appendix A.

Part L2 2021 (SAP 10.2)

Table 1.2-1 Reported CO2 emissions for the Proposed Development after each stage of the Energy Hierarchy for Non-Domestic Buildings

Energy Planning – Greater London Authority guidance on preparing energy assessment	**Carbon Dioxide Emissions (Tonnes CO_2 per Annum)**		
	Regulated Energy	**Total CO_2 Reductions**	**Regulated Energy % Reduction**
Building Regulations 2021 Part L Compliant Development	61.8	-	-
LEAN - After energy demand reduction	47.4	14.4	23%
CLEAN – After Clean Technology	47.4	0.0	0%
GREEN - After Renewable Energy	42.4	5.0	8%

Table 1.2-2 Reported CO2 emissions savings for the Proposed Development after each stage of the Energy Hierarchy for Non-Domestic Buildings

Non-domestic areas (Part L 2021)	**Regulated Carbon Dioxide Savings**	
	(Tonnes CO_2 per annum)	**(%)**
Savings from reduced energy demand	14.4	23%
Savings from Clean Technology	0.0	0%
Savings from renewable energy	5.0	8%
Total Cumulative Savings	19.4	31%
Total Target Savings - GLA's Target	42.4	-

1.3 Carbon Offsetting

Along with the Part L 2021 release, an updated GLA Energy Assessment Guidance was issued in June 2022. This requires results to be reported using the SAP10.2 carbon factors, which considers further decarbonisation of the grid from the SAP10 factors previously used in conjunction with Part L 2013. Thus, SAP10.2 provides a more realistic carbon emissions estimation.

The carbon offset payment of the shortfall in regulated carbon emissions is outlined in this section as per SAP 10.2 Carbon factors for:

Non-domestic areas to achieve net zero for regulated carbon emissions.

Table 1.3-1 Shortfall in regulated carbon dioxide savings – SAP 10.2

	Annual Shortfall Tonnes CO2 (Regulated)	**Off-set Payment per tonne for 30 years (£95 x 30 years)**	**Total Offset payment for Tonnes CO2 Emissions (Regulated)**
Shortfall	1,273	£2,850	£ 120,929

The carbon charge has been calculated as per The London Plan (2021) as well as LBC's CPG (Chapter 7) which aligns the price per tonne of carbon with the GLA's pricing strategy: the rate of £95 per tonne of CO2 per year (or £2,850 over a period of 30 years (95 x 30 years)).

For more details, refer to the GLA spreadsheet summary in Appendix B.

2. Introduction

2.1. Purpose Statement

This report describes the various options for energy, and carbon reduction, and contains a sustainability strategy for the Proposed Development. As part of this document the energy and carbon performance of the Proposed Development is assessed against local and national planning policy requirements as described in Section 3 of this report.

The energy and carbon figures presented in this report are calculated for the purpose of initial estimates only, using the preliminary information currently available at the time of application. Hence whilst they can be used to gain an understanding of the benefits of each technology, they must not be taken out of context; establishing the best economic, and energy-efficient operation will require more complex analysis of building projected load profiles when these are developed.

2.2. Development Description

The building currently comprises a dual use of office and educational use, with the latter reverting to office use on the departure of the London College of Accountancy (LCA).

The existing MEP services include gas boilers located in the basement, with the entire building being served by centralised air handling units (AHUs). The lighting is limited to LED fixtures, and there are currently no photovoltaic (PV) systems in place. Additionally, the ductwork is leaky and inefficient, leading to significant energy losses and reduced overall system performance.

The surrounding area is largely characterised by medium and high buildings and provides a mix of uses, although predominantly comprising retail, office and residential land uses. The jewellery quarter of Hatton Garden lies to the north-west of the site and the adjacent General and Poultry Markets of West Smithfield are being adapted by the London Museum to become their new home.

The description of the proposed development is provided as follows:

"Remodelling, refurbishment and extension of the existing building to provide Use Class E (commercial, retail/restaurant and jewellery workspace), landscaped amenity terraces, balconies, relocated entrances, commuter facilities, on-site loading bay and plant; and other associated works."

Table 2.2-1 Table to describe, the extent of demolition and retention of the existing building as well as key design proposals for the Proposed Development

Building Element	Key Interventions and Proposals
Structure	Retain majority of existing structural elements, rationalizing three cores into one efficient core. Roof extension necessitates new structural slabs for floors 5 to 10, internal rolled steel columns, and reinforced concrete walls. Retained Elements: • Piles: 100% • Foundations: 99% • Columns: 79% • Beams: 70% • Slabs: 49% • Concrete Walls: 30%
Roof	Spacious upper-level terraces and green bridges on lower levels. Diverse planting and landscaping inspired by cloister gardens. Lantern structure integrated into landscaping proposal.
Stairs	New staircases in the new cores, modifications to existing ones. Core staircases extended from 5th to 10th floor, new mezzanine staircase on 9th floor. Precast concrete for stairs, steel for plant stairs.
Facades & External Doors	Full façade replacement with three typologies: • Top: Light, elegant materials, intricate double zigzag profile. • Middle: Stone facing with potential prefabricated limestone, angular inflections, detailed metal glazing infills. • Base: Textured raw concrete or stone. Double glazing for energy efficiency and thermal insulation.
Internal Walls & Doors	Full replacement to suit revised layout, using blockwork and plasterboard partitions.
Finishes & FF&E	High standards and aesthetic requirements to be developed later. Limited information on internal finishes; simple basis of design provided by architect DSDHA.
Building Services	• 100% electric HVAC for decarbonisation. • Roof mounted VPs. • On-floor AHUs with integrated heat pumps for underfloor displacement ventilation. • Perimeter fan coil units with hybrid VRF system, condensers in plant enclosure at L09. • Full lift replacement, passenger lifts serving lower ground to 10th floor, dedicated goods lift, firefighter's lift.
External Works	Extensive landscaping and public realm improvements within the ownership boundary, including seating and greening.

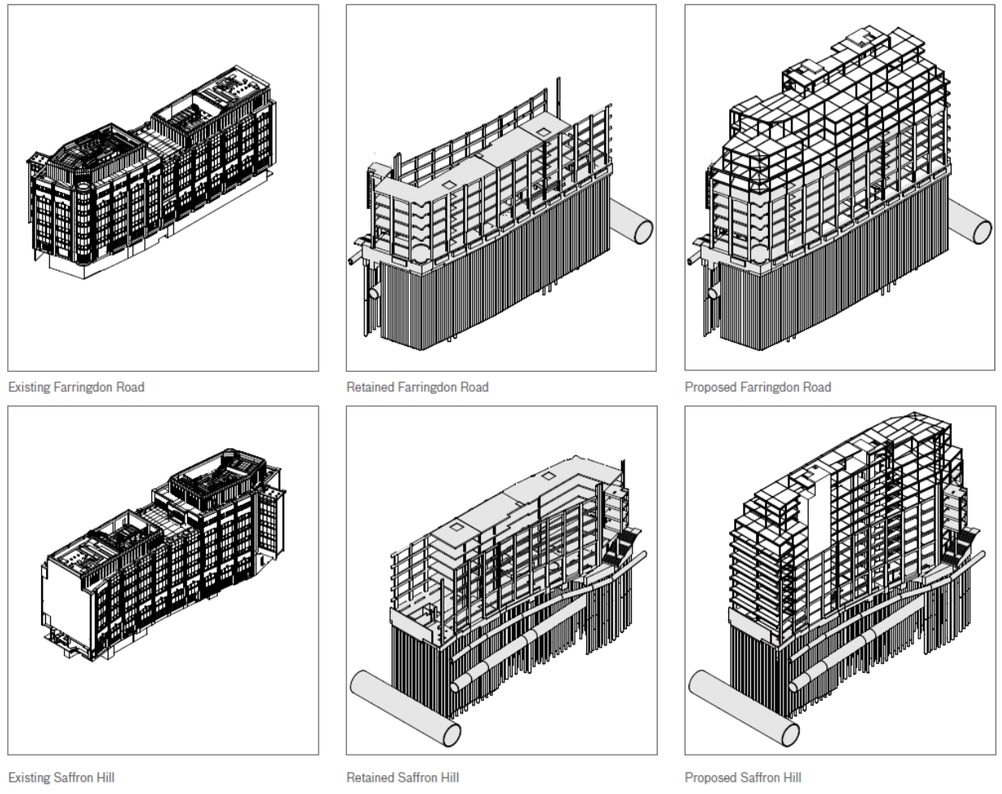


Figure 2.2-1 3D visualisation of extent of demolition of the existing building (source: DSDHA)

The proposed uses are Class E – Office Use; restaurant/retail; and jewellery workspace. The design proposal provides additional commercial floorspace through internal efficiencies and additional massing at roof level.

The key summary areas for existing building and Proposed Development are set out in the table below.

Table 2.2-2 Areas for the existing building and Proposed Development

Use Typology	Existing (GIA sqm)	Proposed (GIA sqm)	Net Change (GIA sqm)
Office	8,901	12,016	3,115
Retail		310	
Jewellery Workspace		520	
Total	8,901	12,846	3,945

2.3. Site & Application Boundary

The surrounding area is largely characterised by medium and high buildings and provides a mix of uses, although predominantly comprising retail, office and residential land uses. The jewellery quarter of Hatton Garden lies to the north-west of the site and the adjacent General and Poultry Markets of West Smithfield are being adapted by the London Museum to become their new home.

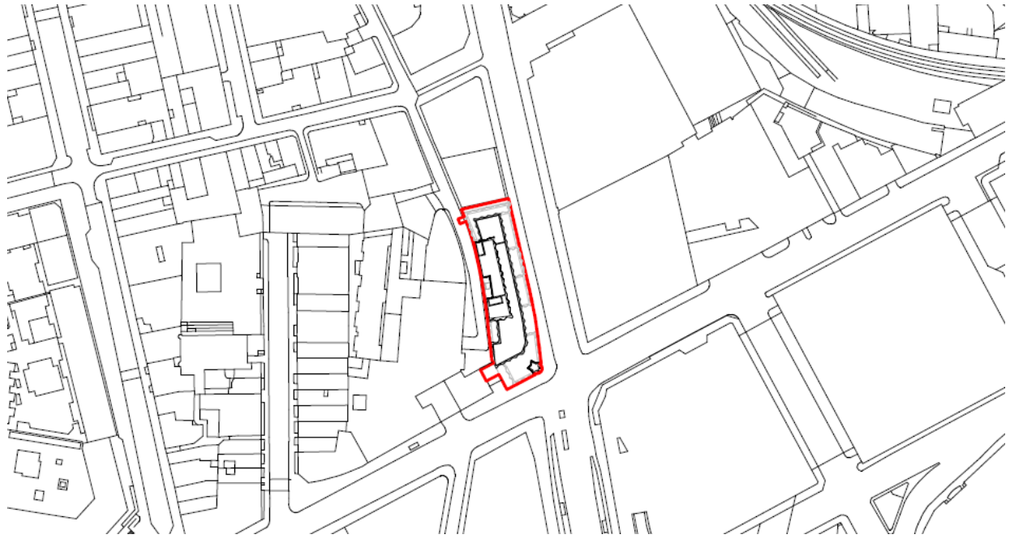


Figure 2.3-1 Planning application red line boundary for the Proposed Development

2.4. Methodology

Sweco UK uses Integrated Environmental Systems' (IES) VE Compliance software to demonstrate Part L2 compliance for the non-domestic areas.

The IES software had to demonstrate that it satisfies all the tests, and other requirements defined in accordance with CIBSE TM33: 'Tests for software accreditation and verification' and ISO 52000-1:2017: 'Energy performance of buildings – Overarching EPB assessment – Part 1: General Framework and procedures'.

The methodology used by the IES accredited software is summarised below:

- A three-dimensional software model of the proposed non-domestic areas of the building is generated using the software's Model IT component. This model is based on the architectural drawings and is an accurate geometric representation of the building.
- The building usage is defined for the building in line with the National Calculation Method's (NCM) various definitions for building uses.

- The building systems are defined and allocated to each of the rooms within the building.
- The software calculates a Building Emissions Rate (BER) based on the geometry of the building, its use, and the efficiency of the building systems defined.
- The software automatically generates a notional building using the geometry for the proposed building, but allocating glazing coverage, U-values, and plant efficiency in accordance with the Elemental Method as defined in NCM modelling Guide 2021 (released April 2022).
- The software calculates an Emissions Rate for the Notional building, which is the Target Emission Rate (TER) for the actual building.

2.5. Energy Assessors

The energy assessment has been carried out and approved by CIBSE Energy Registered Low Carbon Energy Assessors based at Sweco UK – 1 Bath Road, Maidenhead, SL6 4AQ.

Mr Kartik Amrania
Head of Energy and Sustainability Department
CEng, BEng, MSc, LCC, LCEA,
CIBSE LCEA Registration No: LCEA 133950
Email: Kartik.amrania@sweco.co.uk

3. Legislation & Planning Policies

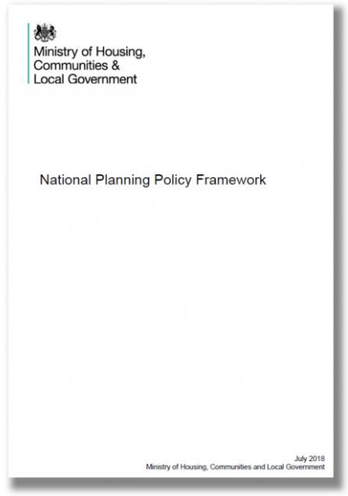
3.1. Legislation & Policy Map

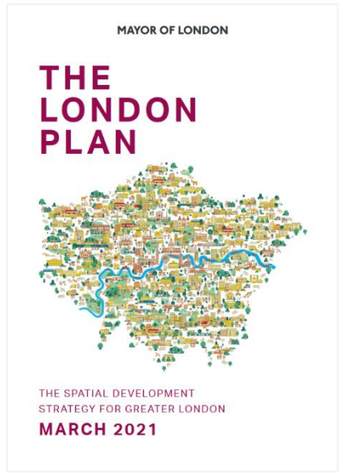
National Legislation

Climate Change Act 2008

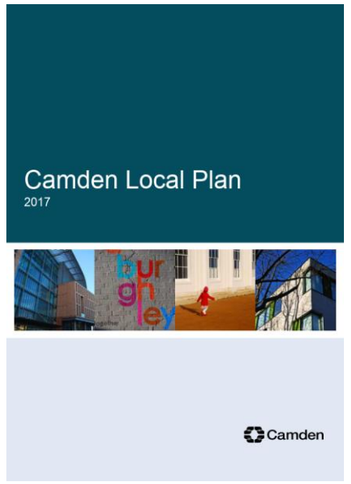
Energy Act 2011

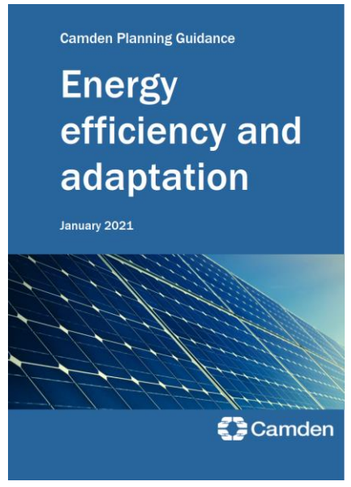
National & Regional Policy





Local Policy





3.2. Legislation

3.2.1. Climate Change Act 2008 (2050 Target Amendment)

The Climate Change Act sets legally binding greenhouse gas emission reductions targets of 100% by 2050 against a 1990 baseline, which are to be achieved through action taken in the UK, and abroad. It contains provisions to enable the Government to require public bodies, and statutory undertakers to carry out their own risk assessment and make plans to address the risk of climate change.

In May 2019, the Climate Change Committee recommended a new emissions target for the UK: net-zero greenhouse gases by 2050 to respond to the Paris Agreement commitments. The recommendation has been adopted by the government, and the targets were amended accordingly in June 2019.

3.2.2. Energy Act 2011

The Act includes provisions for the establishment of the Green Deal, which is a financing framework to fund improvements to the energy efficiency of domestic, and non-domestic properties.

The Act emphasizes the importance of EPCs, which provide information on the energy efficiency of buildings and recommendations for improvement. It aims to ensure buildings meet certain energy efficiency standards. It also includes measures requiring landlords to improve the energy efficiency of rented properties, ensuring they meet minimum standards by specific deadlines. These provisions aim to enhance the energy performance of buildings, reduce carbon emissions, and contribute to overall energy efficiency in the UK.

3.2.3. Building Regulations Part L

The Proposed Development will be assessed under:

Part L2 2021 for the new non-domestic buildings.

It is a requirement that such buildings meet the minimum building regulations in terms of the maximum façade U-values, minimum values for energy efficiencies, and minimum values for CO_2 reductions as listed within the Part L requirements, as shown Section 4.1.

Fuel CO2 emission factors are based on SAP 2021, and the NCM document for Part L 2021 compliance, considered within the energy model to calculate the CO2 emissions that will be produced because of the running of the systems, as outlined within the report. Fuel CO2 emission factors in terms of SAP 10.2 carbon factors are used to calculate the equivalent carbon dioxide emissions associated with different fuels. For example, 1 kWh of power from grid electricity will have a different environmental impact than 1 kWh of power from natural gas as presented in the following table.

Grid electricity has significantly decarbonised since the issue of Part L2A 2013, hence SAP10.2 carbon factors have been released with PartL2A 2021.

This will ensure that the assessment of new developments better reflects the actual carbon emissions associated with their expected operation. The impact of these new emission factors is significant in that technology generating on-site electricity (such as gas-engine CHP) will not achieve the carbon savings they have to date.

Table 3.2-1 Fuel Factors 2013 Part L (SAP10) and Part L 2021 (SAP 10.2)

System	Fuel Source	Emission Factor ($KgCO_2/kWh$)	
		SAP 10	SAP 10.2 (new)
LTHW Heating Energy	Natural Gas	0.210	0.210
Chiller Energy	Grid Electricity	0.233	0.136
Lighting Energy	Grid Electricity	0.233	0.136
Pump / Fan Energy	Grid Electricity	0.233	0.136
DHW Energy	Natural Gas	0.210	0.210

3.3. National Planning Policy Framework (NPPF)

In December 2024, the Ministry of Housing, Communities, and Local Government revised the issue of National Planning Policy Framework (NPPF), which sets out the Government's planning policies for England, and how development should happen in the country.

Chapter 14: "Meeting the challenge of climate change, flooding, and coastal change" is NPPF's relevant section to this energy, and sustainability statement. That chapter provides a framework for local authorities to address the following issues as regards planning applications (key paragraphs extracted as per below).

The planning system should support the transition to a low carbon future in a changing climate, taking full account of flood risk and coastal change. It should help to shape places in ways that contribute to radical reductions in greenhouse gas emissions, minimise vulnerability and improve resilience; encourage the reuse of existing resources, including the conversion of existing buildings; and support renewable and low carbon energy and associated infrastructure.

Paragraph 164 states that new development should be planned for in ways that:

- Avoid increased vulnerability to the range of impacts arising from climate change. When a new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaptation measures, including through the planning of green infrastructure; and

- Can help to reduce greenhouse gas emissions, such as through its location, orientation, and design. Any local requirements for the sustainability of buildings should reflect the Government's policy for national technical standards.

Paragraph 165 states that in order to help increase the use, and supply of renewable, and low carbon energy, and heat, plans should:

- Provide a positive strategy for energy from these sources, that maximises the potential for a suitable development, while ensuring that adverse impacts are addressed satisfactorily (including cumulative landscape, and visual impacts);

- Consider identifying suitable areas for renewable, and low carbon energy sources, and supporting infrastructure, where this would help secure their development;

- Identify opportunities for development to draw its energy supply from decentralised, renewable, or low carbon energy supply systems, and for co-locating potential heat customers, and suppliers.

Paragraph 166 states that in determining planning applications, local planning authorities should expect new development to:

- Comply with any development plan policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved, and its design, that this is not feasible or viable; and

- Take account of landform, layout, building orientation, massing, and landscaping to minimise energy consumption.

Paragraph 168 states that in determining planning applications, local planning authorities should expect new development to:

- Not require applicants to demonstrate the overall need for renewable or low carbon energy, and recognise that even small-scale projects provide a valuable contribution to cutting greenhouse gas emissions; and

- Approve the application if its impacts are (or can be made) acceptable. Once suitable areas for renewable and low carbon energy have been identified in plans, local planning authorities should expect subsequent applications for commercial scale projects outside these areas to demonstrate that the proposed location meets the criteria used in identifying suitable areas.

3.4. Regional Policy

3.4.1. The London Plan 2021

The Mayor of London published the current “London Plan” in March 2021. This is the Spatial Development Strategy for Greater London. The Development Plan for each London Borough must ultimately comply with the general requirements of the London Plan (2021).

To support borough planners, the Mayor has previously published the following guidance documents through London Renewables: “Integrating Renewable Energy into New Developments: A Toolkit for Planners, Developers and Consultants”, and more recently the Supplementary Planning Guidance, “Sustainable Design and Construction”, 2014.

The London Plan includes planning policies both for reducing energy consumption within buildings and, more significantly, for promoting the use of decentralised electricity generation and renewable energy technologies. These policies cover the requirements of each borough with respect to Energy strategies and planning applications.

The Energy Planning – ‘GLA Guidance on preparing energy assessments as part of planning applications’ (June 2022) states the requirements and guidance for energy strategies to ultimately reduce carbon dioxide emissions.

These emissions should include those covered by the Building Regulations and those that are not covered by the Building Regulations.

The Mayor of London has declared a climate emergency and has set an ambition for London to be net zero-carbon. This means all new buildings must be net zero carbon. The Mayor’s London Plan sets the targets and policies required to achieve this. It includes:

- A net zero-carbon target for all major developments, which has applied to major residential developments since 2016.

- A requirement for all major development to ‘be seen’ i.e., to monitor and report its energy performance post-construction to ensure that the actual carbon performance of the development is aligned with the Mayor’s net zero carbon target.

- A requirement for all referable planning applications to calculate and reduce whole life-cycle carbon emissions to fully capture a development’s carbon impact.

Therefore, the target reduction on CO_2 emissions of the development according to the GLA’s requirements is:

- Zero Carbon for Non-Domestic Areas as compared to a Part L2 Compliant Build

The London Plan recognises that energy efficiency should come before energy supply considerations and has suggested a simple strategy known as the Energy Hierarchy (Policy SI 2). The process follows good practice in the design of low carbon buildings and comprises four distinct stages and order of application:

1. Use Less Energy (Be Lean).
2. Supply Energy Efficiently (Be Clean).
3. Use Renewable Energy (Be Green).
4. Monitor, verify and report on energy performance (Be Seen).

This strategy puts energy efficiency/conservation measures first to reduce the demand for energy, 'Be Lean'. Following this, consideration must be given to supplying the resultant reduced energy demand as efficiently as possible, including to exploit local energy resources (such as secondary heat) and supply energy efficiently, 'Be Clean'. Sources of low or zero carbon and renewable energy technologies should then be examined for incorporation, 'Be Green'. Lastly, it is a requirement for developments to monitor and report energy performance post-construction to ensure that the actual carbon performance of the development is aligned with the Mayor's net zero carbon target, 'Be Seen'.

London Plan (2021) requires a minimum on-site reduction of:

At least 35 per cent beyond Building Regulations: 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.

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

1. Connect to local existing or planned heat networks;
2. Use zero-emission or local secondary heat sources (in conjunction with heat pump, if required);
3. Use low-emission combined heat and power (only where there is a case for CHP to enable the delivery of an area-wide heat network, meet the development's electricity demand and provide demand response to the local electricity network;
4. Use ultra-low NOx gas boilers.

The table below outlines compliance with the London Plan (2021).

Table 3.4-1 Compliance with the London Plan 2021

London Plan (2021)	Applied measure at the Proposed Development
Policy SI1 Improving Air Quality	Fossil-fuel free development with all-electric energy strategy using Variable Refrigerant Flow (VRF) located at roof level to provide heating and cooling to the perimeter areas of office tenancies. Refer to Section 10 and Section 11.8.
Policy SI2 Minimising greenhouse gas emissions	**31%** carbon reduction via passive, and energy-efficient design, and use of all electric design. Refer to Sections 1.2,5,8, 10 and 11.3.
Policy SI3 Energy Infrastructure	The heating and cooling system of the development is standalone and there is little opportunity to efficiently connect the system to a future district heating system. Refer to Section 7.2 and Appendix G.
Policy S14 Managing Heat Risk	Measures adopted to reduce building cooling demand (detailed façade optimisation), and thermal assessment (Hea04) conducted in line with London Plan's and Camden's cooling hierarchy . The development team is looking to maximise the urban greening where possible. Refer to Sections 5.2, 6, and Appendix D.
Policy SI5 Water Infrastructure	Relevant BREEAM credits targeted, green roofs will be integrated into the development. Blue roof system at all roofs and terraces to attenuate and control surface water runoff. Refer to Section 11.5 and accompanying BREEAM pre-assessment (Appendix E).
Policy SI7 Reducing waste, and supporting the circular economy	Relevant BREEAM credits targeted, life cycle assessment, and early considerations of applying the waste hierarchy through the design and maximising retention - 70% of the existing structure. The Pre-Demolition Audit has been conducted by Material Index which identifies key opportunities for retaining and reusing materials from strip-out and demolition to support the Proposed Development. Refer to Sections 11.7 and accompanying BREEAM pre-assessment (Appendix E), Whole Life Carbon Analysis and Circular Economy Statement both submitted separately as part of this application.
Policy SI8 Waste capacity, and net waste self-sufficiency	Relevant BREEAM credits targeted. Refer to Section 11.7 and accompanying appendices with BREEAM pre-assessment in Appendix E.

London Plan (2021)	Applied measure at the Proposed Development
Policy SI10 Aggregates	Relevant BREEAM credits targeted, life cycle assessment, and early considerations of applying the waste hierarchy through the design. Refer to Sections 11.7 and accompanying BREEAM pre-assessment (Appendix E), Whole Life Carbon Analysis and Circular Economy Statement both submitted separately as part of this application.
Policy SI12 Flood risk management	Risk of flooding from all sourced considered to be less than 1 in 1000 annual probability in flooding, site sits within Flood Zone 1. Refer to Section 11.5, Flood Risk Assessment submitted as part of this application and accompanying appendix with BREEAM pre-assessment (Appendix E).

3.4.2. London Environment Strategy (May 2018)

The Mayor of London published the London Environment Strategy setting out London's plans to tackle environmental challenges by 2050. The aims are:

- For London to have the best air quality of any major world city by 2050, going beyond the legal requirements to protect human health, and minimise inequalities.
- For London to be the world's first National Park City, where more than half of its area is green, where the natural environment is protected, and where the network of green infrastructure is managed to benefit all Londoners.
- For London to be a zero-carbon city by 2050, with energy-efficient buildings, clean transport, and clean energy.
- To make London a zero-waste city. By 2026, no biodegradable or recyclable waste will be sent to landfill, and by 2030, 65 per cent of London's municipal waste will be recycled.
- For London, and Londoners to be resilient to severe weather, and longer-term climate change impacts. This will include flooding, heat risk, and drought.
- For Londoners' quality of life to be improved by reducing the number of people adversely affected by noise, and promoting quieter, and tranquil spaces.
- For London to transition to a low carbon circular economy.

As summarised in this report, the Proposed Development will positively contribute to achieving the objectives set out by the London Environment Strategy

3.5. Local Policies

3.5.1. Camden Local Plan (2017)

The London Borough of Camden (LBC) take a strong stance on sustainability and have had a number of forward-thinking policies related to this subject in place for a number of years. The are two key adopted planning policy documents from LBC that have been referred to for sustainability requirements throughout the Energy & Sustainability Strategy. These are:

- Camden Local Plan (2017)
- Energy Efficiency & Adaptation CPG (January 2021), which supports compliance with policies CC1 and CC2 of the Camden Local Plan (2017)

These documents form the basis of the content of the Energy & Sustainability Strategy and are referred to directly in various sections of the report. A summary of the policy headlines and requirements from each document can be found in Tables 3.5.1 and 3.5.2 below.

Table 3.5-1 Summary of the key energy & sustainability policies found within the Camden Local Plan (2017) and where evidence of compliance with these policies can be found within this report

Policy Reference	Policy Intent/Requirements	Where compliance can be found in this report
CC1	Promote Zero-Carbon development Energy hierarchy Sustainable transport Energy improvements for existing buildings Optimise resource efficiency Review Whole Life Carbon Decentralised energy networks	Refer to Sections 1.1, 5.2, 7,8,9, 10 and Section 11.3.
CC2	Green spaces & infrastructure Managing surface water runoff (SuDS) Green & blue roof systems Managing overheating & cooling Requirement for a Sustainability Statement Future Adaptation BREEAM 'Excellent'	Refer to Sections 6, 11.5, 11.9 and the accompanying BREEAM pre-assessment tracker (Appendix E).
CC3	Water efficiency measures Flood risk & flood resilience measures Drainage & SuDS	Refer to Section 11.5, the FRA and Drainage strategy reports submitted as part of this application and the accompanying BREEAM pre-assessment tracker.
CC4	Air Quality Assessments (AQA) Construction Management Plan (CMP)	Refer to Section 11.8 and the accompanying BREEAM pre-assessment tracker.
CC5	Reducing waste Operational waste facilities Circular economy principles & recycling	Refer to Section 11.7 and the accompanying BREEAM pre-assessment tracker.

Policy Reference	Policy Intent/Requirements	Where compliance can be found in this report
A3	Improve site biodiversity and urban greening Protect existing trees & vegetation of value	Refer to Section 11.9 and the accompanying BREEAM pre-assessment tracker.
D1	High quality design Sustainable in design & construction Sustainable & durable construction High quality materials Promotes health Opportunities for greening & biodiversity enhancements Incorporates outdoor amenity space Carefully integrates building services	Refer to Sections 6, 10, 11.7, 11.9 and 11.10 and DSDHA's DAS submitted as part of this application.

Table 3.5-2 Summary of the key energy & sustainability guidance found within the Camden Energy Efficiency & Adaptability CPG (EEA CPG) and where evidence of compliance with these policies can be found within this report

CPG Chapter Reference	Policy Intent/Requirements	Where compliance can be found in this report
2	**Energy Hierarchy** Submit an energy statement Follow the Mayor's Energy Hierarchy	Refer to Sections 1.1 and 1.2 and Appendix B.
3	**'Be Lean' stage of Energy Hierarchy** Passive Design measures Daylight & sunlight Overheating Natural ventilation opportunities Thermal performance HVAC systems efficiency	Refer to Section 5.
4	**Decentralised energy** Review of opportunities to connect to district heat networks and identifying heat network priority areas	Refer to Sections 7.2 and 10.
5	**Renewable energy technologies** Consider feasibility of on-site energy generation Target a 20% reduction in CO_2 emissions from on-site renewable energy generation Specific requirements for PV panels Specific requirements for ASHPs	Refer to Sections 8.1 and 8.2.
6	**Energy Statements** Requirements for how to produce and report within Energy Statements/Strategies	Refer to Sections 1.1 and 4.1.
7	**Energy Reduction** New Build and deep refurbishments to achieve London Plan targets (35% reduction against extant Part L version) Refurbishment to achieve 'greatest possible reduction' against Part L2B Carbon offsetting	Refer to Section 1.1 – 1.3.
8	**Energy Efficiency in Existing Buildings** Demonstrate how sustainable design principles have been implemented Sensitive improvements to be made Application of renewables	Refer to Sections 5.3 and 8.2.
9	**Reuse & Resource Efficiency** Condition & Feasibility Studies Development options for reuse Whole life carbon assessments Circular economy & waste	Refer to Sections 11.6, 11.7, Condition and Feasibility Study submitted as part of this application. Whole Life Carbon Assessment and Circular Economy Statement issued within the wider application documentation.
10	**Sustainable Design & Construction** Provide a sustainability statement Overheating & Cooling Hierarchy Passive design review Review of paragraph 10.30 measures	Refer to Sections 5.2, 6, 11 – Sustainability Statement and Appendix D – Thermal Comfort Assessment (Hea04).
11	**Sustainable Assessment Tools** Achieve BREEAM 'Excellent' Achieve 60% of energy and water credits Achieve 40% of materials credits	We are targeting Excellent with a score of 80.89% for the Office **Energy:** 76% of the credits are targeted for the Office **Water:** 77% of the credits are targeted for the Office **Materials:** 57% of the credits are targeted for the Office

The EEA CPG includes a number of tables and guidance proformas for reporting within Energy and Sustainability Statements. Where relevant, these formats have been applied within this document to ensure consistency of review and data provision.

3.5.2. Regulation 18 Draft (Consultation Version) of the New Camden Local Plan (January 2024)

In addition to the adopted policy documents, the Applicant is also aware that a Regulation 18 Draft (Consultation Version) of the New Camden Local Plan (January 2024) has been published and is available for review from Camden's website. The draft firms up some of the key policy positions and commitments from the 2017 Local Plan and EEA CPG, with a clear message of intent on sustainability.

While we recognise that this is a consultation draft at the time of submission and thus carries limited weight, we have still reviewed draft policy to explored how the proposals may align with the intent of this document.

Key policies include:

- Specific advice on demolition and expectation of any approach to justify (CC1, CC2)
- Policy introduction specific to circular economy (CC3)
- Introduction of minimum expectation for upfront embodied carbon (CC4)
- Clear and detailed expectation for operational energy reduction for refurbished and new buildings, shifting focus to EUI targets (CC5 & 6)
- Specific policy for overheating (CC8)
- Specific policies related to urban greening and biodiversity (NE1 & 2)

Figure 3.5-1 Draft New Camden Local Plan

4. Baseline Carbon Emissions

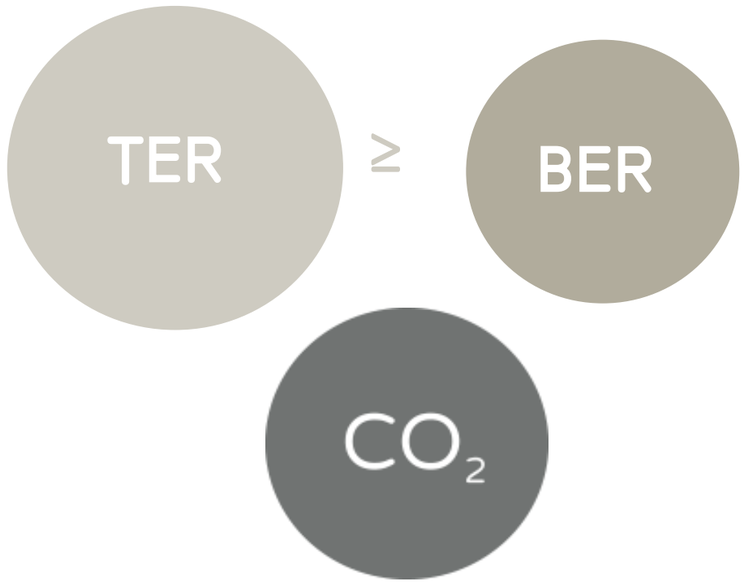
4.1. Baseline Target Emissions Rate (TER)

The 'baseline' building represents a development which just meets the minimum standards of CO_2 emissions reduction (i.e., for new-built buildings (including extensions) the Building Emissions Rate (BER) is equal to or lower than the Target Emissions Rate (TER), as defined by Part L of the Building Regulations 2021).

Allowances for energy consumption not included under Part L have been made by reference to published material or by calculation. These include small power (energy use for electrical appliances). The energy breakdown, and carbon dioxide emissions by end-use, and area are shown in Section 1.

As part of the study for the commercial areas of the building, a thermal model of the building was developed, and analysed using the approved IES Virtual Environment (VE) Software (Version 2024 4.0.0). This software models the carbon dioxide emission rates produced by a building in accordance with Part L2 of the Building Regulations (2021).

Unregulated energy use, and the associated carbon dioxide emissions for the non-domestic buildings has been calculated using the BRUKL document (typical output document), and Chartered Institution of Building Services Engineers' (CIBSE) publications for guidance, as well as evidence established through previous development work.



5. Be Lean (Reduce Energy Demand)

5.1. Introduction

This section of the report details the applied measures at the Proposed Development to reduce energy demand as part of the 'Be Lean' stage of the Energy Hierarchy, and is based on the following strategies:

- "Fabric First approach" – designing of a high thermal performing building envelope, with optimised glazing ratio for daylighting, and solar gains management during summer, and winter.
- Promoting energy savings and wellness initiatives through robust metering, and control strategy.
- Energy-efficient equipment will be used throughout the development to reduce energy consumption; and
- Setting an ambitious energy use intensity target (EUI) for operational energy.

5.2. Passive Design Features – Regulated Energy

5.2.1. Introduction

Passive features take advantage of the climate, location, and site context to reduce energy demand for regulated energy uses (e.g., heating, cooling, ventilation, lighting, and pump energy). Examples of design features include maximising the use of natural resources, such as passive solar heating, daylighting, use of natural ventilation and designing out unwanted gains through glazing ratio optimisation, including greenery for stabilising temperature conditions, wherever possible.

5.2.2. Site Location & Microclimate

Higher temperatures can be experienced due to urban heat island impact within a densely populated environment. Potential issues of sunlight availability at ground level during winter months can arise as well as excess solar gain protection is necessary for upper levels for the summer period. The design positively responds to the local environmental conditions by:

- Developing a massing for any extensions that optimises the site potential, whilst striving to safeguard daylight, and sunlight to existing nearby residential properties.
- Locating delivery, and servicing routes away from heavily pedestrianised areas, and cyclist routes.
- Locating intakes of air supply as far as possible from pollution sources.
- Adding landscape and vegetation to mitigate some felt effects of the Urban Heat Island effect.

The surrounding buildings' stature contributes to reducing direct solar radiation by offering suitable shading, a factor that has been acknowledged and incorporated into the energy model. The Proposed Development depends on the shading provided by neighbouring structures. The buildings factored into the energy model are all existing.

5.2.3. Building Orientation, Layout & Form

The Proposed Development's narrow form aids in maximising daylight provision. Early design stage assessments concluded that despite the optimised glazing, there is some degree of daylight penetration into the perimeter zones even at typical levels. The core is located in the south, south-west façade of the development which helps in mitigating excess solar ingress to occupied spaces. The extension levels are staggered to create an architecturally interesting form, punctuated by terraces and double-heighted external spaces which also provide increased avenue for providing green and communal spaces.

The building is enclosed by Charterhouse Street on the south, Saffron Hill on the west and Farringdon Street on the east, with buildings all along these roads. This helps the lower levels through shading provided by the context. The upper levels are relatively more exposed where appropriate passive design measures have been implemented to minimise excessive solar gains in these areas.

5.2.4. Façade Optimisation

Sweco along with DSDHA carried out extensive modelling and review processes to optimise design elements such as window-to-wall ratios, glass g-values, and the depth of reveals and external shading.

Early-stage analysis for the typical floors was carried out to identity passive design measures to improve solar gains performance. The aim for these analysis was to contain solar gains in perimeters zones between 40-50 W/m² (around the single orientation perimeter zones for not more than 3% of the percentage hours during occupied hours, assuming an occupancy profile of 8am-6pm during weekdays and using a CIBSE DSY (Design Summer Year) for London) to ensure appropriate plant sizing for expected cooling loads, while also considering daylight provision, buildability, embodied carbon, and feedback from the planning and pre-application process.

Extensive analyses for both typical as well as upper floors was carried out. Analysis included testing the efficacy of various strategies such as improvised glazing ratios, introduction of shading elements – vertical and horizontal as well as introduction of opacity in the form of spandrel panels.

The result is a façade design that will be responsive to both the context and the environment, targeting an average solid-to-glazing ratio of 55% across different façades. To achieve passive solar shading, the façade has horizontal projections as well as vertical columnar shading along with terraces and opaque elements.

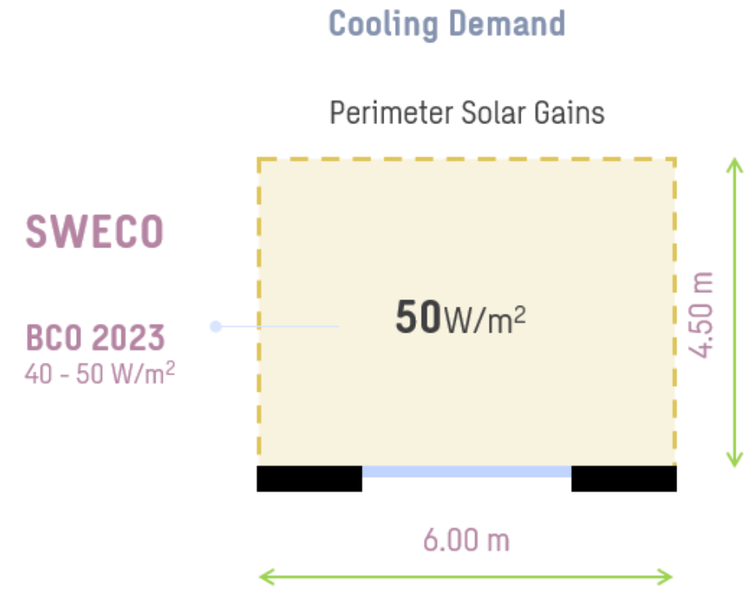


Figure 5.2-1 Peak solar load target

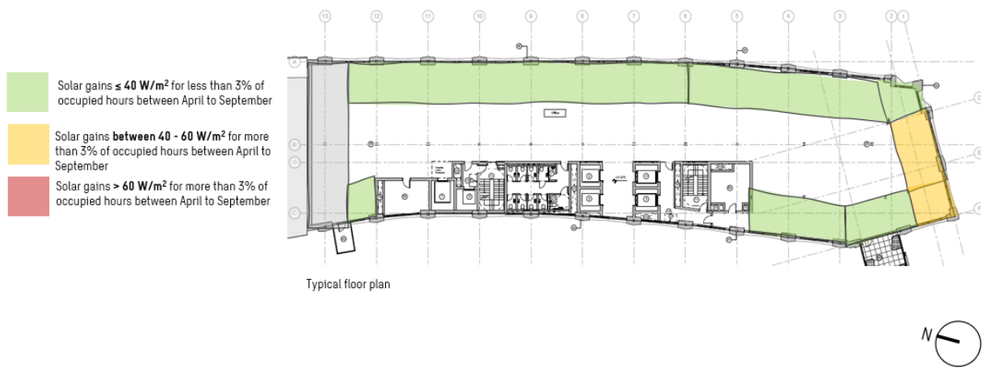


Figure 5.2-2 Peak solar loads for a typical floor of the Proposed Development

5.2.5. Building Envelope

The external envelope of a building acts as an important climatic modifier, with a well-designed façade significantly reducing the building's energy demand and contributing to a comfortable internal environment by minimising cold draughts, and excessive solar heat gains in summer.

The outlined U-values in Table 5.2.5.1 are critical to reducing carbon emissions, and coordination on the practice of achieving these U-values has been discussed with the appointed façade consultant, and architectural team, the next stages of technical design will provide more detailed calculations to confirm those.

Table 5.2-1 Building fabric thermal performance inputs for the new facade systems

Parameter – New Fabric Elements		Part L2 Limiting Value	Part L2 Notional Building Parameters	Proposed Values
Building Airtightness (@ 50Pa)		8 $m^3/h/m^2$	3 $m^3/h/m^2$	3 $m^3/h/m^2$
U-values	Wall (Retained)	0.26 W/m^2K	0.18 W/m^2K	0.20 W/m^2K
	Wall (Extension)	0.26 W/m^2K	0.18 W/m^2K	0.15 W/m^2K
	Roof	0.18 W/m^2K	0.15 W/m^2K	0.18 W/m^2K
	Floor	0.18 W/m^2K	0.15 W/m^2K	0.18 W/m^2K
	Curtain wall	1.6 W/m^2K	1.4 W/m^2K	1.3 W/m^2K (Overall: glazing & frame)
Glazing U-value		1.6 W/m^2K	1.4 W/m^2K	1.3 W/m^2K (including frame)
Glazing g-value (BS EN 410)		Office Elevations		0.28
		Shopfront glazing (retail)		0.40
Glazing Visible Light Transmittance		-	71%	50-65%
Thermal Mass		N/A		Low - Medium
Percentage of Glazing (floor average)		1m high window across each elevation		50-60%

Notes:

1. *The "Proposed Values" are the construction parameters applied to the actual building simulation model and should be reflective of the average of the actual building element U-value.*
2. *The U-values include repeating cold thermal bridges. A margin of 10% of the U-value has been added to the target U-values to make provision for non-repeating thermal bridging. The thermal bridging coefficient should not exceed 10% of the target U-values listed above.*
3. *Glazing g-value to vary based upon exposure to sunlight, to balance daylighting against the cooling loads.*
4. *The g-value specified to shopfronts or active frontages of the building considers that façade set-backs or additional shading is proposed. The design must be able to manage the solar gains entering the space to allow for a transparent façade whilst considering passive solar gain control measures.*

5.2.6. Cooling & Overheating

Policy SI 4 of the London Plan (2021) requires that major development proposals should reduce the potential of overheating and the reliance on air conditioning systems.

Camden's Local Plan policy CC2: Adapting to Climate Change as well as Chapter 10 of the CPG mandates that developments implement strategies to mitigate the effects of urban and residential overheating by following the cooling hierarchy. This hierarchy is in accordance with the London Plan's cooling hierarchy, which emphasises that active cooling should only be utilised after all passive measures have been applied.

The design principles of the scheme were analysed with the use of dynamic overheating modelling. Thermal comfort was assessed against CIBSE criteria and GLA's guidance for commercial and residential accommodation and includes the latest weather sets from CIBSE TM49: Design Summer Years for London (2014). A full assessment can be found in Appendix D of this report. The assessment is also based on BREEAM methodology for assessing overheating risk in commercial areas.

Sweco and DSDHA have developed the façade using dynamic modelling exercises to effectively balance solar gains, daylighting, and views while mitigating overheating. The analyses included modelling various optimisations that examined efficacy of glazing ratios, inclusion of solidity and using horizontal and vertical shading elements.

Comprehensive analyses were conducted for both typical and upper floors to address overheating concerns. The analysis examined the effectiveness of various strategies, including adjusted glazing ratios, the addition of shading elements—both vertical and horizontal—and the use of spandrel panels for added opacity. The outcome is a façade design that priorities thermal comfort by responding to the surrounding context and environment, achieving an average solid-to-glazing ratio of 55% across different façades. To mitigate overheating, the façade features horizontal projections and vertical columnar shading, along with terraces and opaque elements to provide effective passive solar shading. For details on the solar targets, please refer to Section 5.2.4, and for the results of the Thermal Comfort Assessment, see Section 6 of this report.

5.2.7. Daylighting Strategy

As previously discussed, the façade performance of the development is being optimised to enhance daylight provision, carefully considering factors such as solar performance of glass, window-to-wall ratios, and passive solar shading measures to ensure that the solar gains targets are not achieved at the expense of other key performance indicators. For instance, a balanced approach is taken to ensure that the specified g-value does not hinder the glass's ability to provide adequate visual light transmittance, and these considerations will be reflected in the project specifications.

The treatment of the lower and upper levels will differ; lower levels offer more opportunities to explore glazing ratios, benefiting from shading provided by adjacent buildings to maximise daylight provision while the top levels balance a reduction in glazing to prevent excess solar gains while still allowing adequate daylight egress into the floorplate.

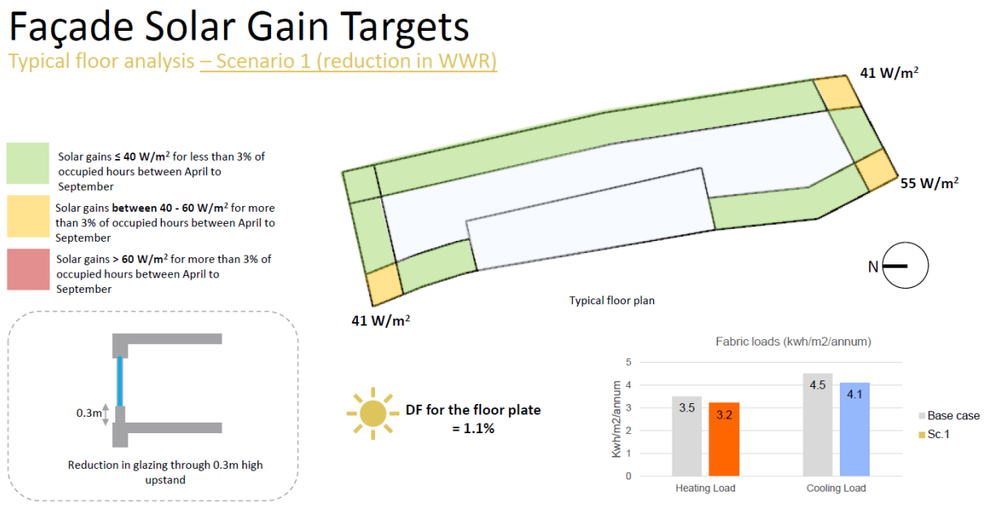


Figure 5.2-3 Initial multi-parameter analysis to balance daylight and solar gains

5.3. Active Design Features – Regulated Energy

5.3.1. Introduction

Active features include the power-driven systems used to operate the building accounting for energy efficiency considerations as presented in this section.

5.3.2. Heating, Cooling & Ventilation (HVAC) Strategy

The development will be built as a shell and core with the base building services installations designed to enable the lettable office spaces to be fitted out to category 'A' or category 'B' specification once a tenant is on board. The category 'A' design will be undertaken by the design team to demonstrate spatial fit.

Landlord's plant will include on-floor air handling units (AHUs) with two AHU per floor on Level 01-07 and a single AHU located on Level 09 serving Level 08-09. The AHUs will be located within dedicated, acoustically insulated plant rooms. The AHUs will be equipped with integrated heat pumps to allow air to be heated/cooled to the desired room temperature for distribution to office floor via a displacement system.

Variable Refrigerant Flow (VRF) units located at roof level will provide heating & cooling to the perimeter areas of office tenancies and landlord areas where required. Two VRF units per floor will be provided with at least one additional unit provided for use to landlord areas. BC control units will be provided to the tenancies as an interface between the outdoor unit and indoor terminal units - this will be located on the floor which it is serving.

The base build MEP services have generally been developed to enable a single tenancy per office level.

5.3.3. Building Management System & Metering

The development will be provided with a microprocessor-based digital Building Management System (BMS). The BMS will automate the building services systems, helping building managers understand how the building is operating, and allow them to control, and adjust systems to optimise performance, in a simple, efficient manner.

BMS control of landlord plant and equipment will be designed with energy efficiency as the key driver. Some examples of the energy-efficient controls include:

- **Demand led control strategies:** The BMS shall use demand-led strategies where appropriate, demands for heating, and cooling shall be monitored by the BMS, evaluated, and processed, prior to commanding systems operational.

- **Time program control:** The BMS shall provide time schedules that can be programmed to define when an operation signal is to be sent to the controlled plant. The time schedules shall allow different on/off times for building/plant control strategies to be defined throughout the year.

- **Optimisation Control:** The BMS shall provide individual optimisation programmes for the time schedules associated with temperature control of space/zone, to enable the operation of the related heating and/or cooling systems prior to normal operating periods, to bring the zones within comfortable temperatures at the start of normal occupancy times. The optimisation programme shall be self-adaptive using an iterative process after each period of operation to improve its performance.

- **Seasonal Operation:** Plant controls shall be pre-programmed for seasonal operation, allowing plant start-up routines, and temperature control set points to be determined and automatically adjusted based on the season of operation.

5.3.4. Energy Metering & Billing

All landlord meters shall be connected and interfaced with the building management system (BMS) to enable energy consumption data to be collated, analysed, and distributed as required by the metering, and billing strategy (possible for up to 4 tenancies as designed).

Metering of energy usage on all floors, per tenancy will allow building owners / occupiers to view and interrogate where potential energy savings can be made throughout their buildings.

The energy metering, and sub metering strategy will be in line with best practice as outlined in CIBSE TM31, 39, and 46 to ensure compliance with current legislation, together with Part L2A of the Building Regulations and BREEAM Ene-02.

The strategy will be compliant with The Heat Network (Metering, and Billing) Regulations 2014, and the EU Energy Efficiency Directive. All notifications, and assessments as required by the regulations shall be made by the Contractor. A Metering Strategy is included in Appendix C.

5.3.5. EC/DC Motors for Fan Coil Units

The current Part L Building Regulations set stringent efficiencies for the fans used in all air conditioning and mechanical ventilation systems. Recent advances in fan motor technology have resulted in substantial reductions in energy consumption, and otherwise a significant proportion of building energy use. EC/DC (electronically commutated direct current) motors will be used in place of conventional AC motors.

5.3.6. High Efficiency Variable Speed Drives

By varying the fan, and pump speeds for the water, and air distribution systems to match the building load profiles, fan, and pump energy consumption will be considerably reduced. This functionality will be afforded and managed via the intelligent Building Management System (BMS).

5.3.7. Ventilation Heat Recovery

The energy required to heat or cool the incoming fresh air supply to the buildings will be significantly reduced by using an efficient heat recovery system. The heat recovery systems will utilise the thermal properties of the return air to transfer 'free' heat/cooling to the incoming fresh air supply. These will be controlled to minimise the demand for any heating, and cooling of the fresh air supply.

Heat recovery between the return/exhaust air, and outside air shall be provided on all supply, and extract units via a thermal wheel with efficiencies of 88%. The efficiencies will conform to the European Directive 2009/125/EC, which required increased efficiencies from 1st January 2018.

5.3.8. Low Energy Lighting

A full lighting installation will be provided throughout the landlord, and common areas of the buildings, generally comprising LED luminaires, with functional lighting. All luminaires will be provided with dimmable control gear (addressable) to suit its type and application. All landlord lighting will be controlled through the addressable lighting control system.

Lighting will be provided to the external areas, including public space at the ground floor, and on the external terraces. External luminaires will generally comprise suitably IP-rated LED luminaires to suit the architectural design. Luminaires will be provided with DALI-addressable dimmable control gear. Where proposed, external lighting will be controlled through the building lighting control, and management system, and minimised wherever possible to avoid light pollution. Lighting levels are listed in the next table.

Table 5.3-1 Applied lighting specification for the Proposed Development

System	Parameter	Applied Value
Lighting Efficiency: Non-domestic Areas	Commercial	Based on 400 Lux Display lighting 35 lm/crit watt
	Office Areas	5.0 W/m² Based on 500 Lux
	Reception Areas	5.5 W/m² Based on 400 Lux Display lighting - 35 lm/W
	Storage Areas	100 Lux & 110 lm/W
	Toilet Areas	200 Lux & 110 lm/W
	Shower Areas	200 Lux & 110 lm/W
	Circulation Areas	215 Lux & 110 lm/W
	Plant Areas	200 Lux & 110 lm/W
	Cycle Store	100 Lux & 110 lm/W
	Lift Lobby Areas	200 Lux & 110 lm/W
	Stairs	150 Lux & 110 lm/W
Lighting Controls	Transient Spaces	Presence Detection On/Off
	Occupied Spaces	Presence Detection On/Off Daylight Dimming Control

Note: All installed Lighting will be LED, and all-day lighting areas to have daylight dimming controls with local sensors with presence detectors. All transient areas will have presence detectors.

5.3.9. Automatic Monitoring & Targeting

The Building Regulations Approved Document L2A identifies that the provision of automatic monitoring and targeting with alarms for out-of-range values, can provide significant savings in energy consumption of the building services systems. A saving in energy consumption of 5% is awarded for complete installations that measures, records, transmits, analyses, reports, and communicates meaningful energy management information to enable the operator to interrogate and manage the energy it uses.

5.3.10. Power Factor Correction

The Building Regulations Approved Document L identifies that the provision of power factor correction to the building's electrical supply can provide significant savings in electrical consumption. A saving in electrical energy consumption of 1% is awarded for power factor correction to 0.9, and a saving of 2.5% awarded for power factor correction to 0.95 power factor. This Proposed Development intends to have a power factor correction of 0.95 as a minimum.

5.3.11. Efficient HVAC Parameters

The following design parameters were assigned to the base building heating, ventilation, and air conditioning (HVAC) systems to establish its annual CO_2 emission rate.

Table 5.3-2 applied HVAC Parameters for Main Central Plant, Non-Domestic Areas

System	Parameter	Applied Value
Cooling System Office	Seasonal Efficiency (SEER)	13.90
	Nominal Efficiency (EER)	4.20
Cooling System Reception/Retail [4]	Seasonal Efficiency (SEER)	13.90
	Nominal Efficiency (EER)	4.20
Heating System Office	Seasonal Efficiency (SCOP)	7.51
Heating System Reception/Retail [4]	Seasonal Efficiency (SCOP)	7.51

System	Parameter	Applied Value
Heating System WC Heat Pump	Seasonal Efficiency (SCOP)	4.60
Air Handling units (AHUs) – Office Space	SFP	1.50 W/l/sec (average value)
	Ventilation Heat Recovery Efficiency	88% (Thermal wheel)
	Demand Control Ventilation	Yes
Air Handling units (AHUs) –Showers	SFP	1.40 W/l/sec (average value)
	Ventilation Heat Recovery Efficiency	83% (Plate exchanger)
	Demand Control Ventilation	No
Electric Water Heater - DHW Toilets	Delivery Efficiency	100%
Pumps	Pump Type	Variable Speed with multiple pressure sensors
	DHW Controls	Timed Control
Electrical / Metering	Power Factor	Greater Than 0.95
	Lighting systems have provision for metering	Yes
	Automatic Monitoring of energy Data?	Yes
	Controls	Central Start & Stop Optimum Start & Stop Local time & temperature Control Weather Compensation Control

Note 1: The lean building, as per GLA assessment guidance, will provide space heating and DHW with the same system types as the actual building.

Note 2: Retail to be fitted out by tenant.

5.4. Low-Energy Design – Unregulated Energy

5.4.1. Introduction

Unregulated energy refers to 'plug loads' such as:

- Lifts, escalators.
- Refrigeration systems.
- Computers, laptops, printers, photocopiers, audio-visual equipment.
- Server rooms, and other electrical loads.

Unregulated energy use can account for a large portion of the total energy consumption within office buildings according to CIBSE TM54 – prediction of operational energy use. Therefore, to bridge the performance gap of design performance versus actual measured performance during operation of the building, it is important to address unregulated energy use as it is not considered under Approved Document Part L of the Building Regulations. This section summarises how the Proposed Development will control unregulated energy use and achieve an ambitious target of energy use intensity (EUI) target, which accounts for both regulated, and unregulated energy use.

5.4.2. Low-Energy Culture

Providing building users, and operators with practical guidance on the importance and methods of energy efficiency can lead to effective, cost-free reductions in energy usage, and carbon emissions. Savings can be expected in, for example:

- Operating comfort cooling systems efficiently.
- Lighting Energy: a culture of 'turn-it-off', providing task lighting wherever possible.
- Small Power: prefer electrical equipment with energy labelling, and avoiding monitors, and PCs etc. in standby mode.
- Cooling/Heating Energy: widening 'acceptable' temperature range.
- Vertical transportation: promote the use of stairs with lift-trimming strategy.

Training of operators and facility managers is particularly important to provide them with the skills and knowledge to implement and continue to improve an energy management programme.

The amount of energy that can be saved will be dependent upon the motivation of the occupants, and the effectiveness of the awareness programmes. The development will actively encourage a low energy culture as part of its building operation, and commercial leasing strategy.

5.4.3. Low-Energy White Goods

All white goods provided in the development, including washing machines, dryers, dishwashers, and fridge/freezers, must have a certified energy label. These labels will range from A to E, with E being the least efficient.

Ratings F&G have been banned since March 2024 for fridges, freezers, fridge-freezers, washing machines, washer dryers and dishwashers.

Information on the EU Energy Efficiency Labelling Scheme of efficient white goods will be provided to the white goods supplied by the developer.

5.4.4. High-Efficiency Vertical Transportation

The vertical transportation systems will be specified with energy-saving features intended to reduce energy use, both while lifts are moving and when in standby mode. Such measures can be particularly beneficial when applied to passenger lifts in large workplaces which commonly deal with high numbers of people moving in, out, and around the building. These measures typically include:

- Specification of modern VVVF drive systems.
- Quantity, size, and speed of passenger lifts optimised to meet agreed performance benchmarks and thereby minimise base energy load.
- Real-time monitoring of prevailing passenger demand and switching lifts in and out of service to minimise the energy consumption while maintaining specified performance benchmarks.
- Provision of energy-efficient lighting.
- Car lighting automatically switched off when cars are not occupied.
- Optimised dispatcher and drive control.

In association with the Vertical Transportation specification features indicated above, other measures may be considered, such as:

- Promote the use of stairs for single or two-floor travel to reduce lift use (which can be overridden for those unable or less willing to use the stairs).
- Implementing novel technologies, such as providing landing call stations with a “green” button, for an energy-efficient trip using energy optimisation algorithms, and a “blue” button, for a lift-performance call, with lifts being allocated according to waiting time or time to destination optimisation algorithms.

5.5. Be Lean – Carbon Emissions Reduction

Based on the above design parameters, a summary of the energy consumption, and CO2 emissions rate for the ‘Lean’ building can be seen in below in Table 5.5.1 and summarised in Section 1. The ‘Lean’ energy efficiency measures described here are calculated to reduce regulated carbon dioxide emissions of the Proposed Development by **23%**, compared to Part L2 2021. A summary of the energy consumption, and CO2 emissions rate for the Lean non-domestic buildings are based on the BRUKL reports within Appendix A.

Table 5.5.1: reported CO_2 emissions for the Proposed Development after the ‘Be Lean’ stage of the Energy Hierarchy for Non-Domestic Buildings.

Energy Planning – Greater London Authority guidance on preparing energy assessment	**Carbon Dioxide Emissions (Tonnes CO_2 per Annum)**		
	Regulated Energy	**Total CO_2 Reductions**	**Regulated Energy % Reduction**
Building Regulations 2021 Part L Compliant Development	61.8	-	-
LEAN - After energy demand reduction	47.4	14.4	23%

5.6. Camden EEA CPG Section 10 Review

This section has set out the energy demand reduction measures for the Proposed Development that have resulted in the stated performance at this stage of the Energy Hierarchy. As set out in Chapter 10 of the EEA CPG (paragraph 10.30), applicants are expected to demonstrate how sustainable design and construction principles have been incorporated. The areas in Table 5.6.1 (passive) and Table 5.6.2 (active) below are relevant to this section, and the location of compliance with these considerations is set out for clarity.

Table 5.6-1 LBC EEA CPG passive energy demand reduction considerations and where these items are addressed within this section, alongside a summary of outcomes

Energy Demand Reduction Consideration	**Compliance within this section**
Layout of uses	Refer to the Design and Access Statement
Design of windows and openings	Refer to the Design and Access Statement
Floorplate size and depths and floor to ceiling heights	Refer to the Design and Access Statement
Reducing internal heat gains	Refer to Section 5.3
Reducing the need for artificial lighting	Refer to Section 5.2 and 5.3
Limiting excessive solar gain	Refer to Section 5.2
Optimising natural ventilation	Refer to Section 6
Passive cooling	Refer to Section 6
Green infrastructure	Refer to section 11.9
Best practice levels of insulation	Refer to Section 5.2
Draught-proofing & air tightness	Refer to Section 5.2
Thermal mass	Refer to Section 5.2
Thermal buffers	Refer to Section 10
Renewable energy technology	Refer to Section 8 60m^2 of PV panels included within the Proposed Development design

Table 5.6-2 Camden EEA CPG active energy demand reduction considerations and where these items are addressed within this section, alongside a summary of outcomes

Energy Demand Reduction Consideration	Compliance within this section
Efficient ventilation	Section 5.3 and 10
Efficient cooling	Section 5.3 and 10
Efficient heating	Section 5.3 and 10
Efficient lighting	Section 5.3 and 10
Zoning, controls and sensors	Section 5.3 and 10
Efficient appliances and equipment	Section 5.4
Energy monitoring & building management systems	Section 5.3 and 9.1
Metering	Section 5.3 and 9.1 and Appendix C

6. Cooling & Overheating

6.1. Cooling Hierarchy

Policy SI 4 of The London Plan (2021) states that major development proposals should reduce potential overheating, and reliance on air-conditioning systems, and demonstrate this in accordance with the following cooling hierarchy:

Table 6.1-1 London Plan 2021 Cooling Hierarchy, and Proposed Development strategy

Cooling Hierarchy	Proposed Strategy
Reduce the amount of heat entering a building in summer through orientation, shading, albedo, fenestration, insulation, and green roofs, and walls.	The glazing ratio has been optimised through early-stage design analysis by setting onerous solar gains targets (BCO guidelines). The horizontal and vertical shading along with terraces and roof vegetation contribute to solar mitigation and reduce urban heat island effect.
Minimise internal heat generation through energy-efficient design.	Efficient lighting has been proposed to reduce heat gains from lighting.
Manage the heat within the building through exposed internal thermal mass, and high ceilings	Maximising the floor to ceiling height proposed to the office areas.
Passive ventilation	Open-able vents have been incorporated into the facade through levels 1-7 to enhance occupant well-being.
Mechanical ventilation	Highly efficient mechanical ventilation with efficient heat recovery is proposed for fresh air supply all year round.
Active cooling systems	Energy-efficient design through the use of all electric HVAC (VRF).

6.2. Overheating Analysis

The full thermal comfort assessment is included in Appendix D of this application document and is therefore not repeated in full here. The thermal modelling results demonstrate that the building design and services strategy of comfort cooling can deliver thermal comfort levels in occupied spaces in accordance with the criteria set out in The London Plan (Policy SI 4) as well as the GLA requirements to conduct a TM52 assessment.

Both policies require to be in line with CIBSE Guide A Environmental Design Table 1.5 by using Design Summer Year (DSY) weather file London DSY1, DSY2 and DSY3.

The report shows the scenarios assessed to determine the risk of overheating and thermal comfort conditions. The percentage of annual occupied hours that the operative temperature exceeds 25°C in offices and reception areas as well as retail in all the areas assessed, considers 3% as the maximum allowance to ensure thermal comfort conditions. The threshold is given by CIBSE Guide A.

All office areas comply with the criteria for weather scenario LHR 2020 50% DSY 1 when the cooling setpoint is 23°C. As specified by the M&E design, this set point sits within the band 24°C ±2, and the spaces pass with an average cooling capacity of 55 W/m^2 for all offices areas with a maximum cooling capacity of 95 W/m^2 required for level 9 in the DSY1 weather scenario.

A free-running building relying solely on natural ventilation scenario would not be able to reach adequate levels of thermal comfort (as outlined in CIBSE TM52 criteria for predominately naturally ventilated buildings) due to the deep floor plan of the building which reduces the ventilation effectiveness.

A detailed analysis can be found in Appendix D.

6.3. Active Cooling Demand

The GLA's Energy Assessment Guidance requires that developments report the active cooling demand predicted by the energy modelling compliance tool.

Cooling loads taken from compliance tools should only be referred to satisfy GLA's requirement of data collection for monitoring purposes, and it is not indicative of the designed cooling demand of the building. Those tools are used for compliance, with a rigid methodology, and the mechanical design will better inform the cooling demand within the occupied areas of the development.

The following measures have therefore been applied to reduce the cooling loads from outset:

- Optimised glazing ratio to significantly reduce solar gains and achieve adequate daylighting.
- External shading elements dimensioned to reduce solar heat gains to the building perimeter, and in particular the office accommodation.
- Consideration of surrounding buildings to cast shadows on the lower levels.

The active cooling demand for the Proposed Development as per 'Lean' BRUKL report (HVAC Systems Performance) is summarised in the table below:

Table 6.3-1 Active cooling demand – Proposed Development 'Lean' building – Part L 2021

Building	Area weighted average building Cooling Demand	Area weighted average building Cooling Demand
	(MJ/m²)	(MJ/year)
Actual	**110.6**	**1,372,048.2**
Notional	**318.3**	**3,948,518.7**

Table above shows a **65%** reduction in building cooling demand when comparing the actual building (the Proposed Development design) to the notional Part L 2021 baseline.

This can be attributed to the passive design measures such as optimised glazing ratio, shading elements, and to the high performing cooling systems integrated to the building, and for office spaces.

7. Be Clean – Heating Infrastructure

7.1. Introduction

This section outlines the feasibility of clean energy supply to the Proposed Development as required by the 'Be Clean' stage of the Energy Hierarchy.

After careful selection of appropriate servicing strategies, and plant selection, the design team agreed the scheme will primarily utilise a roof mounted VRF system to serve the building's heating and cooling demand and to not connect to the DHN.

7.2. District Heating & Cooling Networks

An assessment of the Mayor of London's Heat Map tool shows that there are no existing District Heat Networks (DHN) near the site. However, a review of proposed future DHN routes indicates that the Citigen network, operated by E.ON, is located in close proximity to the site, approximately 128 meters away. The design team was in dialogue with E.ON's energy officer to move forward with a carbon analysis to confirm the carbon and primary energy factors for the DHN as well the required decarbonisation plan.

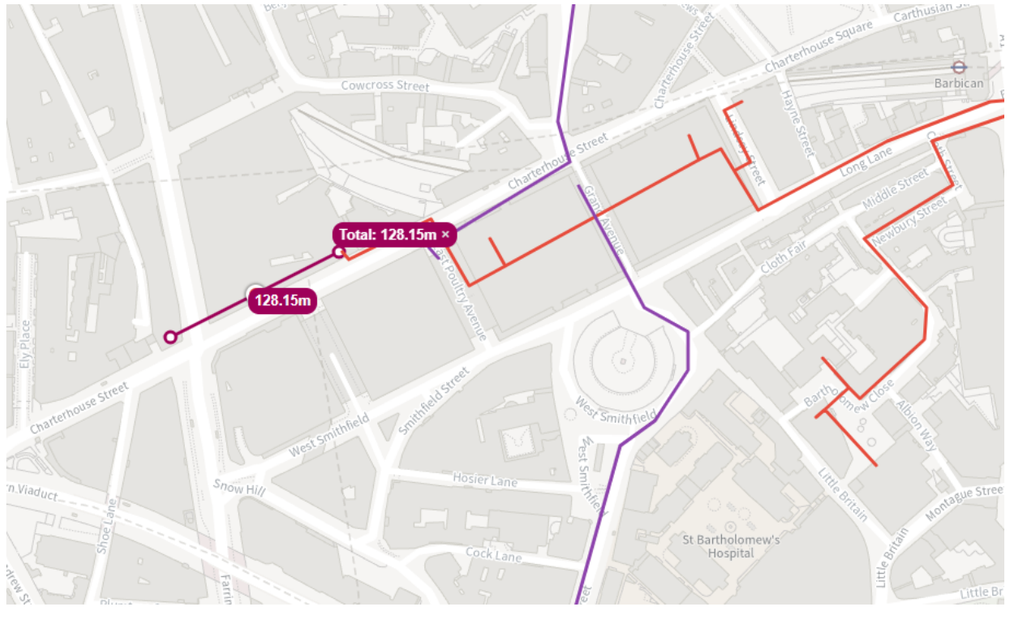


Figure 7.2-1 DH network in proximity of the Proposed Developed

7.3. Correspondence with DHN Provider (E.ON)

Based on initial discussions with E.ON, the DHN provider, crossing Farringdon Road (highlighted in green in Figure 7.3.1) was highlighted as a challenge, as there will be difficulties in installing piping along this route. The numerous services present in Farringdon Road significantly increase the difficulty and complexity of expanding across the area. These services are at the same depth where the piping would typically be placed and would need to be avoided, adding further complexity to the infrastructure. Please refer to Figure 7.3.2 for the correspondence with the provider.

Connecting to a district heat network can also significantly impact the EUI of a building. Since the DHN relies on heat generation using natural gas (boilers), it affects the EUI due to poorer emission factors. To target the EUI target set in the Draft New Camden Local Plan, an all-electric energy strategy was implemented at the Proposed Development. An evaluation of potential plant provision for a future DHN connection was conducted as part of the design process.

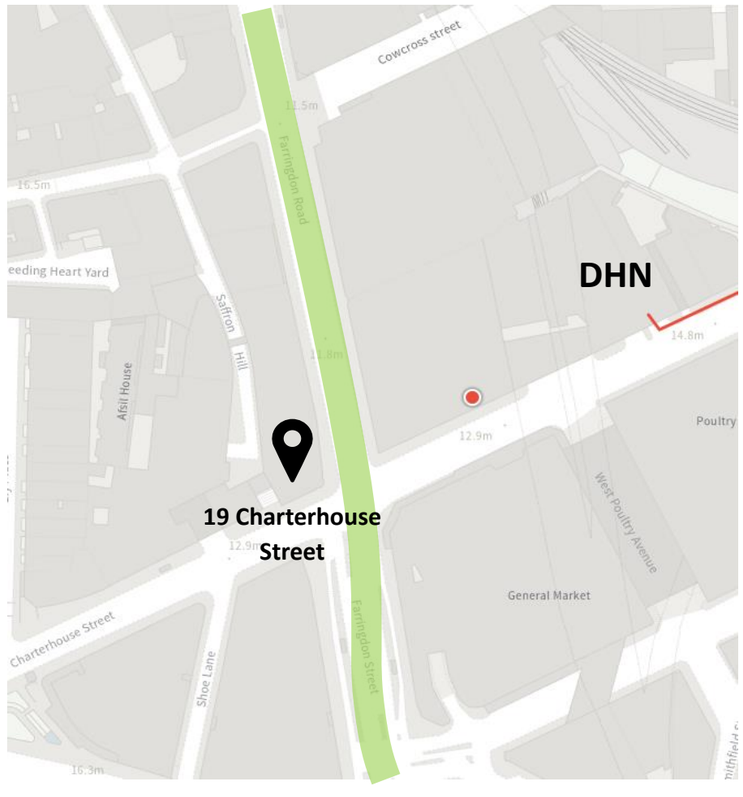


Figure 7.3-1 Location of the Proposed Development in relation to the existing District Heat Network (DHN), with Farringdon Road positioned between the two

A dedicated room has been set aside for the future DHN, should it become available and feasible to connect to. The proposed location is on the Lower Ground Floor. For detailed plan, please refer to Appendix G.

From: Melas, Apostolos <apostolos.melas@eonenergy.com>
Sent: 24 September 2024 15:37
To: Mohd Hamid, Asma
Cc: Amrania, Kartik; Vekinis, Avgoustinos; Potomska, Monika
Subject: RE: 19 Charterhouse Street - District Heating Connection

Hello Asma,

You are right, we have not expanded westwards due to the services in Farringdon road.
The number of services in Farringdon road significantly increase the difficulty and complexity of expanding across, as some of these services will be at a depth where we would normally put our pipes in.
These existing services need to avoided or diverted to ensure no disruptions, and the costs for diverting the services will not b under Citigen's scope. We ask the customer to take this item under their control, in terms of costs and time.
A detailed GPR scan survey can help to identify the existing services, which can do on behalf of you.

Also, under Farringdon road there is an underground river, which could potentially increase the complexity of infrastructure needed with the underground pipe. This would be subject to further studies for the existing area.

In regards to the equipment required in your building, the requirement is for a heat exchanger skid to be installed in the ground level, or a basement. Our primary pipe will come from the street, into your building and connecting to the skid. On the skid, there will be a small length of pipe and a flange to connect your secondary pipework.
Based on the heat peak demand of your building, and considering from another recent similar project, a footprint of minimum 3.5m x 3.5m (and at 2.5m height) will be needed for the heat skid. This can be confirmed once we have detailed information from you and our Engineering team.

Kind regards

Apostolos Melas
Sales Manager
E.ON City Energy Solutions
M: +44 (0) 7977 526170
Email: apostolos.melas@eonenergy.com

www.eon.com | Facebook | Instagram | LinkedIn | Twitter | Youtube

E.ON Energy Infrastructure Solutions
47-53 Charterhouse St
London
EC1M 6PB
District heating | Networks and infrastructure | E.ON (eonenergy.com)

From: Mohd Hamid, Asma <asma.hamid@sweco.co.uk>
Sent: Monday, September 23, 2024 5:29 PM
To: Melas, Apostolos <apostolos.melas@eonenergy.com>
Cc: Amrania, Kartik <Kartik.Amrania@sweco.co.uk>; Vekinis, Avgoustinos <avgoustinos.vekinis@eonenergy.com>; Potomska, Monika <monika.potomska@sweco.co.uk>
Subject: RE: 19 Charterhouse Street - District Heating Connection

Hi Apostolos,

Thank you for your response.

We understood that Citigen has not expanded the district heating network towards the west of the EON building due to the congestion on Farringdon Road. Please would you be able to advise further on this?

In addition to the above, we'd be keen to understand the plant requirements to be allowed for to incorporate district heating.

Once your design team have reviewed this, please could we set up a meeting to catch up on this?

Best regards,
Asma Hamid
Project Engineer

Sweco UK Limited | Maidenhead
Telephone +44 1628 598212

SWECO

For more information on how Sweco processes your personal data, please read here.

Figure 7.3-2 Correspondence with the DHN provider regarding connection with the Proposed Development

7.4. Be Clean – Carbon Emissions Reduction

The clean emissions are equal to the lean stage figures, for Part L 2021 methodology applies the same systems and carbon factors associated with the Be Lean Stage (i.e. heat pump systems fall within the 'Be Green' part of the Mayor's Energy Hierarchy).

8. Be Green – Renewable Energy

8.1. Considerations for LZC Technologies

Further energy, and carbon dioxide emissions savings could, in principle, be made through the adoption of renewable and low & zero carbon (LZC) technologies. This section provides an appraisal of the renewable energy technologies suitable for the Proposed Development as part of the 'Be Green' stage of the Energy Hierarchy.

The suitability of available technologies is sensitive to several factors, including site constraints, development footprint, surrounding environment, access limitations, and development type.

To this end, the following renewable energy technologies have been investigated to establish their suitability and feasibility.

Table 8.1-1 LZC application summary

LZC Technology	Description	Applicability
Wind Turbines	Wind turbines produce electricity directly from the energy in the wind. This is then fed into the buildings electrical system via a control gear. Two types of wind turbines are available: horizontal axis, and vertical axis. The former tends to be noisy and produce vibration. The latter are quieter in operation, and more suited to installation on buildings but are generally less efficient, and more expensive. Although wind turbines are a highly visible form of renewable energy, they can normally provide only a very small contribution to the total electrical consumption of buildings in the city and urban locations. Probably visually unacceptable in planning terms, there are also concerns that such a turbine would create unacceptable noise levels during the day, and night. Furthermore, at this stage, the flexibility in façade design is limited.	N
Solar Hot Water	Solar hot water panels must be in a generally south facing position, ideally at about 30° to the horizontal. If located vertically, the output is reduced by about 15%. The scheme investigated is based on installing a nominal active area of high efficiency (evacuated tube) solar hot water panels, accommodated on the roof of the building. Such systems are relatively low maintenance, are a proven technology, and are a visible indication of the development's green aspirations. Although efficient, and cost-effective in implementation, solar hot water systems can only offset a fraction of the domestic hot water demand for the site.	N
Ground Source Heat Pumps	The proposed building is a commercial office space, designed to balance heating, and cooling demand. The annual overall cooling load is unbalanced with the annual heating load due to the massing, and commercial use of the building. Therefore, there is no requirement to store energy, and hence a GSHP will not be suitable application as part of the energy strategy.	N
Aquifer Heat Pumps	The use of the London aquifer to reject heat to (in cooling mode), and to draw heat from (in heating mode) can reduce emissions from a development, depending on the number of boreholes, and the potential yield. In an open-loop aquifer-based heat pump system, boreholes are sunk into the chalk strata. Aquifer water is pumped up to the surface and stored temporarily in a tank. This water is usually at 12-14°C year-round. The water is passed through a heat exchanger where it heats or cools the condenser water circuit serving the heat pumps. The water is then pumped back into the aquifer. Boreholes are normally sunk in pairs, one abstraction, and one discharge. A licence from the Environment Agency is required to extract aquifer water. The difficulties of achieving acceptable separation on-site, the central London location of the development, and the distance from water sources would severely restrict the effectiveness of an aquifer system. Also given the relatively small contribution to the site compared with the benefits of the community energy system, it is not proposed to pursue this option for the Proposed Development.	N
Heat Pumps	Air Source Heat Pumps systems are typically all-electric systems that use heat pumps to provide space heating and cooling to building spaces. They can serve multiple zones in a building, each with different heating, and cooling requirements by simultaneously providing low temperature hot water (LTHW) and chilled water (CHW) to be distributed on demand. When these units are used to provide space heating, air-source heat pumps (ASHP) work similarly to a fridge, but in reverse. It extracts heat from the outside air in the same way that a fridge extracts heat from its inside.	**Y**
Gas Powered Fuel Cells	Fuel Cells are highly efficient electrochemical energy conversion devices. A fuel cell consists of stack combined with sub-systems to form a functional energy solution. Fuel cells, when running on Hydrogen, combine Hydrogen, and Oxygen to produce pure water plus high-grade electric energy with no associated carbon emissions. Therefore, they offer the potential to provide a	N

LZC Technology	Description	Applicability
	zero-carbon solution when running on hydrogen generated and stored via renewables. Natural gas-powered fuel cells instead, convert the chemical energy from the methane in natural gas into electricity through a chemical reaction with Oxygen. A fuel-cell principal output is electricity, along with the harvest of waste heat, which can be utilised in building as a combined heat, and power (CHP) plant. The fuel cells main advantage in comparison to internal combustion driven CHP is their high electrical efficiency. Currently, available fuel cells can reach up to 48% with 200 kW size units. (Minimum single module). The cost of the fuel cells is high as they are, despite numerous installations in London, not mass-produced. The application of fuel cells is limited by the following: • High capital purchase costs (units not mass-produced to be cost-effective) in comparison to internal combustion engine based (IC) CHP • Minimum unit size approx.200kW per unit • Significantly larger footprint in compares to internal combustion engine CHP. • Extensive ancillary support units external to the Fuel Cells. • Slow response, and start-up Associated investment costs are higher compared to other technologies. As above, the Proposed Development is under a requirement to connect to the DH network.	
Photovoltaics	Photovoltaic panels convert solar energy into electricity and are best placed in an unobstructed location, generally south-facing at 30° inclination, ideally. When located vertically, the output can be reduced by about 15%. PV panels provide a visible green label for the building and make use of space at the top of the buildings.	Y

8.1.1. Heat Pumps

Please refer to the table above for benefits of an all-electric heat pump system. The scheme will primarily utilise a roof mounted VRF system to serve the building's heating and cooling demand and to not connect to the DHN. The system efficiencies are stated in Table 5.3.2 of this report. Please refer to Section 10 for further detail of the energy strategy.

8.1.2. Photovoltaics (PV)

Photovoltaic panels convert solar energy into electricity and are best placed in an unobstructed location, generally south-facing at 30° inclination, ideally. When located vertically, the output can be reduced by about 15%. PV panels provide a visible green label for the building and make use of space at the top of the buildings.

To achieve carbon reductions, photovoltaic panels will be installed at roof level to serve the landlord within the building, as follows:

- 23 PV panels over circa 60 sqm

The electricity produced by PV panels will be fed to the building and used to meet part of the landlord energy demand.

Based on the current design, the PVs generation profiles would be likely compatible with the building electric load, and the share of electricity produced on-site is relatively small, energy storage by means of batteries is not considered for this development. This will eliminate the environmental costs related to battery manufacturing, and end of life disposal, for the benefit of building's sustainability.

The installation of photovoltaic (PV) panels may be constrained by several factors, including the need for access and maintenance throughout their lifecycle, available plant space on the roof, and the incorporation of green roofs, planting, and accessible terrace areas, all of which are essential components of the Sustainability Strategy for this development. Although modifying the roof and adding additional floors can create more usable space, it is important to balance this space across various requirements while considering sustainability goals and occupant aspirations. Considering the challenges mentioned, the provision for PVs has been maximised. For a detailed indicative PV layout please refer to Appendix F.

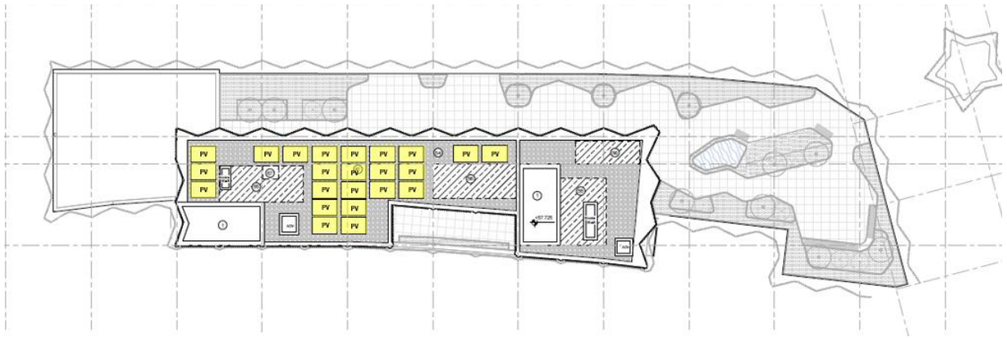


Figure 8.1-1 Indicative PV layout

8.2. Be Green – Carbon Emissions Reduction

Based on the above design parameters, a summary of the energy consumption, and CO_2 emissions rate for the 'Green' stage at the Proposed Development are shown in tables below.

The 'Green' measures described reduce the regulated carbon dioxide emissions of the commercial areas by **8%** against Part L2A 2021. Please refer to Sections 1.1 and 1.2.

Table 8.2-1 Reported CO2 emissions for the Proposed Development after each stage of the Energy Hierarchy for Non-Domestic Buildings.

Energy Planning – Greater London Authority guidance on preparing energy assessment	Carbon Dioxide Emissions (Tonnes CO_2 per Annum)		
	Regulated Energy	Total CO_2 Reductions	Regulated Energy % Reduction
Building Regulations 2021 Part L Compliant Development	61.8	-	-
LEAN - After energy demand reduction	47.4	14.4	23%
CLEAN – After Clean Technology	47.4	0.0	0%
GREEN - After Renewable Energy	42.4	5.0	8%

Table 8.2-2 Regulated CO2 emissions savings for the Proposed Development from each stage of the Energy Hierarchy for Non-Domestic Buildings.

Non-domestic areas (Part L 2021)	Regulated Carbon Dioxide Savings	
	(Tonnes CO_2 per annum)	(%)
Savings from reduced energy demand	14.4	23%
Savings from Clean Technology	0.0	0%
Savings from renewable energy	5.0	8%
Total Cumulative Savings	19.4	31%
Total Target Savings - GLA's Target	42.4	-

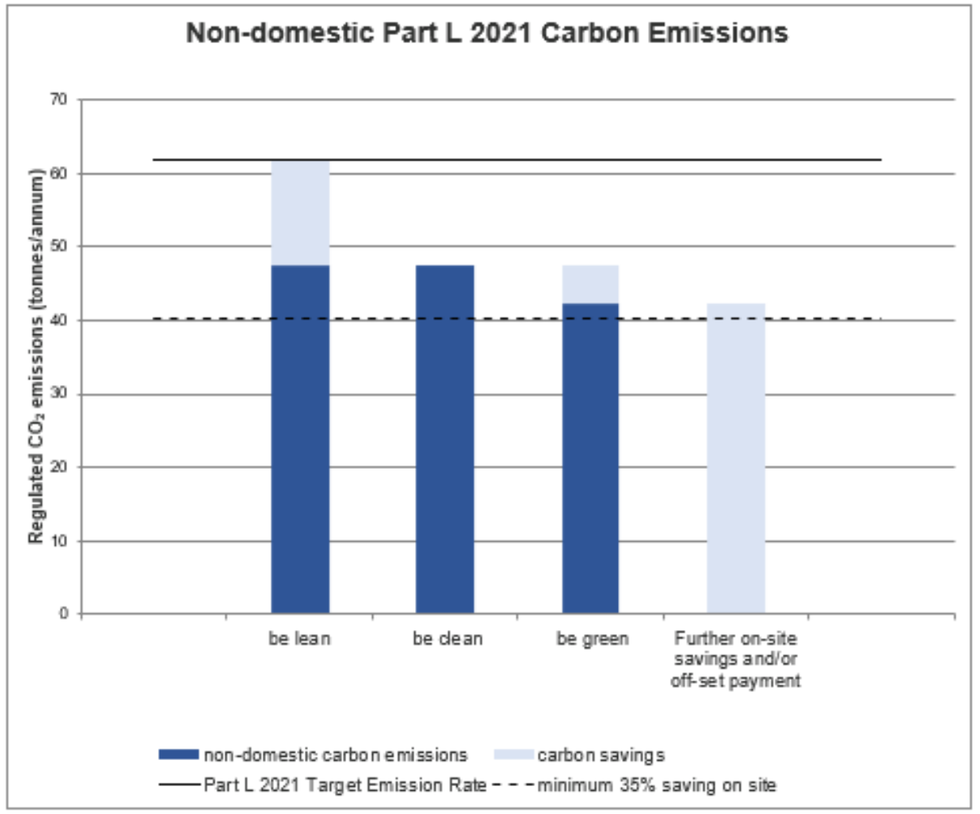


Figure 8.2-1 Reported CO2 emissions for the Proposed Development after each stage of the Energy Hierarchy for Non-Domestic Buildings

9. Energy Use Intensity (EUI)

9.1. Importance of EUI

The gap between predicted and actual operational energy of new buildings is acknowledged to be significant. Part of the reason for the energy performance gap in the United Kingdom is that buildings are traditionally designed only to show compliance with the Building Regulations, rather than to target actual energy efficiency through a robust and detailed design for performance exercise.

Figure 9.1.1 shows a comparison of the energy breakdown estimated following both the Building Regulations Approved Document Part L2 and CIBSE TM54 methodology, and the actual building metered data.

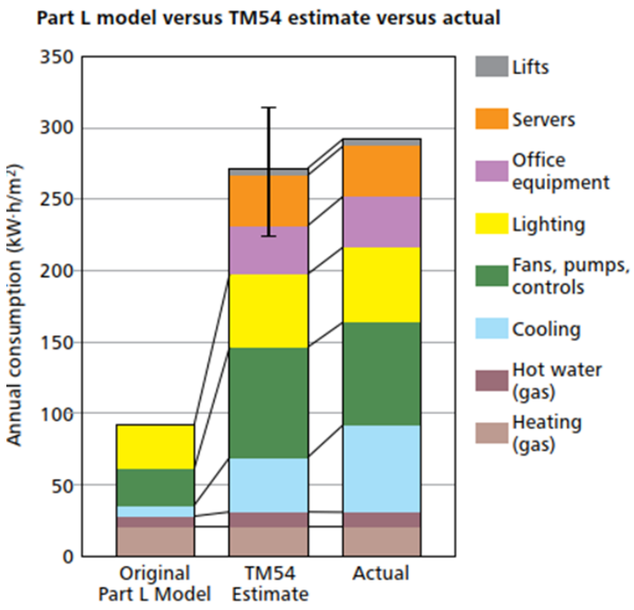


Figure 9.1-1 Example comparison of Approved Document Part L2A model and calculations of operational performance for a case study building (CIBSE TM54)

One of the main reasons behind the difference between Part L2 calculation and the monitored data is that compliance calculations are subject to standardisations created for simplification and comparability purposes. For instance, Part L2 calculation uses standard inputs for operational and occupational hours, as well as weather tapes based on old historic data that will be different from the external conditions in which the building will operate. Secondly, the compliance calculation excludes a large set of energy uses such as servers, small power, lifts and escalators, catering, external lighting etc.

9.2. CIBSE Methodology

A high-level assessment of operational energy performance has been undertaken for the Proposed Development, utilising the principles of modelling from CIBSE Guide TM54 and certification schemes such as NABERS UK. In terms of project design stages, the development has only recently reached the conclusion of RIBA Stage 2, and therefore with the detail available to the assessor at the time of application, this is the most appropriate type of assessment to undertake. The modelling provides a guide as to where the whole building operational energy might sit.

The building energy will be split into two distinct parts, “Base Building Services” for the landlord energy and “Tenant Services” for the end-user energy consumption, as shown in the Figure 9.2.1, while Figure 9.2.2 summarises the CIBSE TM54 methodology for the evaluation of building energy uses, including a summary of the required actions at each step.

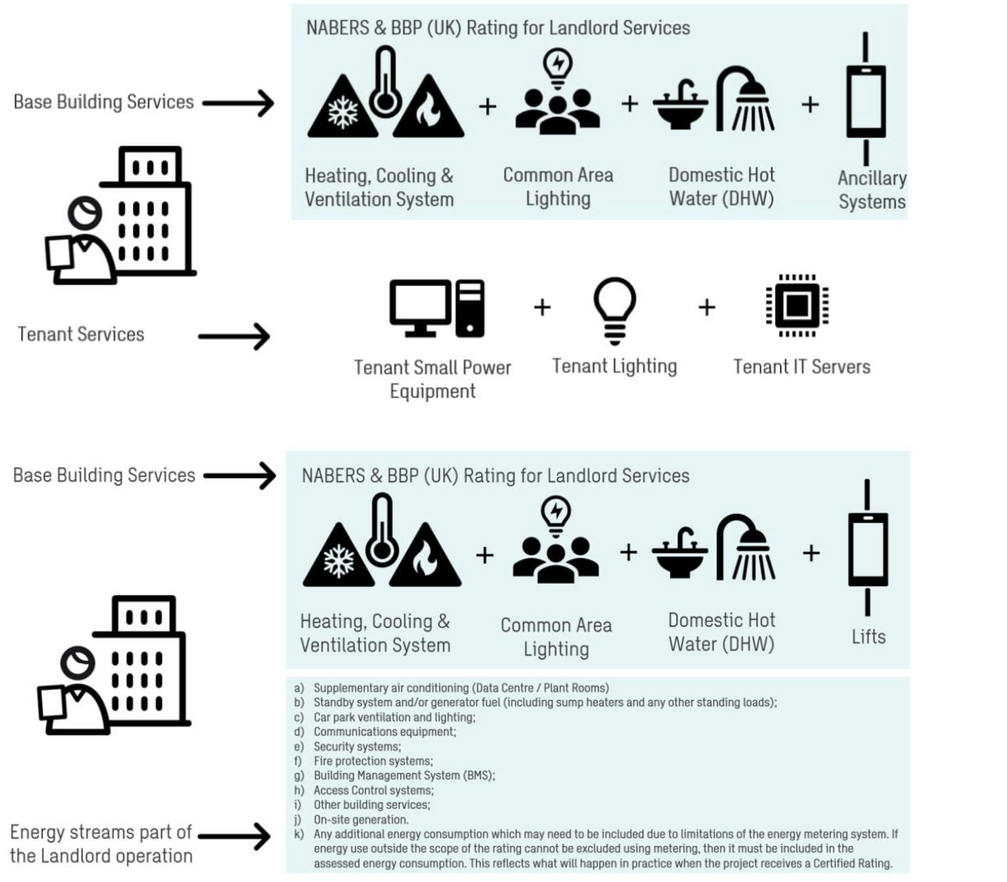


Figure 9.2-1 Visual representation of the NABERs and BBP proposed building rating system

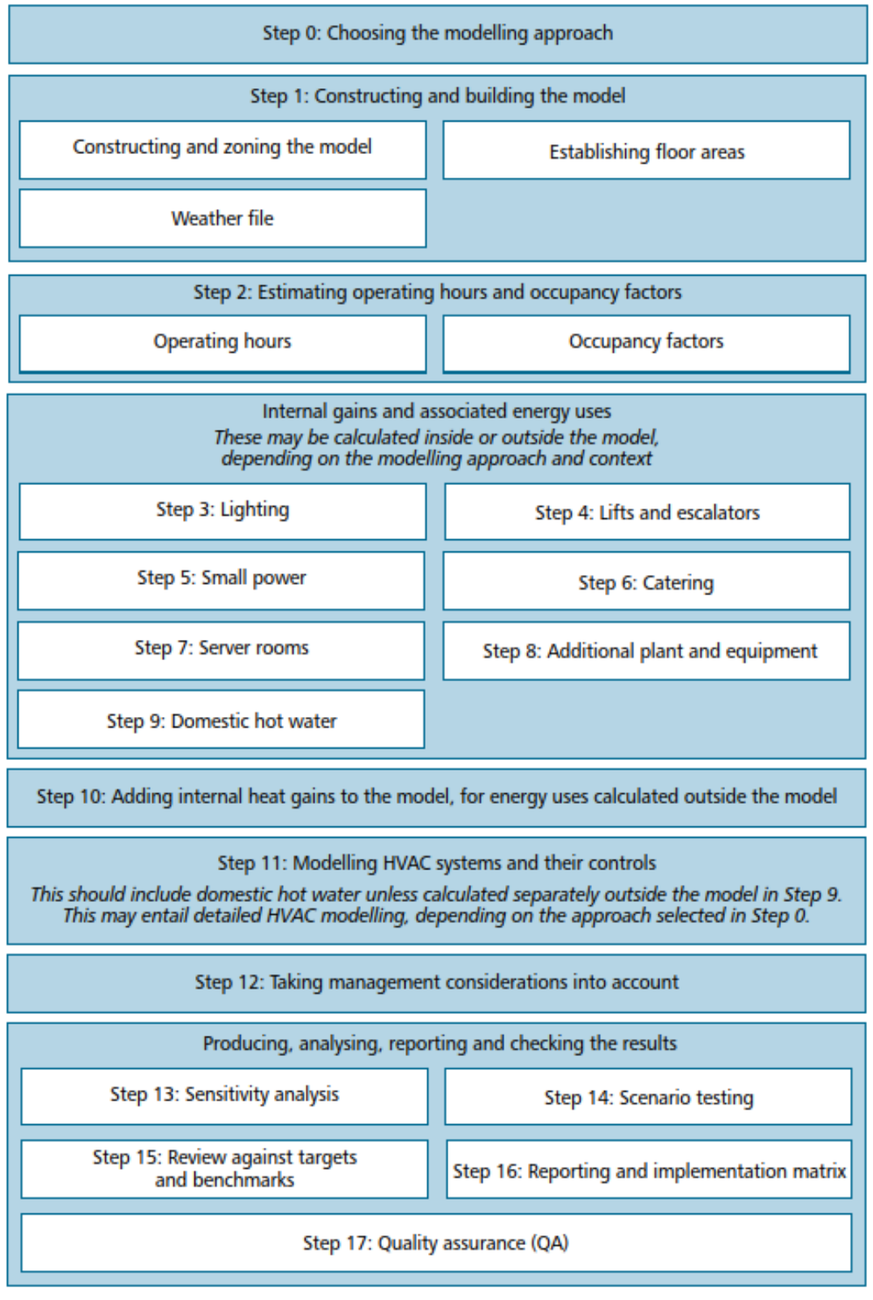


Figure 9.2-2 CIBSE TM54 Methodology to evaluate operational energy use at the design stage

The approach used for this project combines a detailed modelling of the main systems in IES Apache HVAC. However, external calculations have been performed to quantify end uses that are not able to capture in the DSM software. Some observations are highlighted below:

- The energy consumption of the main HVAC equipment – including chillers, boilers, heat pumps, air handling units, and circulating pumps – is calculated within the ApacheHVAC model. The performance characteristics and control strategies for this equipment, as input into the DSM, are based on the latest design stage documentation, including equipment schedules, selections, BMS design operations, and mechanical and electrical schematics. When this information is not available, typical standard equipment performance and controls are assumed.
- Lighting consumption has been calculated based on the lighting power density for each space (office areas, reception, toilets, showers, circulation, stairs, and plants) provided from the design team, and the occupancy schedules based on NABERS benchmarks profiles.
- Extract fans energy has been calculated based on the required air changes levels, occupancy, and systems schedules and SFPs of the selected fans.
- Lifts energy consumption has been calculated in line with the NABERS Guide to Design for Performance, as recommended in Section A.4
- Other auxiliary energy demand – such as security/CCTV equipment, fire alarm systems, associated BMS/UPS loads, emergency lighting, lighting controls, external lighting, trace heating and booster pumps – have been calculated outside the thermal model. For these, collected information from client and design team, as well assumptions related to similar legacy projects, were used for the calculations.

At this stage of the process, the energy modelling constitutes a high-level analysis using the principles of CIBSE Guide TM54 and NABERS best practices, covering both base build/landlord and tenant energy.

9.3. Results

The Energy Use Intensity (EUI) is a measure of the total energy consumed in a building annually. It includes both regulated and unregulated energy but does not include energy use from electrical vehicle charging or any reductions as a result of on-site renewable energy sources. The results from the high-level operational analysis can be found in the table below.

Table 9.3-1Table to show the estimated whole-building operational energy performance of the Proposed Development at application stage in line with GLA's Be Seen methodology

Building type	EUI (kWh/m²/year) GIA Excluding renewable energy	Space heating demand (kWh/m²/year) GIA Excluding renewable energy
GLA Target – Offices (GIA)	55	15
19 Charterhouse (GIA)	78.93	3.92

Where a Whole Life Carbon Assessment (WLCA) is provided with this application, the results of this exercise are also reflected in the B6 module of that exercise, in accordance with the requirement of the London Plan Guidance related to WLCA.

GLA has implemented a mandate to report the Energy Use Intensity (EUI) and space heating demand of developments. The targets set by GLA for offices are outlined in Table 9.3.1. While it is not mandatory to meet these targets, it is necessary to report on them and provide a justification for any deviations.

The EUI target of 55 kWh/m^2 **GIA** recommended by GLA (taken from LETI Climate Emergency Design Guide and reported as 2035-2050 Paris Proof Target by UKGBC), is equivalent to targeting Base Building operational energy of 35 kWh/m^2 (**NIA**)/yr. LETI target is extremely ambitious and poses radical challenges to building services design and building operation.

Two of the main limiting factors are likely to be the thermal performance targets. Applying Passive House Standards could help achieve these targets but would significantly reduce the floor areas due to wide build-ups. Additionally, the non-feasibility of more efficient energy systems, such as ground source heat pumps, would further impact the efficiency of heating and cooling energy.

Another limiting factor is the tenant loads, which are currently unknown due to the present stage of the design and are based on DfP default assumptions. Engaging a dedicated tenant could provide opportunities to further enhance the overall building's Energy Use Intensity (EUI).

Table 9.3-2 Table to show the estimated whole-building operational energy performance of the Proposed Development at application stage.

Landlord/Base Build EUI kWh/m^2/year (GIA) (reported in GLA template as 'regulated')	**Tenant EUI (excluding retail) kWh/m^2/year (GIA) (reported in GLA template as 'unregulated')**
37.24	41.69

10. Energy Strategy

10.1. Proposed Development Energy Strategy

The development will be constructed as a shell and core, with base building services designed to allow for the fit-out of lettable office spaces to either category 'A' or category 'B' specifications once a tenant is secured. The design team will undertake the category 'A' fit-out to ensure spatial compatibility.

The landlord's plant will feature on-floor air handling units (AHUs), with two units per floor on Levels 01-07 and a single unit on Level 09 serving both Levels 08 and 09. These AHUs will be housed in dedicated, acoustically insulated plant rooms. Each unit will include integrated heat pumps to regulate air temperature, allowing for heating and cooling that will be distributed to the office floors via a displacement system.

Additionally, Variable Refrigerant Flow (VRF) units will be installed at roof level to provide heating and cooling to the perimeter areas of office tenancies and landlord spaces as needed. Two VRF units will be allocated per floor, with at least one extra unit designated for landlord areas. BC control units will serve as an interface between the outdoor unit and the indoor terminal units, with these controls located on the respective floors they serve.

The current strategy for the offices is based on a hybrid displacement system. It intends to keep new, and stale are separated and involves introducing the air at low speed directly into the occupied zone at a temperature lower than the room temperature. Displacement ventilation is a passive mechanical cooling strategy whereby the supply air spreads across the floor forming a "reservoir" of cool air. When this cool air gets in contact with heat sources (particularly people and equipment such as computers) it gets warmer and therefore rise up, maintaining temperature comfort conditions within the occupied zone.

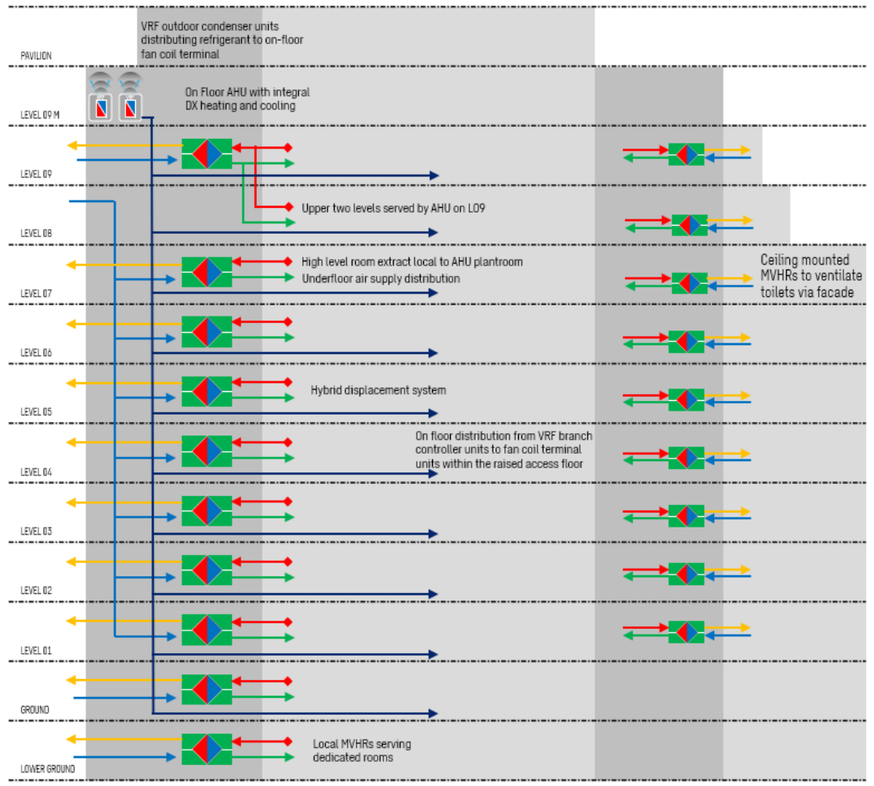


Figure 10.1-1 Energy strategy diagram for 19 Charterhouse Street

11.Sustainability Statement

11.1. Sustainable Development & Context

11.1.1.Introduction

The Sustainability Statement for the Proposed Development has been prepared to meet the requirements set out in the Camden Local Plan (2017) and the Energy Efficiency & Adaptation Camden Planning Guidance (2021). According to Policy CC2 on Adapting to Climate Change and Chapter 10 (paragraph 10.29), it states that:

"Any development involving 5 or more residential units or 500 sqm or more of any additional floorspace is required to demonstrate the [policy requirements of CC2] in a Sustainability Statement".

As the Proposed Development provides 3,962 m^2 GIA of additional floorspace across the building (accounting for infills as well as extensions), a Sustainability Statement is required.

This section should be read in conjunction with the Energy Strategy as set out in Sections 1-10 of this report, as the key requirements and considerations set out within Paragraph 10.30 (and its concurrent table of considerations and measures) are covered both within this Sustainability Statement and throughout the earlier sections of this report. Section 2 should be read and understood to provide site-specific context for some of the performance and design decisions that have resulted in the sustainability and energy performance stated within this document.

11.1.2. Proposed Development Sustainability Strategy

The Proposed Development aims to set a benchmark for long-term sustainable development of commercial refurbishments in LBC. Our proposal for the reinvention and reinvigoration of the Site set out within this report, underwritten by key principles such as a whole-life-cycle approach and delivering a broad scope of sustainability benefits beyond carbon and energy, enables the demonstration of strong intent for the future climate resilience of the Site.

The sustainable design, construction and operation principles embedded in our approach to the Proposed Development form a key element of the wider project objectives and aspirations, which are set out in the Design & Access Statement. This includes the three core principles of our regenerative approach to the Site, which focus on:

- Co-evolving with nature.
- Being a good ancestor.
- Creating a just space for people.

The expanded Venn diagram from the Design & Access Statement is also included here, as shown in the following figure, focusing on regenerative approach to design, construction and operation.

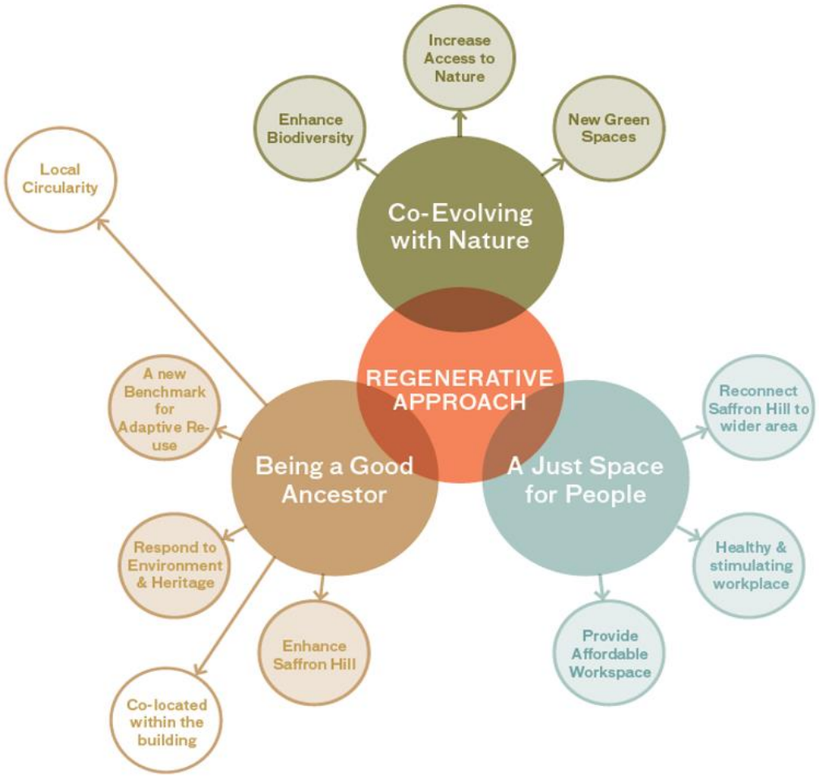


Figure 11.1-1 Expanded Venn diagram of the project objectives for the Proposed Development (Source: DSDHA)

One of the core principles of the Proposed Development is to focus on retention of the existing structure, exploring opportunities for insitu reuse. The Proposed Development successfully achieves this, retaining 42% by mass of existing materials, focusing on structural materials. A condition and feasibility study in compliance with EEA CPG Chapter 9 has been undertaken, which establishes the basis for reuse of 100% of the foundations and other various existing building elements and materials. This focus on retention has also realised strong upfront embodied carbon performance at application stage compared to GLA Benchmarks, with a reported impact of **907 kgCO_2e/m^2 GIA A1-A5** (including 27 kgCO_2e/m^2 GIA A1-A5 of contingency margin).

The proposals include replacement of the façade with a new, high-thermal performance elements and replacement of the existing MEPH systems to deliver a 'fabric first', 100% electric HVAC development that is able to aspire towards Paris proof energy targets and optimise long-term energy consumption and operational carbon emissions. Systems are optimised for future interrogation and opportunities for long-term optimisation, backed by application of energy performance certification schemes such as NABERS UK and detailed Design for Performance modelling. The reported **Energy Use Intensity (EUI)** as part of the Be Seen reporting at application stage is **78.83 kWh/m^2/yr. (GIA)** whole-building. Please refer to section 9 of this report for comparison against GLA benchmarks.

Beyond energy and carbon emissions, the Proposed Development successfully addresses other key sustainability principles and LBC policy requirements such as strong performance in urban greening and biodiversity, metrics of circularity and reuse, water efficiency and recycling and surface water runoff management. Key sustainability outcomes are balanced against one another to achieve the optimal holistic design for the site, centred on the regenerative approach. The table below summarises the key sustainability targets for the Proposed Development and how the proposal is performing against these targets at application stage.

Table 11.1-1 Project aspirational sustainability targets for 19 Charterhouse Street and summary of application stage performance against these targets

Sustainability Item	Project Target	Application Stage Performance
Embodied Carbon - Upfront	600 $kgCO_2e/m^2$ GIA A1-A5	907 $kgCO_2e/m^2$ GIA A1-A5*
Embodied Carbon – Life Cycle	970 $kgCO_2e/m^2$ GIA A1-A5	1,622 $kgCO_2e/m^2$ GIA A1-A5*
Retention of existing materials	Maximise	42%
Energy Use Intensity (EUI) – Base Building	55 kWh/m^2/year (GIA)**	37.24 kWh/m^2/year (GIA)***
Energy Use Intensity (EUI) – Whole Building	90 kWh/m^2/year (GIA)**	78.93 kWh/m^2/year (GIA)***
BR Part L 2021 - LEAN	≥15%	23%
BR Part L 2021 - GREEN	≥20%	8%
BREEAM	BREEAM ‘Excellent’ with aspiration for ‘Outstanding’	BREEAM Pre-Assessment in Appendix E shows ‘Excellent’ rating with 80.89% score
Urban Greening Factor	0.3	0.3
Biodiversity Net Gain	>10%	Significantly greater than 10%
Demolition Waste	>95% diverted from landfill	98%**
Demolition & Strip Out Material Reuse & Recycling	90% of demo & strip out waste to be reused or recycled	As per aspirational target**
Construction Waste	6.5 tonnes/$100m^2$ GIA & 95% diverted from landfill	11.1 tonnes/$100m^2$ GIA & 90% diverted from landfill **

**It should be noted that the application stage results are reflective of a RIBA Stage 2 level of design detail and therefore further optimisation of the application-stage performance is expected during the latter project stages prior to practical completion of the Proposed Development. This particularly impacts modelling tasks such as WLCA and Design for Performance energy models, which use the limited available detail at early stages and therefore make set assumptions and include contingency/margins. It is unlikely that these metrics reach the aspirational targets at application stage as they require future optimisation and supply chain/construction input to verify, and therefore these metrics represents a development ‘baseline’ position at this stage.*

***targets in line with UKGBC’s publication: Net zero carbon: energy performance targets for offices, Table 1 which aligns with UK NABERS rating of 5 stars.*

****aspirational project target only as not yet possible to verify due to stage of project, further calculations to take place at next design stages.*

Additional detail on these aspirational targets is included across the Energy Strategy, this Sustainability Statement and the specific appendices related to various calculations such as the WLCA and the Part L modelling outputs.

11.2. Sustainability Certifications

The BREEAM assessment is a key component of the Proposed Development Sustainability Strategy, aligning specific credits with the project's energy and sustainability objectives. It provides a framework for sustainable development and a comprehensive evaluation of overall sustainability performance. With a focus on design intent, BREEAM can also act as a timeline management tool, establishing deadlines for design information in accordance with the RIBA Plan of Works and prioritising early actions before the end of RIBA Stage 2 to ensure the timely integration of sustainable practices.

The Proposed Development project involves remodelling and refurbishing of the existing site into flexible office spaces along with a new ground floor entrance lobby and a series of retail and affordable jewellery units located on both the lower ground floor and ground floor. The proposal will seek to retain as much of the existing structural elements as possible, whilst rationalising the existing three cores into one efficient core that services all levels of the proposals. Existing structural piles, internal and facade columns and ribbed concrete slabs will be retained, infilling the existing core locations with appropriate structural systems.

As a result of the significant structural façade and new extension a BREEAM New Construction V6.1 scheme has been chosen for the Proposed Development, even though there is a significant element of retention for existing structure. While some credits may be more difficult to achieve, others (such as Mat01 Life Cycle Assessment) will be more straightforward, balancing the credit return. For this reason, the 2018 New Construction V6.1 scheme was chosen.

The majority of the area uplift comes from the extension floors at the top of the Proposed Development. The BRE has confirmed that for larger projects, where the extension is greater than 500 m^2 NIA a single New Construction assessment can be completed (BREEAM Technical Manual SD5079 2023). A minimum of BREEAM 'Excellent' has been targeted for the scheme, in accordance with CC2 of the Camden Local Plan (2017) and CC10 of the Draft New Camden Local Plan (2024). The appended BREEAM Pre-assessment Tracker (Appendix E) indicates a targeted score of 80.89%, exceeding the minimum requirement for ‘Excellent’ by just over 11%, with a potential future score of 90.27%.

Chapter 11 of the Camden Energy Efficiency & Adaptability CPG (EEA CPG) mandates that the proposed development achieves 60% of the Energy and Water Credits, as well as 40% of the Material Credits. The proposed development exceeds these requirements with:

- 76% of Energy credits targeted for the Office.
- 77% of Water credits targeted for the Office.
- 50% of Material credits targeted for the Office.

The targeted Energy credits include ENE04 and the BREEAM Low and Zero Carbon Feasibility Report, as highlighted in Section 5.5 of the EEA CPG, which is included in this submission. Additionally, the proposed development aims to achieve a minimum of 3 credits under WAT01, exceeding the minimum standard for Excellent as described in Section 5.55 of the Camden Local Plan (2017) and required by Policy CC9 of the Draft New Camden Local Plan (2024).

11.3. Energy & Operational CO_2 Emissions

The operational energy and associated CO_2 emissions information can be observed within the Energy Strategy and in particular within the following sections of this report and its appendices:

- **Section 1:** summary of Part L 2021 site-wide performance.
- **Section 5:** passive and active design measures and performance (particularly important given the context of façade retention for the Proposed Development).
- **Section 9:** EUI performance for base build, tenant and whole-building.
- **Section 10:** energy strategy summary.

Further detailed studies and reviews of the operational energy performance of the building will take place at RIBA Stages 3 and 4 of the design process, points at which we have not yet reached. The results within this application document represent high-level modelling using the rules of key industry methodologies to estimate energy consumption using the limited detail available at the time of submission.

11.4. Operational Water Consumption

Minimising water consumption is an important aspect of sustainable design. Application of BREEAM plays an important role in steering the project towards low operational water consumption, and therefore credits have been selected accordingly to support this approach. This section covers the water conservation part of the Table provided in EEA CPG Chapter 10 Paragraph 10.30 (efficient use of water and reuse of water).

A minimum of 3 no. credits have been targeted for the office BREEAM assessment for the Proposed Development. This is typically achievable using low-flow and water efficient sanitaryware. Sweco would advise that the table below sets out the minimum performance requirements for each relevant item to achieve the 3-credit mark.

The table below shows the minimum requirements for water efficiency of sanitary components.

Table 11.4-1 Proposed Development's target water efficiency for installed sanitaryware and water consuming equipment for potable water

Water Fittings	Target Capacity/Flow Rate	Units
WCs	3.75	Effective flush (litres)
Wash hand basin taps	4.5	Litres/min
Showers	6.0	Litres/min
Urinals	1.5	Litres/bowl/hour
Urinal (1 urinal only)	2	Litres/bowl/hour
Kitchen tap (kitchenette)	6	Litres/min
Cleaners sink tap	5	Litres/min

The following will also be included within the design & construction of the Proposed Development, supported by the BREEAM credit targets:

- Compliant metering and monitoring systems in line with BREEAM Wat02 requirements.
- Water leak detection, alarmed and connected to BMS.
- Sanitary shut-off devices to WC areas on office floors.
- Management of unregulated water consumption including management of irrigation systems for planting at L04 and L05.

11.5. Flood Risk, Water Management & Drainage

11.5.1. Flood Risk Assessment

A Flood Risk Assessment (FRA) (ref. DMAG-2352-FRA) has been conducted for the Proposed Development. This is included within the wider planning application documentation, with the findings summarised here.

Based on the Environment Agency's "Flood Map for Planning (Rivers and Sea)", the site is located within Flood Zone 1 - an area assessed as having a low probability of flooding (less than 1 in 1,000 annual) from rivers and sea. The location of the Site in reference to the Environment Agency's floor map is shown in the figure below.

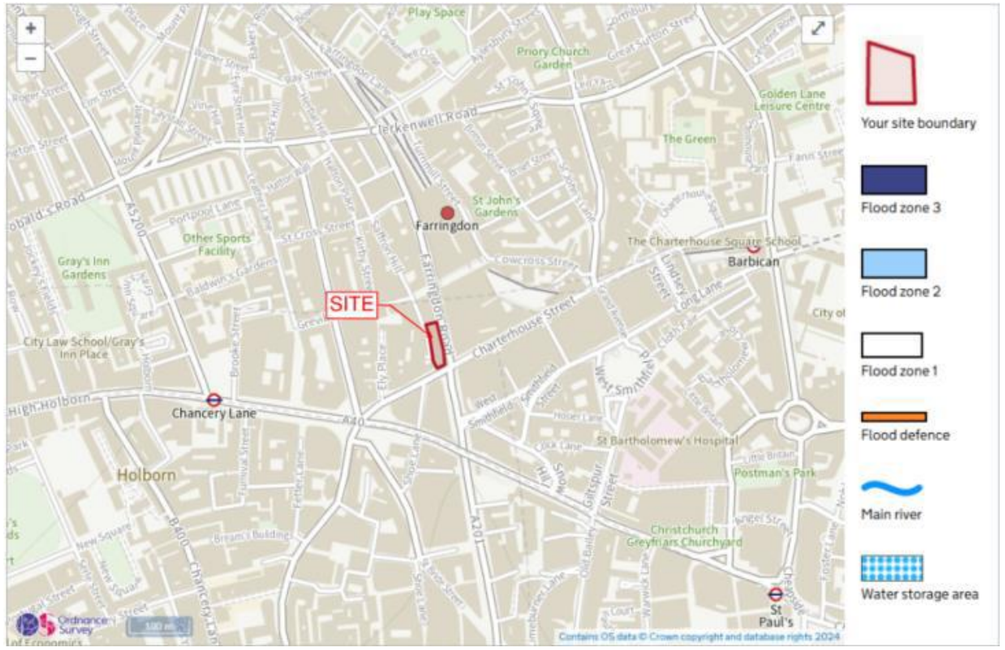


Figure 11.5-1 Location of the Site in reference to the Environment Agency's flood map & zones

The FRA takes into account the London Borough of Camden Strategic Flood Risk assessment material within the context of confirming the probability of flooding for the Proposed Development. Section 4 of the submitted FRA notes that the surface water flood map provided by the EA (Figure 11.5.1) indicates the Site has a very low risk of flooding from surface water. However, there is potential for surface water flooding on the surrounding highways, detailed as follows:

- high risk of surface water flooding at the southern end of Saffron Hill
- low risk of surface water flooding at Farringdon Road
- very low risk of surface water flooding at Charterhouse Street

Since, the Site´s surrounding highways have different risks of flooding from surface water, the drainage system in the post-developed Site will be designed to contain up to the 1 in 100-year event with the inclusion of 40% climate change as well as incorporate appropriate SuDS to reduce and slow down runoff from the development and reduce flood risk further. This will ensure that the development does not increase flood risk both on and off site and will return capacity to the receiving sewers.

11.5.2. Sustainable Drainage Systems (SuDS)

This section provides a summary of the sustainable drainage strategy and solutions, with the full detail included as part of the wider planning application documentation. Please refer to Drainage Strategy Report (ref. DMAG-2352-DSR) for further details on this.

Foul and surface water from the development are to be kept separate at all times until they connect to an existing outfall manhole, to discharge to the existing combined public sewer in Saffron Hill, via existing outfalls.

Foul Water

The foul water strategy is to discharge foul flows from the lower ground floor and above floors unrestrictedly by gravity to the public sewer reusing the existing connection to the sewer. Flows from the basement will be pumped to high level.

Surface Water

The hierarchy for surface water disposal has been followed to establish the drainage strategy for the site. A blue roof system is proposed at all roofs and terraces to attenuate and control surface water discharge to the required magnitudes.

The drainage strategy has been written in accordance with the National Planning Policy Framework (NPPF), the Sustainable Design and Construction Supplementary Planning Guidance (SPG), the London Plan and London borough of Camden local guidance.

An assessment of applicability of Sustainable Drainage Systems (SuDS) has been completed as part of the submission for the Proposed Development, following the drainage hierarchy. Table below sets out the key considerations of the drainage hierarchy and what has been defined as appropriate for the site.

Table 11.5-1 SuDS evaluation for the Proposed Development following the Drainage Hierarchy

SuDS Technique	Feasibility	Site limitations / Use
Rainwater use as a resource (for example rainwater harvesting, blue roofs for irrigation	✓	Blue roofs are proposed on most roofs/terraces of the proposed building.
Rainwater infiltration to ground at or close to source	✗	Infiltration systems under the building is unsuitable due to the inability to maintain the required 5m distance from building.
Rainwater attenuation in green infrastructure features for gradual release (for example green roofs, rain gardens)	✓	The catchment areas and the Site area will be attenuated within the Site in blue roof systems. There is no space in the development for external green infrastructure given the building occupies the whole site area.

SuDS Technique	Feasibility	Site limitations / Use
Rainwater discharge direct to a watercourse (unless not appropriate)	✗	There is no watercourse in the vicinity of the Site to be able to feasibly discharge the surface water to. As such, this is not practical and has not been considered.
Controlled rainwater discharge to a surface water sewer or drain	✗	There are no surface water sewers in the vicinity of the Site. Therefore, it is not feasible to discharge to a surface water sewer.
Controlled rainwater discharge to a combined sewer	✓	Surface water generated within the Site will be discharged at a restricted rate to the existing public combined water sewers.

The proposed blue roof design reduces the impermeable area. The foul water strategy is to discharge foul flows from Ground Floor and above floors unrestrictedly by gravity to the public sewer reusing the existing connection to the sewer. Flows from the lower ground floor and new basement will be pumped to high level.

The building footprint occupies the full extent of the site; therefore, infiltration systems are not feasible and there are no watercourses near the site. It is proposed to continue to discharge flows to the public sewer at a total restricted rate with prior attenuation within the site.

It is proposed to provide green roofs at various levels which will enhance biodiversity of the development. Rainwater will be attenuated at roof/terrace levels in blue roof systems to restrict discharge rate to a maximum of 5.97 l/s (1:100-year storm event + 40% climate change). The use of blue roofs will reduce the existing run-off rates and provide a betterment of at least 86% and up to 94% for the maximum existing run-off rate. The proposed surface water system of the building will discharge to the public sewer via an existing outfall, if possible.

An increase in peak rainfall intensity of 40% to allow for the predicted effects of climate change is considered in the design in line with the current government guidance.

11.6. Materials & Embodied Carbon

Embodied carbon and material efficiency are crucial considerations for the Proposed Development. They play a central role in decision-making and support the regenerative approach to the site.

The summary of the results for the WLCA of the Proposed Development are shown in the following table, with applied contingencies stated.

Embodied carbon accounts for 55.6% of the building's emissions over its 60-year RSP, totalling 1,622 kgCO2e/m² GIA. This is expected due to the significant rearrangement and extension of the existing structure, complete replacement of the facade, and all internal finishes, fittings, and building services.

Table 11.6-1 Proposed Development WLCA results at application stage in kgCO2e/m2 GIA, with separate column showing the additional contingency margin included in the reported value

WLCA Modules	Reported Result (Application Stage)	Includes contingency of…
Upfront Carbon $kgCO_2e/m^2$ GIA A1-A5	907	27
Life Cycle Embodied $kgCO_2e/m^2$ GIA A-C ex. B6 & B7	1622	57
Whole Life Carbon $kgCO_2e/m^2$ GIA A-C inc. B6 & B7	2,919	66

The results show a strong position for the Proposed Development at the application stage, with upfront embodied carbon metrics (A1-A5) below the GLA Benchmark rates, even with significant contingency included at this early project stage. The Applicant feels these levels of contingency are appropriate given the timing of the study and the information provided.

There is potential to reduce upfront embodied carbon by approximately 125 kgCO2e/m2 GIA A1-A5, aiding in meeting the aspirational targets through investigations of the following options and their feasibility/appropriateness. Structural steel options include using electric arc furnace steel, very low carbon steelwork, and reused steel. Concrete options involve reducing embodied carbon through recycled materials and reviewing strength grades. Rebar with a carbon factor of <0.5 kgCO2e/kg will be investigated. Facade efficiency and finishes & fittings will be explored for material efficiency and minimalism. Building services will prioritise CIBSE TM65 data and low carbon refrigerants. The contractor will be challenged to reduce site emissions by an additional 50%. Further opportunities to improve performance are identified within the WLCA report submitted as part of this application and quantified in the GLA reporting template. These opportunities are viable and will be explored as the design progresses towards construction.

11.6.1. BREEAM

The project will include a requirement in specifications at RIBA 3 for Environmental Product Declarations (EPDs). These documents provide third-party verified environmental performance data for materials and products used on a development and are the basis of the LCA modelling exercises. Some product groups are more likely to have EPD information than others due to market competitiveness. It is important that the product groups are identified at RIBA 3 and agreements are made for reflecting their requirement in specification.

A requirement should be set on the project for giving preference to locally sourced materials and has been fed back to the team. Sweco also wish to establish the minimum requirements for responsible sourcing certifications for key material groups at Stage 2. The below table is based on Sweco experience and market feedback on available certifications for each group and is the proposed target

for key materials. Please note that the timber requirement is mandatory; no BREEAM certificate can be provided if this is not upheld.

The table below describes the minimum proposed responsible sourcing certification requirements for key material groups for the Proposed Development, to be reflected in consultant specifications.

Table 11.6-2 Table to show the targeted responsible sourcing certification for key material and product groups to uphold responsible sourcing targets

Key material/Product Group	Minimum Certification Level
Concrete/cement	BES 6001 (Very Good)
Steel (reinforcement)	CARES/BES 6001 (Very Good)
Steel (structural)	BES 6001 (Very Good)
Timber (mandatory)	FSC, PEFC
Metals	ISO 14001 Key Process + Supply Chain
Gypsum/Plasterboard	BES 6001 (Very Good)
Stone	BES 6001 (pavers), ISO 14001 Key Process + Supply Chain
Glass	ISO 14001 Key Process + Supply Chain
Insulation	BES 6001 (Very Good) preferred, ISO 14001 Key Process + Supply Chain as a minimum

Within the submitted BREEAM assessment for the office areas, **57%** of available credits are targeted for Materials, in line with the requirements of EEA CPG Chapter 11 (paragraph 11.3).

11.7. Waste & The Circular Economy

11.7.1. Material Waste for the Existing and Proposed Scheme

The Detailed Circular Economy Statement (CES) has been prepared in accordance with the GLA London Plan Guidance (LPG) on Circular Economy Statements (March 2022), utilising the GLA Circular Economy Statement Template. This document outlines the strategy for both the Existing and Proposed Developments, adhering to the GLA Decision Trees for each. Please see the full detailed CES which is included in this application.

The primary circular economy focus for the Proposed Development revolves around a refurbishment and retrofit approach, emphasising high levels of material retention to minimise waste generation and preserve existing resources. A substantial portion of the materials is designated for retention, significantly reducing demolition, transport needs and waste generation. Most retained materials are structural components, as described earlier in this report.

The Pre-Demolition Audit, conducted by Material Index (and included as a standalone submission document with this application), suggests the following key opportunities related to retention and reuse of materials from strip-out and demolition to facilitate the Proposed Development:

- 42% by weight of materials to be retained insitu (this is as a % of **all** quantified materials in the building).
- 0.1% by weight of non-structural materials with potential for on-site reuse.
- 4% by weight of non-structural materials with potential for off-site reuse.
- 54% by weight of materials designation for recycling and other waste streams (with priority for the majority of this material being recycled).

The figures presented reflect the status at the time of submission and will be updated as the project progresses, ensuring alignment with sustainability goals and adapting to real-time developments in waste management. In the next design phases, new materials for the Proposed Development will be carefully evaluated to maximise the use of recycled content and secondary materials.

Table 11.7-1 Proposed Development Circular Economy aspirational project targets in line with the London Plan and LPG for Circular Economy Statement policy requirements

Waste Target Category	Target
Diversion from Landfill (Demolition, Excavation, Construction) by weight	95%
Recycled Content by value	20%
Materials Reused or Recycled from Demolition & Strip Out by weight	90%
Disassembly potential with Reuse at End-of-Life by weight	95%

11.7.2. The Building's Waste in Operation

Momentum Transport Consultancy have completed the Delivery and Servicing Plan (ref. 250307_19CH_DSP) covering the Operational Waste Management Strategy for the Proposed Development and the outcomes of that assessment are summarised below.

The design incorporates sufficient and easily accessible waste storage areas. The proposed bin-based waste management system is designed to be flexible, allowing for adjustments in the number and type of bins based on the development's recycling rates. The goal is to achieve an 80% recycling target by 2030. The Facilities Management (FM) team will oversee the waste storage area and monitor operational metrics, such as the rate and quality of recycling. They will coordinate with private waste collection contractors to explore opportunities for enhancing recyclable waste storage.

The design facilitates the separate collection of general waste, mixed dry recycling, glass and food waste. Recycling waste stream may be further sorted into categories such as cardboard, paper, plastics, and metals, depending on the waste generated by the occupants.

It is assumed the different land uses within the development would share bins. Based on this forecast waste generation, the required quantities of storage bins and their capacities is as follows:

• 1 x 1,100l Eurobin for general waste

• 2 x 660l Eurobin for paper and cardboard and dry recyclables

• 5 x 360l Eurobin for glass

• 4 x 240l Eurobin for food waste

According to Regulation 12 of the Waste (England and Wales) Regulations 2011, waste producers and handlers must follow the waste hierarchy (prevention, preparing for reuse, recycling, recovery, and disposal) unless justified otherwise for environmental or technical reasons. The hierarchy emphasises waste prevention as the highest priority, followed by preparation for reuse, recycling, recovery (incl. energy recovery) and finally, disposal (incl. landfill). To comply with London Plan policy SI 7, no recyclable or biodegradable waste should go to landfill.

The Facility Management team is expected to consider the waste hierarchy when making decisions about off-site waste management for tenant waste. Guidance is available on implementing the waste hierarchy. For the types of waste routinely generated by the development, the following waste management options should be prioritised (after taking actions to minimise waste generation and ensuring proper source segregation):

Mixed Dry Recyclable Wastes: Initially, the FM team should look to sort recyclables on-site, separating paper and cardboard from plastics, metals and glass. These sorted materials should be sent for further processing to be recycled into packaging or paper products, rather than being used as fuel. The FM team should inquire with waste management contractors about the fate of the residual waste from sorting mixed recyclables, ensuring it does not end up in landfill.

Food Waste: Waste producers should send food waste for anaerobic digestion rather than composting, as this aligns with the guidance and supports the waste hierarchy.

11.8. Air Quality & Pollution

11.8.1. Maintaining Internal Air Quality

When considering air quality performance, it is important to consider mitigation of internal air quality impacts for the building occupants as well as the external air quality concerns raised in the policy documentation. Development that promotes health is a key element of Local Plan (2017) Policy D1. The Proposed Development is designed to ensure that optimal indoor air quality is maintained for the building occupants and uses the best-practice methodologies set out in BREEAM and WELL to help establish this.

Occupant health and wellbeing is a core principle of the 'A Just Space for People' element of the Regenerative Approach for the Proposed Development, focusing on creating a healthy and stimulating workplace. The proposed Development promotes occupant health by:

- Employing key principles of the IWBI's WELL Building Standard.
- Providing cycle parking and facilities for building occupiers in accordance with the requirements of the London Plan & Camden guidance (see Section 11.11).
- Providing accessible outdoor space for building occupants via multiple accessible terraces.
- Extensive urban greening across roof and terraces achieving a UGF of 0.3.
- Maintaining compliant internal and external acoustic performance, further supported by BREEAM credit targets (Hea05 and Pol05).
- Ensuring comprehensive safety and security of the site, including features such as comprehensive fall prevention for accessible terraces.
- Maintaining acceptable internal thermal comfort throughout the year and under future potential climate change scenarios (see Energy Strategy & Appendix D).

These features also help to support the intent of Draft Local Plan Policy SC1, where the proposed developed is designed to promote healthy behaviours.

11.8.2. Noise Pollution

An Environmental Noise Survey has been undertaken by the appointed acoustics consultant Adam Ford, Sweco, and is included within the submitted planning application documentation. This section provides a brief summary of that report; please refer to the full report for detailed information and assessment of noise impacts of the development. As assessment has been carried out to determine the plant noise emissions at the nearest noise sensitive window based on the early plant selection information available at this early project design stage. The assessment indicated that the proposed plant, in conjunction with the proposed mitigation measures, should be capable of achieving the proposed atmospheric noise emissions criteria at the nearest noise-sensitive receptors. The Environmental Noise Survey also provides further consideration of additional plant items and the mitigation measures that will be incorporated to comply with LBC requirements.

11.9. Urban Greening

The Design & Access Statement sets out the vision for the Proposed Development in terms of improved public realm and enhanced landscaping/urban greening and biodiversity. The existing Site has very poor site biodiversity. Proposals include significant enhancement of greening and biodiverse planting and allocations across roofs, terraces and within the wider public realm.

Figure 11.9-1 Axonometric overviews of urban greening across roofs and terraces for the Proposed Development (refer also to the Design & Access Statement)

The proposal creates generous terrace amenities on the upper levels and introduces green bridges and balconies on the lower levels. Small inset terraces will feature on the upper levels, referencing the contextual language of historical cloister gardens. These terraces will feature a range of planting and landscaping details to reflect the spaces' functionality.

On Level 9, a large corner terrace is proposed, affording amazing views out to local landmarks such as St. Paul's Cathedral. The terrace will also integrate the lantern structure into the landscaping proposal.

At Level 10, a large roof terrace with generous planting and landscaping is provided as well as a proposed water features. Accessed via a roof pavilion, there is also additional space for amenity. The terrace is proposed to afford views in all directions across London's diverse urban landscape.

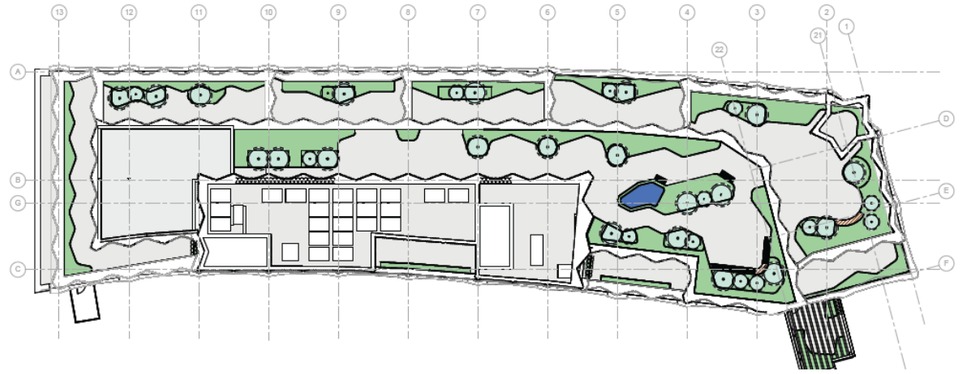


Figure 11.9-2 Level 10 proposed water feature

Overall, the Proposed Development provides **319m²** of intensive green roof and/or vegetation over structure, significantly improving site greening and biodiversity compared to the existing condition. As set out in the Design & Access Statement, this results in a calculated Urban Greening Factor (UGF) score of **0.3**. Considering that in Sweco's experience achieving a strong UGF is problematic for developments where significant elements of the existing building are retained, this represents a positive position for the Proposed Development at this stage. The Proposed Development facilities this through stepped massing and creation of terraces, which allow for a greater extent of green installations to be deployed.

Further considerations and design initiatives for urban greening and biodiversity management over the long-term have included the following:

- Consideration of how to deploy drought-resilient plants in consideration of future climate change and long-term management of successful planted installations.
- Targeting of BREEAM Wat04 credits demands strong & considered approach to irrigation including utilisation of water-efficient ways of maintaining plant species and digitalisation of watering systems.
- Long-term habitat management and maintenance plans will be created to ensure that plant health and biodiversity on site is monitored and managed.

The successful long-term management and performance of green spaces on buildings within the Applicant's existing portfolio of projects provides further weight of intent to the principles set out and proposed for this development to deliver a strong greening and biodiversity outcome.

11.10. Sustainable Transport

In accordance with Policy T1 of the Camden Local Plan (2017) and Policy T2 of the Draft New Camden Local Plan (2024), the proposed development prioritises a safe and accessible environment for both cyclists and pedestrians. The Site location achieves a PTAL rating of 6b from Transport for London's WebCAT tool, the highest possible rating for an urban location, demonstrating its outstanding accessibility from public transport. Nearby transport hubs include:

- Farringdon Station is the closest National Rail station located within 237m of the Site. Thameslink and Elizabeth Line services operate from the station and provide access to an average of 92 services at peak time.
- St Paul's, Blackfriars, Farringdon, Barbican and Chancery Lane underground stations are located within a 500m walk.
- Multiple bus routes can be accessed with a short walking distance, offering access to over 182 buses at peak times.
- Lime and Human Forest currently operate dockless bike hire as well as Local Santander Cycle Hire Docking Stations are located within 280 m, offering access to hire bicycles. Short-stay cycle parking is provided on surrounding streets within 100 m of the Site.

The Proposed Development aims to promote active travel by providing safe, secure and well-designed end of trip facilities. The following facilities are proposed:

- 218 no. long-stay cycle parking for users, comprising predominantly of 174 two-tier cycle parking and 10 sheffield stand cycles provision as well as 12 accessible spaces cycles and 22 foldable cycles located at lower ground floor. In addition, 37 cycle spaces will be provided for short-stay use.
- Associated 22 individual shower cubicles and changing space, including 146 lockers, at the lower ground floor. Shower and changing facilities are designated male/female. Unisex and gendered accessible shower and WC facilities are provided.
- No car parking provided on site.

This level of provision represents a significant uplift compared to the existing provision for the current insitu building and helps to positively promote sustainable travel to and from the development. Enabling such provision within existing constraints of the basement within a retrofit scheme represents a strong positive outcome in the context of adaptive reuse of the existing structure.

Figure 11.10.1 demonstrates the location of the main cycle storage area and facilities within the basement, and how this space is accessed. For further details and drawings related to the cycle storage provision and facilities, please refer to the Planning Access Statement (ref. 250308_24103_19CHARTERHOUSE) submitted with this application.

Figure 11.10-1 Drawing to show location, layout and access of the main cycle storage and facilities for the Proposed Development.

11.11. Sustainable Construction

Sustainability and environmental considerations must be managed throughout the construction phase of the development. A Site Waste Management Plan (SWMP) will be required as part of the BREEAM strategy, outlining waste management targets that include:

- Management of non-hazardous construction waste
- Accurate records of waste generation and disposal routes
- Proper handling of any hazardous waste on site

The principal contractor will be responsible for implementing sustainable practices during construction. They must possess an Environmental Management Scheme (EMS), such as ISO 14001, and adhere to best practice pollution prevention guidelines (PPG6).

During construction, the principal contractor will also need to meet BREEAM criteria related to construction management, including monitoring site water and energy use, waste production, and material deliveries. Additionally, a Site Environmental Management Plan (SEMP) will be developed in alignment with ecological recommendations to ensure site protection and enhancement, in accordance with A1 and A3 the Camden Local Plan (2017).

A draft Construction Management Plan (CMP) has been included as part of this planning application submission. This will ensure that associated with the proposed works construction impacts are minimised as well as any cumulative impacts of other nearby construction sites will be mitigated and managed. The CMP follows the best-practice guidance set out in:

- Construction Logistics Safety (CLOCS) Standard
- Considerate Contractors Scheme (CCS) framework

- Guide for Contractors Working in Camden
- London Good Practice Guide: Noise & Vibration Control for Demolition and Construction
- Control of Dust and Emissions During Construction and Demolition
- CPG 6 (Amenity)

The role of the contractor and their teams is becoming ever-more important in realising the successful outcomes of key sustainability deliverable such as WLCA, circular economy outcomes and energy performance. In recognition of this, the following measures could be deployed to ensure that these metrics, which form important part of the Sustainability Strategy, will be delivered successfully:

- **WLCA:** contractors will be vetted at tender stage for their expertise in delivering comprehensive WLCAs and will be required to support existing carbon reduction measures and propose additional measures from their supply chain to achieve set carbon targets.
- **WLCA:** contractors will be required to follow Sweco's Contractor & Trades Requirements specifications to enable successful management of WLCA during construction and ensure that their trades are managed effectively to deliver carbon goals.
- **WLCA:** targets will be established pre-construction for site activities and site transport to focus on maximising reduction in emissions from actions on site (energy consumption, fuels, water and delivery methods).
- **Operational energy:** specifications will be established pre-construction for roles and responsibilities for contractors in terms of equipment, commissioning and soft landings to ensure that operational energy & performance targets are delivered, working interactively with the design team.
- **CE & Waste:** both construction and demolition contractors will have set targets and responsibilities for prioritising reuse in the first instance and maximising recycling of waste streams from demolition, strip out and construction. They will be required to regularly report progress and actions to achieve the project's CE and waste goals.

12. Summary & Conclusions

The sustainability aspiration for the Proposed Development is to deliver a showcase project for sustainable refurbishment in LBC that reimagines and revitalises the existing building into a modern, futureproofed sustainable development. Maximising opportunities to retain existing structure are at the heart of the proposals, focusing on using less material in construction to deliver low carbon outcomes.

The Proposed Development will need to conform to the requirements set out in Approved Document **Part L Volume 2 (Conservation of Fuel and Power) of the Building Regulations 2021**, and thus submit an energy assessment for the purposes of the planning application. The methodology of carrying out, and reporting predicted energy consumption, and associated carbon emissions are outlined in the Mayor's Energy Hierarchy as detailed in the Energy Assessment Guidance (June 2022).

Following the energy and carbon evaluation, it is proposed that practical energy efficiency measures along with low, and zero carbon (LZC) applications are incorporated into the design for the Proposed Development. In order to achieve this, a full façade replacement to modern high energy efficiency standards is proposed across all elevations, along with replacement and upgrade of the building services systems.

The Sustainability Statement in Section 11 provides details of the overall sustainability strategy for the Proposed Development and the key features to support LBC policy requirements. The following metrics are demonstrably achieved through this report at application stage.

- Building Regulations Part L 2021 overall site-wide carbon emissions reductions of **31%** over Part L 2021 baseline.
- Building Regulations Part L 2021 site-wide carbon emissions reductions of **8%** at 'Be Green' stage of the Energy Hierarchy.
- Building Regulations Part L 2021 site-wide carbon emissions reductions of **23%** at 'Be Lean' stage of the Energy Hierarchy.
- 70% of existing materials retained insitu, focusing on structural materials.
- An upfront embodied carbon of **907 $kgCO_2e/m^2$ GIA (A1-A5)** (with reported values including early-stage contingency of **+27 $kgCO_2e/m^2$ GIA (A1-A5).**
- 100% electric HVAC building services solution and utilising PV installation at roof level.
- Base-build operational Energy Use Intensity (EUI) of **78.93 kWh/m^2/year (GIA)**
- The Proposed Development provides additional planting across roofs and terraces, significantly improving site greening and biodiversity.
- Target of minimum BREEAM Excellent (target score of 80.89%) with aspiration for Outstanding (target score of 90.27%).
- Blue roof system is proposed at all roofs and terraces to attenuate and control surface water runoff.
- Intensive green roof or vegetation over structure alongside green walls and trees contributing to an Urban Greening Factor (UGF) of 0.3.
- Significant improvements to sustainable transport facilities with cycle spaces and showers.
- Target 95% diversion from landfill for demolition and construction waste.
- Explore opportunities for reuse of demolition materials.

Appendix A

BRUKL Reports

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

19 Charterhouse - Lean

As designed

Date: Mon Mar 31 14:57:22 2025

Administrative information

Building Details

Address: Charterhouse Street, London, EC1N 6RA

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.26

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.26

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

Certifier details

Name: Kartik Amrania

Telephone number:

Address: 1 Bath road, Maidenhead, SL6 4AQ

Foundation area [m^2]: 869.62

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

Target CO_2 emission rate (TER), $kgCO_2/m^2annum$	4.98	
Building CO_2 emission rate (BER), $kgCO_2/m^2annum$	3.82	
Target primary energy rate (TPER), kWh_{PE}/m^2annum	54.86	
Building primary energy rate (BPER), kWh_{PE}/m^2annum	41.49	
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	0.19	0.2	GF000001:Surf[5]
Floors	0.18	0.18	0.18	GF00001E:Surf[0]
Pitched roofs	0.16	-	-	No pitched roofs in building
Flat roofs	0.18	0.18	0.18	GF00000F:Surf[0]
Windows** and roof windows	1.6	1.31	1.31	GF000004:Surf[0]
Rooflights***	2.2	-	-	No roof lights in building
Personnel doors^	1.6	1.3	1.3	GF00000A:Surf[0]
Vehicle access & similar large doors	1.3	-	-	No vehicle access doors in building
High usage entrance doors	3	-	-	No high usage entrance doors in building

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

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

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

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

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

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

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

Building services

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

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

1- Retail_AHSP VRF

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.64	13.9	0	1.5	0.88
Standard value	2.5*	N/A	N/A	2^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

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

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

2- Office_ASHP VRF (no CCM)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.64	13.9	0	1.5	0.88
Standard value	2.5*	N/A	N/A	2^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

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

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

3- WC_ASHP VRF

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.64	7.6	0	1.4	0.88
Standard value	2.5*	N/A	N/A	2^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

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

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

4- Reception lobby_ASHP VRF

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.64	13.9	0	1.4	0.88
Standard value	2.5*	N/A	N/A	2^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

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

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

5- Office_ASHP VRF (7-9 CCM)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.64	13.9	0	1.5	0.88
Standard value	2.5*	N/A	N/A	2^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

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

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

6- Office_ASHP VRF (Nat Vent Peri)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.64	13.9	0	1.5	0.88
Standard value	2.5*	N/A	N/A	2^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

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

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

7- Cycle Store_AHSP VRF

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.64	7.6	0	1.4	0.88
Standard value	2.5*	N/A	N/A	2^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

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

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

8- Showers_Heating only

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.64	-	0.2	-	0.88
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

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

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

Zone-level mechanical ventilation, exhaust, and terminal units

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

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

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
GF_Retail_Peri_W	-	-	-	-	-	-	-	0.3	-	-	N/A
GF_Retail_Peri_N	-	-	-	-	-	-	-	0.3	-	-	N/A
GF_Retail_INT	-	-	-	-	-	-	-	0.3	-	-	N/A
GF_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
GF_Retail_Peri_W2	-	-	-	-	-	-	-	0.3	-	-	N/A
GF_Retail_Peri_S	-	-	-	-	-	-	-	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
GF_Retail_Peri_S1	-	-	-	-	-	-	-	0.3	-	-	N/A
GF_Retail_Peri_S2	-	-	-	-	-	-	-	0.3	-	-	N/A
GF_Retail_Peri_E1	-	-	-	-	-	-	-	0.3	-	-	N/A
GF_Retail_Peri_E2	-	-	-	-	-	-	-	0.3	-	-	N/A
GF_Retail_Peri_E	-	-	-	-	-	-	-	0.3	-	-	N/A
GF_Retail_INT	-	-	-	-	-	-	-	0.3	-	-	N/A
GF_Retail_INT	-	-	-	-	-	-	-	0.3	-	-	N/A
L01_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L01_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L02_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L02_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L03_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L03_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L04_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L04_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L05_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L05_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L06_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L06_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L07_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L07_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L07_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L08_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L08_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L09_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L09_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L10_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L10_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
LG_Retail_Peri_E	-	-	-	-	-	-	-	0.3	-	-	N/A
LG_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
LG_Shower/Changing	-	-	0.4	-	-	-	-	-	-	-	N/A
LG_Shower/Changing	-	-	0.4	-	-	-	-	-	-	-	N/A
LG_Locker/Changing	-	-	0.4	-	-	-	-	-	-	-	N/A
LG_Locker/Changing	-	-	0.4	-	-	-	-	-	-	-	N/A
LG_Locker/Changing	-	-	0.4	-	-	-	-	-	-	-	N/A
LG_Locker/Changing	-	-	0.4	-	-	-	-	-	-	-	N/A
LG_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
LG_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
LG_Locker	-	-	0.4	-	-	-	-	-	-	-	N/A
LG_Locker	-	-	0.4	-	-	-	-	-	-	-	N/A
LG_showers	-	-	0.4	-	-	-	-	-	-	-	N/A
LG_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
LG_Shower	-	-	0.4	-	-	-	-	-	-	-	N/A
LG_Retail_Peri_E1	-	-	-	-	-	-	-	0.3	-	-	N/A

General lighting and display lighting	General luminaire	Display light source	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
GF_Retail_Peri_W	99	15	10
GF_Retail_Peri_N	101	15	10
GF_Retail_INT	98	15	10
GF_Circ	110	-	-
GF_Circ	110	-	-
GF_stair	110	-	-
GF_stair	110	-	-
GF_stair	110	-	-
GF_Circ	110	-	-
GF_Circ	110	-	-
GF_Circ	110	-	-
GF_WC	110	-	-
GF_Storage	110	-	-
GF_Circ	110	-	-
GF_Circ	110	-	-
GF_Retail_Peri_W2	99	15	10
GF_Retail_Peri_S	102	15	10
GF_Retail_Peri_S1	100	15	10
GF_Retail_Peri_S2	101	15	10
GF_Retail_Peri_E1	100	15	10
GF_Retail_Peri_E2	101	15	10
GF_Retail_Peri_E	102	15	10
GF_Retail_INT	97	15	10
GF_Retail_INT	102	15	10
GF_lobby	117	15	9
GF_Lobby_Int	114	15	9
GF_Lobby	117	15	9
GF_lobby	118	15	9
GF_Lobby_Int	116	15	9
L01_Office_Peri_W	150	-	-
L01_Office_Peri_W	149	-	-
L01_Office_Peri_SW3	158	-	-
L01_stair	110	-	-
L01_stair	110	-	-
L01_AHU	110	-	-
L01_WC	110	-	-
L01_WC	110	-	-
L01_circ	110	-	-
L01_circ	110	-	-
L01_circ	110	-	-
L01_circ	110	-	-
L01_Office_Peri_E	148	-	-

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
L01_Office_Peri_E1	147	-	-
L01_Office_Peri_E2	157	-	-
L01_Office_Peri_S	147	-	-
L01_Office_Peri_SW	153	-	-
L01_Office_Peri_W1	152	-	-
L01_Office_Peri_W	186	-	-
L01_Office_Int	147	-	-
L02_Office_Peri_W1	147	-	-
L02_Office_Peri_S1	149	-	-
L02_Office_Peri_S2	149	-	-
L02_Office_Peri_E1	153	-	-
L02_Office_Peri_E2	164	-	-
L02_AHU	110	-	-
L02_stair	110	-	-
L02_stair	110	-	-
L02_circ	110	-	-
L02_circ	110	-	-
L02_circ	110	-	-
L02_AHU	110	-	-
L02_WC	110	-	-
L02_WC lobby	110	-	-
L02_WC	110	-	-
L02_Office_Peri_W2	148	-	-
L02_Office_Peri_N	150	-	-
L02_Office_Int	146	-	-
L03_Office_Peri_W1	147	-	-
L03_Office_Peri_S1	149	-	-
L03_Office_Peri_S2	149	-	-
L03_Office_Peri_E1	153	-	-
L03_Office_Peri_E2	164	-	-
L03_AHU	110	-	-
L03_stair	110	-	-
L03_stair	110	-	-
L03_circ	110	-	-
L03_circ	110	-	-
L03_circ	110	-	-
L03_AHU	110	-	-
L03_WC	110	-	-
L03_WC lobby	110	-	-
L03_WC	110	-	-
L03_Office_Peri_N1	150	-	-
L03_Office_Peri_W2	148	-	-
L03_Office_Int	146	-	-

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
L04_Office_Peri_W1	147	-	-
L04_Office_Peri_S1	149	-	-
L04_Office_Peri_S2	149	-	-
L04_Office_Peri_E1	153	-	-
L04_Office_Peri_E2	164	-	-
L04_AHU	110	-	-
L04_stair	110	-	-
L04_stair	110	-	-
L04_circ	110	-	-
L04_circ	110	-	-
L04_circ	110	-	-
L04_AHU	110	-	-
L04_WC	110	-	-
L04_WC lobby	110	-	-
L04_WC	110	-	-
L04_Office_Peri_W1	147	-	-
L04_Office_Peri_N1	150	-	-
L04_Office_Int	146	-	-
L05_Office_Peri_W1	147	-	-
L05_Office_Peri_W1	147	-	-
L05_Office_Peri_S1	149	-	-
L05_Office_Peri_S2	149	-	-
L05_Office_Peri_E1	153	-	-
L05_Office_Peri_S2	149	-	-
L05_Office_Peri_E1	153	-	-
L05_Office_Peri_E2	164	-	-
L05_AHU	110	-	-
L05_stair	110	-	-
L05_stair	110	-	-
L05_circ	110	-	-
L05_circ	110	-	-
L05_circ	110	-	-
L05_AHU	110	-	-
L05_WC	110	-	-
L05_WC lobby	110	-	-
L05_WC	110	-	-
L05_Office_Peri_N	150	-	-
L05_Office_Peri_N	146	-	-
L06_Office_Peri_W1	147	-	-
L06_Office_Peri_W1	147	-	-
L06_Office_Peri_S1	149	-	-
L06_Office_Peri_S2	149	-	-
L06_Office_Peri_E1	153	-	-
L06_Office_Peri_E2	164	-	-
L06_AHU	110	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
Standard value	95	80	0.3
L06_stair	110	-	-
L06_stair	110	-	-
L06_circ	110	-	-
L06_circ	110	-	-
L06_circ	110	-	-
L06_AHU	110	-	-
L06_WC	110	-	-
L06_WC lobby	110	-	-
L06_WC	110	-	-
L06_Office_Peri_N	150	-	-
L06_Office_Int	146	-	-
L07_Office_Peri_E	148	-	-
L07_Office_Peri_N	149	-	-
L07_Office_Peri_N3	198	-	-
L07_Office_Peri_W1	159	-	-
L07_Office_Peri_W2	155	-	-
L07_Office_Int	145	-	-
L07_AHU	110	-	-
L07_Circ	110	-	-
L07_Circ	110	-	-
L07_Stair	110	-	-
L07_Stair	110	-	-
L07_WC	110	-	-
L07_Stair	110	-	-
L07_WC	110	-	-
L07_WC	110	-	-
L07_WC lobby	110	-	-
L07_Circ	110	-	-
L07_AHU	110	-	-
L07_Office_Peri_E4	153	-	-
L07_Office_Peri_E2	150	-	-
L07_Office_Peri_S	150	-	-
L07_Office_Peri_E1	151	-	-
L07_Office_Int	148	-	-
L08_Office_Peri_N	152	-	-
L08_Office_Peri_N3	157	-	-
L08_Office_Peri_E1	152	-	-
L08_Office_Peri_E2	151	-	-
L08_Office_Peri_S	151	-	-
L08_Office_Peri_W1	149	-	-
L08_Office_Peri_W2	150	-	-
L08_Office_Int	154	-	-
L08_Office_Int	145	-	-
L08_Circ	110	-	-
L08_Circ	110	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
Standard value	95	80	0.3
L08_Stair	110	-	-
L08_Stair	110	-	-
L08_WC	110	-	-
L08_WC	110	-	-
L08_WC lobby	110	-	-
L08_Circ	110	-	-
L08_Office_Int	148	-	-
L08_Office_Peri_E4	150	-	-
L08_Office__Peri_E	151	-	-
L08_Office_Peri_E5	156	-	-
L08_Office_Peri_E3	148	-	-
L09_Office DH_Peri_E1	168	-	-
L09_Office DH_Peri_E2	150	-	-
L09_Office DH_Peri_S	154	-	-
L09_Office DH_Peri_W1	249	-	-
L09_Office DH_Peri_W2	166	-	-
L09_Stair	110	-	-
L09_WC lobby	110	-	-
L09_Office DH_Peri_E3	168	-	-
L09_Circ	110	-	-
L09_Circ	110	-	-
L09_Circ	110	-	-
L09_WC	110	-	-
L09_Circ	110	-	-
L09_WC	110	-	-
L09_WC	110	-	-
L09_Stair	110	-	-
L09_Plant	110	-	-
L09_Store	110	-	-
L09_Store	110	-	-
L09_Plant	110	-	-
L10_Pavilion	179	-	-
L10_Stair	110	-	-
L10_WC	110	-	-
L10_circ	110	-	-
L10_WC	110	-	-
L10_circ	110	-	-
L10_circ	110	-	-
L10_Stair	110	-	-
L10_Circ	110	-	-
LG_comms_room	110	-	-
LG_comms_room	110	-	-
LG_Plant	110	-	-
LG_BOH	110	-	-
LG_cycle store	110	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
Standard value	95	80	0.3
LG_cycle store	110	-	-
LG_Retail_Peri_E	106	15	10
LG_Circ	110	-	-
LG_Circ	110	-	-
LG_Circ	110	-	-
LG_Circ	110	-	-
LG_BNO	110	-	-
LG_Station rm	110	-	-
LG_switchroom	110	-	-
LG_Plant	110	-	-
LG_Comms	110	-	-
LG_pump rm	110	-	-
LG_Stair	110	-	-
LG_Stair	110	-	-
LG_Circ	110	-	-
LG_Stair	110	-	-
LG_WC	110	-	-
LG_Shower/Changing	110	-	-
LG_Shower/Changing	110	-	-
LG_Locker/Changing	110	-	-
LG_Locker/Changing	110	-	-
LG_Locker/Changing	110	-	-
LG_Locker/Changing	110	-	-
LG_Locker/Changing	110	-	-
LG_WC	110	-	-
LG_WC	110	-	-
LG_Locker	110	-	-
LG_Locker	110	-	-
LG_WC lobby	110	-	-
LG_WC lobby	110	-	-
LG_WC lobby	110	-	-
LG_WC lobby	110	-	-
LG_WC lobby	110	-	-
LG_Circ	110	-	-
LG_Plant	110	-	-
LG_showers	110	-	-
LG_WC	110	-	-
LG_Shower	110	-	-
LG_loading bay	110	-	-
LG_Retail_Peri_E1	112	15	10
BF_Plant	110	-	-
BF_Plant	110	-	-
BF_Plant	110	-	-
BF_circ	110	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
Standard value	95	80	0.3
BF_Stair	110	-	-
BF_Plant	110	-	-
BF_Plant	110	-	-
BF_circ	110	-	-
L08_Circ	110	-	-
L09_Core	110	-	-

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

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
GF_Retail_Peri_W	NO (-54.2%)	NO
GF_Retail_Peri_N	NO (-81.5%)	NO
GF_Retail_INT	NO (-57%)	NO
GF_Circ	NO (-49.8%)	NO
GF_Circ	N/A	N/A
GF_stair	YES (+20.4%)	NO
GF_stair	N/A	N/A
GF_stair	N/A	N/A
GF_Circ	NO (-0.1%)	NO
GF_Circ	YES (+20.5%)	NO
GF_Circ	N/A	N/A
GF_Circ	N/A	N/A
GF_WC	N/A	N/A
GF_Circ	N/A	N/A
GF_Circ	N/A	N/A
GF_Retail_Peri_W2	NO (-32.4%)	NO
GF_Retail_Peri_S	NO (-25.6%)	NO
GF_Retail_Peri_S1	NO (-7.5%)	NO
GF_Retail_Peri_S2	NO (-4.3%)	NO
GF_Retail_Peri_E1	NO (-29.8%)	NO
GF_Retail_Peri_E2	NO (-0.1%)	NO
GF_Retail_Peri_E	NO (-24.3%)	NO
GF_Retail_INT	NO (-52%)	NO
GF_Retail_INT	NO (-32.2%)	NO
GF_lobby	NO (-57.4%)	NO
GF_Lobby_Int	NO (-52.4%)	NO
GF_Lobby	YES (+51.5%)	NO
GF_lobby	NO (-55.5%)	NO
GF_Lobby_Int	NO (-55.3%)	NO
L01_Office_Peri_W	NO (-89.6%)	NO
L01_Office_Peri_W	NO (-59.7%)	NO
L01_Office_Peri_SW3	NO (-65.4%)	NO
L01_stair	NO (-47.1%)	NO
L01_stair	N/A	N/A
L01_WC	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L01_WC	N/A	N/A
L01_circ	N/A	N/A
L01_circ	N/A	N/A
L01_circ	NO (-51.3%)	NO
L01_circ	NO (-43.7%)	NO
L01_Office_Peri_E	NO (-54.2%)	NO
L01_Office_Peri_E1	NO (-51.5%)	NO
L01_Office_Peri_E2	NO (-51.2%)	NO
L01_Office_Peri_S	NO (-35.9%)	NO
L01_Office_Peri_SW	NO (-53.9%)	NO
L01_Office_Peri_W1	NO (-50.4%)	NO
L01_Office_Peri_W	N/A	N/A
L01_Office_Int	NO (-75%)	NO
L02_Office_Peri_W1	NO (-41.4%)	NO
L02_Office_Peri_S1	NO (-38.4%)	NO
L02_Office_Peri_S2	NO (-31.9%)	NO
L02_Office_Peri_E1	NO (-39.1%)	NO
L02_Office_Peri_E2	NO (-52.5%)	NO
L02_stair	NO (-15.1%)	NO
L02_stair	N/A	N/A
L02_circ	N/A	N/A
L02_circ	NO (-18.6%)	NO
L02_circ	NO (-29%)	NO
L02_WC	N/A	N/A
L02_WC lobby	N/A	N/A
L02_WC	N/A	N/A
L02_WC lobby	N/A	N/A
L02_WC	N/A	N/A
L02_Office_Peri_W2	NO (-45.9%)	NO
L02_Office_Peri_N	NO (-88.4%)	NO
L02_Office_Int	NO (-73.2%)	NO
L03_Office_Peri_W1	NO (-41.9%)	NO
L03_Office_Peri_S1	NO (-38.6%)	NO
L03_Office_Peri_S2	NO (-31.6%)	NO
L03_Office_Peri_E1	NO (-39.5%)	NO
L03_Office_Peri_E2	NO (-52.2%)	NO
L03_stair	NO (-5.3%)	NO
L03_stair	N/A	N/A
L03_circ	N/A	N/A
L03_circ	NO (-21.4%)	NO
L03_circ	NO (-31.8%)	NO
L03_WC	N/A	N/A
L03_WC lobby	N/A	N/A
L03_WC	N/A	N/A
L03_Office_Peri_N1	NO (-88.6%)	NO
L03_Office_Peri_W2	NO (-46.3%)	NO
L03_Office_Int	NO (-73.5%)	NO
L04_Office_Peri_W1	NO (-40.4%)	NO
L04_Office_Peri_S1	NO (-40.6%)	NO
L04_Office_Peri_S2	NO (-33.9%)	NO
L04_Office_Peri_E1	NO (-36.3%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L04_Office_Peri_E2	NO (-52%)	NO
L04_stair	NO (-15.1%)	NO
L04_stair	N/A	N/A
L04_circ	N/A	N/A
L04_circ	NO (-22.3%)	NO
L04_circ	NO (-31.7%)	NO
L04_WC	N/A	N/A
L04_WC lobby	N/A	N/A
L04_WC	N/A	N/A
L04_Office_Peri_W1	NO (-43.8%)	NO
L04_Office_Peri_N1	NO (-88.5%)	NO
L04_Office_Int	NO (-72.8%)	NO
L05_Office_Peri_W1	NO (-46.5%)	NO
L05_Office_Peri_W1	NO (-42.9%)	NO
L05_Office_Peri_S1	NO (-40.6%)	NO
L05_Office_Peri_S2	NO (-31.8%)	NO
L05_Office_Peri_E1	NO (-37.5%)	NO
L05_Office_Peri_E2	NO (-54.4%)	NO
L05_stair	NO (-18%)	NO
L05_stair	N/A	N/A
L05_circ	N/A	N/A
L05_circ	NO (-20.1%)	NO
L05_circ	NO (-30.2%)	NO
L05_WC	N/A	N/A
L05_WC lobby	N/A	N/A
L05_WC	N/A	N/A
L05_Office_Peri_N	NO (-88.8%)	NO
L05_Office_Peri_N	NO (-73.7%)	NO
L06_Office_Peri_W1	NO (-44.6%)	NO
L06_Office_Peri_W1	NO (-40.7%)	NO
L06_Office_Peri_S1	NO (-38.6%)	NO
L06_Office_Peri_S2	NO (-30.5%)	NO
L06_Office_Peri_E1	NO (-36.6%)	NO
L06_Office_Peri_E2	NO (-47.8%)	NO
L06_stair	NO (-15.1%)	NO
L06_stair	N/A	N/A
L06_circ	N/A	N/A
L06_circ	NO (-19.8%)	NO
L06_circ	NO (-29.7%)	NO
L06_WC	N/A	N/A
L06_WC lobby	N/A	N/A
L06_WC	N/A	N/A
L06_Office_Peri_N	NO (-88.1%)	NO
L06_Office_Int	NO (-72.6%)	NO
L07_Office_Peri_E	NO (-22.2%)	NO
L07_Office_Peri_N	NO (-35.8%)	NO
L07_Office_Peri_N3	NO (-13.3%)	NO
L07_Office_Peri_W1	NO (-26%)	NO
L07_Office_Peri_W2	NO (-18.3%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L07_Office_Int	NO (-34.6%)	NO
L07_Circ	NO (-2.5%)	NO
L07_Circ	NO (-11.5%)	NO
L07_Stair	N/A	N/A
L07_Stair	YES (+8.2%)	NO
L07_WC	N/A	N/A
L07_WC	N/A	N/A
L07_WC lobby	N/A	N/A
L07_Circ	N/A	N/A
L07_Office_Peri_E4	NO (-34%)	NO
L07_Office_Peri_E2	NO (-18.6%)	NO
L07_Office_Peri_S	NO (-6.2%)	NO
L07_Office_Peri_E1	NO (-14.8%)	NO
L07_Office_Int	NO (-57.5%)	NO
L08_Office_Peri_N	NO (-33.7%)	NO
L08_Office_Peri_N3	NO (-3.2%)	NO
L08_Office_Peri_E1	NO (-14.7%)	NO
L08_Office_Peri_E2	NO (-29.9%)	NO
L08_Office_Peri_S	NO (-12.2%)	NO
L08_Office_Peri_W1	NO (-8.5%)	NO
L08_Office_Peri_W2	NO (-16.4%)	NO
L08_Office_Int	NO (-29.4%)	NO
L08_Office_Int	NO (-33.8%)	NO
L08_Circ	NO (-3.2%)	NO
L08_Circ	NO (-10.5%)	NO
L08_Stair	N/A	N/A
L08_Stair	YES (+8.2%)	NO
L08_WC	N/A	N/A
L08_WC	N/A	N/A
L08_WC lobby	N/A	N/A
L08_Circ	N/A	N/A
L08_Office_Int	NO (-44.4%)	NO
L08_Office_Peri_E4	NO (-17.9%)	NO
L08_Office__Peri_E	NO (-18.9%)	NO
L08_Office_Peri_E5	NO (-24.3%)	NO
L08_Office_Peri_E3	NO (-14.5%)	NO
L09_Office DH_Peri_E1	YES (+45.5%)	NO
L09_Office DH_Peri_E2	YES (+56.1%)	NO
L09_Office DH_Peri_S	YES (+46.4%)	NO
L09_Office DH_Peri_W1	NO (-12.6%)	NO
L09_Office DH_Peri_W2	YES (+51.5%)	NO
L09_Stair	NO (-4.8%)	NO
L09_WC lobby	N/A	N/A
L09_Office DH_Peri_E3	YES (+30.9%)	NO
L09_Circ	NO (-24.4%)	NO
L09_Circ	N/A	N/A
L09_Circ	NO (-18.9%)	NO
L09_WC	N/A	N/A
L09_WC	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L09_Stair	NO (-85.8%)	NO
L10_Pavilion	NO (-8.9%)	NO
L10_Stair	YES (+2.9%)	NO
L10_WC	N/A	N/A
L10_circ	N/A	N/A
L10_WC	N/A	N/A
L10_circ	N/A	N/A
L10_circ	N/A	N/A
L10_Stair	NO (-17.9%)	NO
L10_Circ	NO (-15.3%)	NO
LG_comms_room	N/A	N/A
LG_comms_room	N/A	N/A
LG_BOH	N/A	N/A
LG_Retail_Peri_E	YES (+1.9%)	NO
LG_Circ	N/A	N/A
LG_Circ	N/A	N/A
LG_Circ	N/A	N/A
LG_Circ	N/A	N/A
LG_Comms	N/A	N/A
LG_Stair	N/A	N/A
LG_Stair	N/A	N/A
LG_Circ	YES (+34.1%)	NO
LG_Stair	NO (-99.1%)	NO
LG_WC	N/A	N/A
LG_WC	N/A	N/A
LG_WC	N/A	N/A
LG_WC lobby	N/A	N/A
LG_WC lobby	N/A	N/A
LG_WC lobby	N/A	N/A
LG_WC lobby	N/A	N/A
LG_WC lobby	N/A	N/A
LG_Circ	N/A	N/A
LG_WC	N/A	N/A
LG_Retail_Peri_E1	NO (-40.3%)	NO
BF_circ	N/A	N/A
BF_Stair	N/A	N/A
BF_circ	N/A	N/A
L08_Circ	N/A	N/A

Regulation 25A: Consideration of high efficiency alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	12406.8	12406.8
External area [m^2]	11675.2	11675.2
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	3	3
Average conductance [W/K]	6910.73	0
Average U-value [W/m^2K]	0.59	0
Alpha value* [%]	5.72	10

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

Building Use

% Area	Building Type
6	**Retail/Financial and Professional Services**
	Restaurants and Cafes/Drinking Establishments/Takeaways
94	**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
	Residential Spaces
	Non-residential Institutions: Community/Day Centre
	Non-residential Institutions: Libraries, Museums, and Galleries
	Non-residential Institutions: Education
	Non-residential Institutions: Primary Health Care Building
	Non-residential Institutions: Crown and County Courts
	General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger Terminals
	Others: Emergency Services
	Others: Miscellaneous 24hr Activities
	Others: Car Parks 24 hrs
	Others: Stand Alone Utility Block

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

	Actual	Notional
Heating	2.98	1.02
Cooling	2.21	6.36
Auxiliary	2.92	7.16
Lighting	10.62	14.57
Hot water	9.33	8.28
Equipment*	45.53	45.53
TOTAL**	**28.06**	**37.39**

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

Energy Production by Technology [kWh/m^2]

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

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	104.61	94.66
Primary energy [kWh_{PE}/m^2]	41.49	54.86
Total emissions [kg/m^2]	3.82	4.98

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] Fan coil systems, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	19.8	94.9	2.1	2.4	15	2.64	11.19	2.64	13.9
	Notional	5.5	53.9	0.5	5.3	14.1	2.78	2.84	----	----
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	23.2	59.2	2.4	1.7	2.2	2.64	9.65	2.64	13.9
	Notional	10.9	61.9	1.1	6	8.2	2.78	2.84	----	----
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	41.9	53.2	4.4	1.5	1.8	2.64	9.68	2.64	13.9
	Notional	7.7	22.9	0.8	2.2	7.1	2.78	2.84	----	----
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	99.2	22.7	10.4	1.2	3.8	2.64	5.29	2.64	7.6
	Notional	16.9	63.4	1.7	3.8	10.3	2.78	4.63	----	----
[ST] Central heating using water: radiators, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	96.5	0	10.2	0	2.3	2.64	0	2.64	0
	Notional	94.4	0	9.4	0	2.3	2.78	0	----	----
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	7.7	193.4	0.8	10.1	5.2	2.64	5.29	2.64	7.6
	Notional	26.4	241.9	2.6	14.5	9.6	2.78	4.63	----	----
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	29.9	136.4	3.1	3.9	2.7	2.64	9.65	2.64	13.9
	Notional	6	171.1	0.6	10.3	6.4	2.78	4.63	----	----
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	50.5	73.3	5.3	2.1	2.1	2.64	9.65	2.64	13.9
	Notional	19.6	69.3	2	6.8	9.2	2.78	2.84	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----

Key to terms

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

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

19 Charterhouse - Green

As designed

Date: Mon Mar 31 13:22:41 2025

Administrative information

Building Details

Address: Charterhouse Street, London, EC1N 6RA

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.26

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.26

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

Certifier details

Name: Kartik Amrania

Telephone number:

Address: 1 Bath road, Maidenhead, SL6 4AQ

Foundation area [m^2]: 869.62

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

Target CO_2 emission rate (TER), $kgCO_2/m^2annum$	4.98	
Building CO_2 emission rate (BER), $kgCO_2/m^2annum$	3.42	
Target primary energy rate (TPER), kWh_{PE}/m^2annum	54.86	
Building primary energy rate (BPER), kWh_{PE}/m^2annum	37.2	
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	0.19	0.2	GF000001:Surf[5]
Floors	0.18	0.18	0.18	GF00001E:Surf[0]
Pitched roofs	0.16	-	-	No pitched roofs in building
Flat roofs	0.18	0.18	0.18	GF00000F:Surf[0]
Windows** and roof windows	1.6	1.31	1.31	GF000004:Surf[0]
Rooflights***	2.2	-	-	No roof lights in building
Personnel doors^	1.6	1.3	1.3	GF00000A:Surf[0]
Vehicle access & similar large doors	1.3	-	-	No vehicle access doors in building
High usage entrance doors	3	-	-	No high usage entrance doors in building

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

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

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

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

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

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

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

Building services

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

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

1- Retail_AHSP VRF

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	7.51	13.9	0	1.5	0.88
Standard value	2.5*	N/A	N/A	2^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

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

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

2- Office_ASHP VRF (no CCM)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	7.51	13.9	0	1.5	0.88
Standard value	2.5*	N/A	N/A	2^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

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

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

3- WC_ASHP VRF

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.6	7.6	0	1.4	0.88
Standard value	2.5*	N/A	N/A	2^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

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

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

4- Reception lobby_ASHP VRF

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	7.51	13.9	0	1.4	0.88
Standard value	2.5*	N/A	N/A	2^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

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

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

5- Office_ASHP VRF (7-9 CCM)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	7.51	13.9	0	1.5	0.88
Standard value	2.5*	N/A	N/A	2^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

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

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

6- Office_ASHP VRF (Nat Vent Peri)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	7.51	13.9	0	1.5	0.88
Standard value	2.5*	N/A	N/A	2^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

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

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

7- Cycle Store_AHSP VRF

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.6	7.6	0	1.4	0.88
Standard value	2.5*	N/A	N/A	2^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

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

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

8- Showers_Heating only

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.6	-	0.2	-	0.88
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

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

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

Zone-level mechanical ventilation, exhaust, and terminal units

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

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

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
GF_Retail_Peri_W	-	-	-	-	-	-	-	0.3	-	-	N/A
GF_Retail_Peri_N	-	-	-	-	-	-	-	0.3	-	-	N/A
GF_Retail_INT	-	-	-	-	-	-	-	0.3	-	-	N/A
GF_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
GF_Retail_Peri_W2	-	-	-	-	-	-	-	0.3	-	-	N/A
GF_Retail_Peri_S	-	-	-	-	-	-	-	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
GF_Retail_Peri_S1	-	-	-	-	-	-	-	0.3	-	-	N/A
GF_Retail_Peri_S2	-	-	-	-	-	-	-	0.3	-	-	N/A
GF_Retail_Peri_E1	-	-	-	-	-	-	-	0.3	-	-	N/A
GF_Retail_Peri_E2	-	-	-	-	-	-	-	0.3	-	-	N/A
GF_Retail_Peri_E	-	-	-	-	-	-	-	0.3	-	-	N/A
GF_Retail_INT	-	-	-	-	-	-	-	0.3	-	-	N/A
GF_Retail_INT	-	-	-	-	-	-	-	0.3	-	-	N/A
L01_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L01_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L02_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L02_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L03_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L03_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L04_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L04_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L05_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L05_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L06_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L06_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L07_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L07_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L07_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L08_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L08_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L09_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L09_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L10_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L10_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
LG_Retail_Peri_E	-	-	-	-	-	-	-	0.3	-	-	N/A
LG_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
LG_Shower/Changing	-	-	0.4	-	-	-	-	-	-	-	N/A
LG_Shower/Changing	-	-	0.4	-	-	-	-	-	-	-	N/A
LG_Locker/Changing	-	-	0.4	-	-	-	-	-	-	-	N/A
LG_Locker/Changing	-	-	0.4	-	-	-	-	-	-	-	N/A
LG_Locker/Changing	-	-	0.4	-	-	-	-	-	-	-	N/A
LG_Locker/Changing	-	-	0.4	-	-	-	-	-	-	-	N/A
LG_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
LG_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
LG_Locker	-	-	0.4	-	-	-	-	-	-	-	N/A
LG_Locker	-	-	0.4	-	-	-	-	-	-	-	N/A
LG_showers	-	-	0.4	-	-	-	-	-	-	-	N/A
LG_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
LG_Shower	-	-	0.4	-	-	-	-	-	-	-	N/A
LG_Retail_Peri_E1	-	-	-	-	-	-	-	0.3	-	-	N/A

General lighting and display lighting	General luminaire	Display light source	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
GF_Retail_Peri_W	99	15	10
GF_Retail_Peri_N	101	15	10
GF_Retail_INT	98	15	10
GF_Circ	110	-	-
GF_Circ	110	-	-
GF_stair	110	-	-
GF_stair	110	-	-
GF_stair	110	-	-
GF_Circ	110	-	-
GF_Circ	110	-	-
GF_Circ	110	-	-
GF_WC	110	-	-
GF_Storage	110	-	-
GF_Circ	110	-	-
GF_Circ	110	-	-
GF_Retail_Peri_W2	99	15	10
GF_Retail_Peri_S	102	15	10
GF_Retail_Peri_S1	100	15	10
GF_Retail_Peri_S2	101	15	10
GF_Retail_Peri_E1	100	15	10
GF_Retail_Peri_E2	101	15	10
GF_Retail_Peri_E	102	15	10
GF_Retail_INT	97	15	10
GF_Retail_INT	102	15	10
GF_lobby	117	15	9
GF_Lobby_Int	114	15	9
GF_Lobby	117	15	9
GF_lobby	118	15	9
GF_Lobby_Int	116	15	9
L01_Office_Peri_W	150	-	-
L01_Office_Peri_W	149	-	-
L01_Office_Peri_SW3	158	-	-
L01_stair	110	-	-
L01_stair	110	-	-
L01_AHU	110	-	-
L01_WC	110	-	-
L01_WC	110	-	-
L01_circ	110	-	-
L01_circ	110	-	-
L01_circ	110	-	-
L01_circ	110	-	-
L01_Office_Peri_E	148	-	-

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
L01_Office_Peri_E1	147	-	-
L01_Office_Peri_E2	157	-	-
L01_Office_Peri_S	147	-	-
L01_Office_Peri_SW	153	-	-
L01_Office_Peri_W1	152	-	-
L01_Office_Peri_W	186	-	-
L01_Office_Int	147	-	-
L02_Office_Peri_W1	147	-	-
L02_Office_Peri_S1	149	-	-
L02_Office_Peri_S2	149	-	-
L02_Office_Peri_E1	153	-	-
L02_Office_Peri_E2	164	-	-
L02_AHU	110	-	-
L02_stair	110	-	-
L02_stair	110	-	-
L02_circ	110	-	-
L02_circ	110	-	-
L02_circ	110	-	-
L02_AHU	110	-	-
L02_WC	110	-	-
L02_WC lobby	110	-	-
L02_WC	110	-	-
L02_Office_Peri_W2	148	-	-
L02_Office_Peri_N	150	-	-
L02_Office_Int	146	-	-
L03_Office_Peri_W1	147	-	-
L03_Office_Peri_S1	149	-	-
L03_Office_Peri_S2	149	-	-
L03_Office_Peri_E1	153	-	-
L03_Office_Peri_E2	164	-	-
L03_AHU	110	-	-
L03_stair	110	-	-
L03_stair	110	-	-
L03_circ	110	-	-
L03_circ	110	-	-
L03_circ	110	-	-
L03_AHU	110	-	-
L03_WC	110	-	-
L03_WC lobby	110	-	-
L03_WC	110	-	-
L03_Office_Peri_N1	150	-	-
L03_Office_Peri_W2	148	-	-
L03_Office_Int	146	-	-

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
L04_Office_Peri_W1	147	-	-
L04_Office_Peri_S1	149	-	-
L04_Office_Peri_S2	149	-	-
L04_Office_Peri_E1	153	-	-
L04_Office_Peri_E2	164	-	-
L04_AHU	110	-	-
L04_stair	110	-	-
L04_stair	110	-	-
L04_circ	110	-	-
L04_circ	110	-	-
L04_circ	110	-	-
L04_AHU	110	-	-
L04_WC	110	-	-
L04_WC lobby	110	-	-
L04_WC	110	-	-
L04_Office_Peri_W1	147	-	-
L04_Office_Peri_N1	150	-	-
L04_Office_Int	146	-	-
L05_Office_Peri_W1	147	-	-
L05_Office_Peri_W1	147	-	-
L05_Office_Peri_S1	149	-	-
L05_Office_Peri_S2	149	-	-
L05_Office_Peri_E1	153	-	-
L05_Office_Peri_S2	149	-	-
L05_Office_Peri_E1	153	-	-
L05_Office_Peri_E2	164	-	-
L05_AHU	110	-	-
L05_stair	110	-	-
L05_stair	110	-	-
L05_circ	110	-	-
L05_circ	110	-	-
L05_circ	110	-	-
L05_AHU	110	-	-
L05_WC	110	-	-
L05_WC lobby	110	-	-
L05_WC	110	-	-
L05_Office_Peri_N	150	-	-
L05_Office_Peri_N	146	-	-
L06_Office_Peri_W1	147	-	-
L06_Office_Peri_W1	147	-	-
L06_Office_Peri_S1	149	-	-
L06_Office_Peri_S2	149	-	-
L06_Office_Peri_E1	153	-	-
L06_Office_Peri_E2	164	-	-
L06_AHU	110	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
Standard value	95	80	0.3
L06_stair	110	-	-
L06_stair	110	-	-
L06_circ	110	-	-
L06_circ	110	-	-
L06_circ	110	-	-
L06_AHU	110	-	-
L06_WC	110	-	-
L06_WC lobby	110	-	-
L06_WC	110	-	-
L06_Office_Peri_N	150	-	-
L06_Office_Int	146	-	-
L07_Office_Peri_E	148	-	-
L07_Office_Peri_N	149	-	-
L07_Office_Peri_N3	198	-	-
L07_Office_Peri_W1	159	-	-
L07_Office_Peri_W2	155	-	-
L07_Office_Int	145	-	-
L07_AHU	110	-	-
L07_Circ	110	-	-
L07_Circ	110	-	-
L07_Stair	110	-	-
L07_Stair	110	-	-
L07_WC	110	-	-
L07_Stair	110	-	-
L07_WC	110	-	-
L07_WC	110	-	-
L07_WC lobby	110	-	-
L07_Circ	110	-	-
L07_AHU	110	-	-
L07_Office_Peri_E4	153	-	-
L07_Office_Peri_E2	150	-	-
L07_Office_Peri_S	150	-	-
L07_Office_Peri_E1	151	-	-
L07_Office_Int	148	-	-
L08_Office_Peri_N	152	-	-
L08_Office_Peri_N3	157	-	-
L08_Office_Peri_E1	152	-	-
L08_Office_Peri_E2	151	-	-
L08_Office_Peri_S	151	-	-
L08_Office_Peri_W1	149	-	-
L08_Office_Peri_W2	150	-	-
L08_Office_Int	154	-	-
L08_Office_Int	145	-	-
L08_Circ	110	-	-
L08_Circ	110	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
Standard value	95	80	0.3
L08_Stair	110	-	-
L08_Stair	110	-	-
L08_WC	110	-	-
L08_WC	110	-	-
L08_WC lobby	110	-	-
L08_Circ	110	-	-
L08_Office_Int	148	-	-
L08_Office_Peri_E4	150	-	-
L08_Office__Peri_E	151	-	-
L08_Office_Peri_E5	156	-	-
L08_Office_Peri_E3	148	-	-
L09_Office DH_Peri_E1	168	-	-
L09_Office DH_Peri_E2	150	-	-
L09_Office DH_Peri_S	154	-	-
L09_Office DH_Peri_W1	249	-	-
L09_Office DH_Peri_W2	166	-	-
L09_Stair	110	-	-
L09_WC lobby	110	-	-
L09_Office DH_Peri_E3	168	-	-
L09_Circ	110	-	-
L09_Circ	110	-	-
L09_Circ	110	-	-
L09_WC	110	-	-
L09_Circ	110	-	-
L09_WC	110	-	-
L09_WC	110	-	-
L09_Stair	110	-	-
L09_Plant	110	-	-
L09_Store	110	-	-
L09_Store	110	-	-
L09_Plant	110	-	-
L10_Pavilion	179	-	-
L10_Stair	110	-	-
L10_WC	110	-	-
L10_circ	110	-	-
L10_WC	110	-	-
L10_circ	110	-	-
L10_circ	110	-	-
L10_Stair	110	-	-
L10_Circ	110	-	-
LG_comms_room	110	-	-
LG_comms_room	110	-	-
LG_Plant	110	-	-
LG_BOH	110	-	-
LG_cycle store	110	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
Standard value	95	80	0.3
LG_cycle store	110	-	-
LG_Retail_Peri_E	106	15	10
LG_Circ	110	-	-
LG_Circ	110	-	-
LG_Circ	110	-	-
LG_Circ	110	-	-
LG_BNO	110	-	-
LG_Station rm	110	-	-
LG_switchroom	110	-	-
LG_Plant	110	-	-
LG_Comms	110	-	-
LG_pump rm	110	-	-
LG_Stair	110	-	-
LG_Stair	110	-	-
LG_Circ	110	-	-
LG_Stair	110	-	-
LG_WC	110	-	-
LG_Shower/Changing	110	-	-
LG_Shower/Changing	110	-	-
LG_Locker/Changing	110	-	-
LG_Locker/Changing	110	-	-
LG_Locker/Changing	110	-	-
LG_Locker/Changing	110	-	-
LG_Locker/Changing	110	-	-
LG_WC	110	-	-
LG_WC	110	-	-
LG_Locker	110	-	-
LG_Locker	110	-	-
LG_WC lobby	110	-	-
LG_WC lobby	110	-	-
LG_WC lobby	110	-	-
LG_WC lobby	110	-	-
LG_WC lobby	110	-	-
LG_Circ	110	-	-
LG_Plant	110	-	-
LG_showers	110	-	-
LG_WC	110	-	-
LG_Shower	110	-	-
LG_loading bay	110	-	-
LG_Retail_Peri_E1	112	15	10
BF_Plant	110	-	-
BF_Plant	110	-	-
BF_Plant	110	-	-
BF_circ	110	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
Standard value	95	80	0.3
BF_Stair	110	-	-
BF_Plant	110	-	-
BF_Plant	110	-	-
BF_circ	110	-	-
L08_Circ	110	-	-
L09_Core	110	-	-

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

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
GF_Retail_Peri_W	NO (-54.2%)	NO
GF_Retail_Peri_N	NO (-81.5%)	NO
GF_Retail_INT	NO (-57%)	NO
GF_Circ	NO (-49.8%)	NO
GF_Circ	N/A	N/A
GF_stair	YES (+20.4%)	NO
GF_stair	N/A	N/A
GF_stair	N/A	N/A
GF_Circ	NO (-0.1%)	NO
GF_Circ	YES (+20.5%)	NO
GF_Circ	N/A	N/A
GF_Circ	N/A	N/A
GF_WC	N/A	N/A
GF_Circ	N/A	N/A
GF_Circ	N/A	N/A
GF_Retail_Peri_W2	NO (-32.4%)	NO
GF_Retail_Peri_S	NO (-25.6%)	NO
GF_Retail_Peri_S1	NO (-7.5%)	NO
GF_Retail_Peri_S2	NO (-4.3%)	NO
GF_Retail_Peri_E1	NO (-29.8%)	NO
GF_Retail_Peri_E2	NO (-0.1%)	NO
GF_Retail_Peri_E	NO (-24.3%)	NO
GF_Retail_INT	NO (-52%)	NO
GF_Retail_INT	NO (-32.2%)	NO
GF_lobby	NO (-57.4%)	NO
GF_Lobby_Int	NO (-52.4%)	NO
GF_Lobby	YES (+51.5%)	NO
GF_lobby	NO (-55.5%)	NO
GF_Lobby_Int	NO (-55.3%)	NO
L01_Office_Peri_W	NO (-89.6%)	NO
L01_Office_Peri_W	NO (-59.7%)	NO
L01_Office_Peri_SW3	NO (-65.4%)	NO
L01_stair	NO (-47.1%)	NO
L01_stair	N/A	N/A
L01_WC	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L01_WC	N/A	N/A
L01_circ	N/A	N/A
L01_circ	N/A	N/A
L01_circ	NO (-51.3%)	NO
L01_circ	NO (-43.7%)	NO
L01_Office_Peri_E	NO (-54.2%)	NO
L01_Office_Peri_E1	NO (-51.5%)	NO
L01_Office_Peri_E2	NO (-51.2%)	NO
L01_Office_Peri_S	NO (-35.9%)	NO
L01_Office_Peri_SW	NO (-53.9%)	NO
L01_Office_Peri_W1	NO (-50.4%)	NO
L01_Office_Peri_W	N/A	N/A
L01_Office_Int	NO (-75%)	NO
L02_Office_Peri_W1	NO (-41.4%)	NO
L02_Office_Peri_S1	NO (-38.4%)	NO
L02_Office_Peri_S2	NO (-31.9%)	NO
L02_Office_Peri_E1	NO (-39.1%)	NO
L02_Office_Peri_E2	NO (-52.5%)	NO
L02_stair	NO (-15.1%)	NO
L02_stair	N/A	N/A
L02_circ	N/A	N/A
L02_circ	NO (-18.6%)	NO
L02_circ	NO (-29%)	NO
L02_WC	N/A	N/A
L02_WC lobby	N/A	N/A
L02_WC	N/A	N/A
L02_WC lobby	N/A	N/A
L02_WC	N/A	N/A
L02_Office_Peri_W2	NO (-45.9%)	NO
L02_Office_Peri_N	NO (-88.4%)	NO
L02_Office_Int	NO (-73.2%)	NO
L03_Office_Peri_W1	NO (-41.9%)	NO
L03_Office_Peri_S1	NO (-38.6%)	NO
L03_Office_Peri_S2	NO (-31.6%)	NO
L03_Office_Peri_E1	NO (-39.5%)	NO
L03_Office_Peri_E2	NO (-52.2%)	NO
L03_stair	NO (-5.3%)	NO
L03_stair	N/A	N/A
L03_circ	N/A	N/A
L03_circ	NO (-21.4%)	NO
L03_circ	NO (-31.8%)	NO
L03_WC	N/A	N/A
L03_WC lobby	N/A	N/A
L03_WC	N/A	N/A
L03_Office_Peri_N1	NO (-88.6%)	NO
L03_Office_Peri_W2	NO (-46.3%)	NO
L03_Office_Int	NO (-73.5%)	NO
L04_Office_Peri_W1	NO (-40.4%)	NO
L04_Office_Peri_S1	NO (-40.6%)	NO
L04_Office_Peri_S2	NO (-33.9%)	NO
L04_Office_Peri_E1	NO (-36.3%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L04_Office_Peri_E2	NO (-52%)	NO
L04_stair	NO (-15.1%)	NO
L04_stair	N/A	N/A
L04_circ	N/A	N/A
L04_circ	NO (-22.3%)	NO
L04_circ	NO (-31.7%)	NO
L04_WC	N/A	N/A
L04_WC lobby	N/A	N/A
L04_WC	N/A	N/A
L04_Office_Peri_W1	NO (-43.8%)	NO
L04_Office_Peri_N1	NO (-88.5%)	NO
L04_Office_Int	NO (-72.8%)	NO
L05_Office_Peri_W1	NO (-46.5%)	NO
L05_Office_Peri_W1	NO (-42.9%)	NO
L05_Office_Peri_S1	NO (-40.6%)	NO
L05_Office_Peri_S2	NO (-31.8%)	NO
L05_Office_Peri_E1	NO (-37.5%)	NO
L05_Office_Peri_E2	NO (-54.4%)	NO
L05_stair	NO (-18%)	NO
L05_stair	N/A	N/A
L05_circ	N/A	N/A
L05_circ	NO (-20.1%)	NO
L05_circ	NO (-30.2%)	NO
L05_WC	N/A	N/A
L05_WC lobby	N/A	N/A
L05_WC	N/A	N/A
L05_Office_Peri_N	NO (-88.8%)	NO
L05_Office_Peri_N	NO (-73.7%)	NO
L06_Office_Peri_W1	NO (-44.6%)	NO
L06_Office_Peri_W1	NO (-40.7%)	NO
L06_Office_Peri_S1	NO (-38.6%)	NO
L06_Office_Peri_S2	NO (-30.5%)	NO
L06_Office_Peri_E1	NO (-36.6%)	NO
L06_Office_Peri_E2	NO (-47.8%)	NO
L06_stair	NO (-15.1%)	NO
L06_stair	N/A	N/A
L06_circ	N/A	N/A
L06_circ	NO (-19.8%)	NO
L06_circ	NO (-29.7%)	NO
L06_WC	N/A	N/A
L06_WC lobby	N/A	N/A
L06_WC	N/A	N/A
L06_Office_Peri_N	NO (-88.1%)	NO
L06_Office_Int	NO (-72.6%)	NO
L07_Office_Peri_E	NO (-22.2%)	NO
L07_Office_Peri_N	NO (-35.8%)	NO
L07_Office_Peri_N3	NO (-13.3%)	NO
L07_Office_Peri_W1	NO (-26%)	NO
L07_Office_Peri_W2	NO (-18.3%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L07_Office_Int	NO (-34.6%)	NO
L07_Circ	NO (-2.5%)	NO
L07_Circ	NO (-11.5%)	NO
L07_Stair	N/A	N/A
L07_Stair	YES (+8.2%)	NO
L07_WC	N/A	N/A
L07_WC	N/A	N/A
L07_WC lobby	N/A	N/A
L07_Circ	N/A	N/A
L07_Office_Peri_E4	NO (-34%)	NO
L07_Office_Peri_E2	NO (-18.6%)	NO
L07_Office_Peri_S	NO (-6.2%)	NO
L07_Office_Peri_E1	NO (-14.8%)	NO
L07_Office_Int	NO (-57.5%)	NO
L08_Office_Peri_N	NO (-33.7%)	NO
L08_Office_Peri_N3	NO (-3.2%)	NO
L08_Office_Peri_E1	NO (-14.7%)	NO
L08_Office_Peri_E2	NO (-29.9%)	NO
L08_Office_Peri_S	NO (-12.2%)	NO
L08_Office_Peri_W1	NO (-8.5%)	NO
L08_Office_Peri_W2	NO (-16.4%)	NO
L08_Office_Int	NO (-29.4%)	NO
L08_Office_Int	NO (-33.8%)	NO
L08_Circ	NO (-3.2%)	NO
L08_Circ	NO (-10.5%)	NO
L08_Stair	N/A	N/A
L08_Stair	YES (+8.2%)	NO
L08_WC	N/A	N/A
L08_WC	N/A	N/A
L08_WC lobby	N/A	N/A
L08_Circ	N/A	N/A
L08_Office_Int	NO (-44.4%)	NO
L08_Office_Peri_E4	NO (-17.9%)	NO
L08_Office__Peri_E	NO (-18.9%)	NO
L08_Office_Peri_E5	NO (-24.3%)	NO
L08_Office_Peri_E3	NO (-14.5%)	NO
L09_Office DH_Peri_E1	YES (+45.5%)	NO
L09_Office DH_Peri_E2	YES (+56.1%)	NO
L09_Office DH_Peri_S	YES (+46.4%)	NO
L09_Office DH_Peri_W1	NO (-12.6%)	NO
L09_Office DH_Peri_W2	YES (+51.5%)	NO
L09_Stair	NO (-4.8%)	NO
L09_WC lobby	N/A	N/A
L09_Office DH_Peri_E3	YES (+30.9%)	NO
L09_Circ	NO (-24.4%)	NO
L09_Circ	N/A	N/A
L09_Circ	NO (-18.9%)	NO
L09_WC	N/A	N/A
L09_WC	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L09_Stair	NO (-85.8%)	NO
L10_Pavilion	NO (-8.9%)	NO
L10_Stair	YES (+2.9%)	NO
L10_WC	N/A	N/A
L10_circ	N/A	N/A
L10_WC	N/A	N/A
L10_circ	N/A	N/A
L10_circ	N/A	N/A
L10_Stair	NO (-17.9%)	NO
L10_Circ	NO (-15.3%)	NO
LG_comms_room	N/A	N/A
LG_comms_room	N/A	N/A
LG_BOH	N/A	N/A
LG_Retail_Peri_E	YES (+1.9%)	NO
LG_Circ	N/A	N/A
LG_Circ	N/A	N/A
LG_Circ	N/A	N/A
LG_Circ	N/A	N/A
LG_Comms	N/A	N/A
LG_Stair	N/A	N/A
LG_Stair	N/A	N/A
LG_Circ	YES (+34.1%)	NO
LG_Stair	NO (-99.1%)	NO
LG_WC	N/A	N/A
LG_WC	N/A	N/A
LG_WC	N/A	N/A
LG_WC	N/A	N/A
LG_WC lobby	N/A	N/A
LG_WC lobby	N/A	N/A
LG_WC lobby	N/A	N/A
LG_WC lobby	N/A	N/A
LG_WC lobby	N/A	N/A
LG_Circ	N/A	N/A
LG_WC	N/A	N/A
LG_Retail_Peri_E1	NO (-40.3%)	NO
BF_circ	N/A	N/A
BF_Stair	N/A	N/A
BF_circ	N/A	N/A
L08_Circ	N/A	N/A

Regulation 25A: Consideration of high efficiency alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	12406.8	12406.8
External area [m^2]	11675.2	11675.2
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	3	3
Average conductance [W/K]	6910.73	5383.22
Average U-value [W/m^2K]	0.59	0.46
Alpha value* [%]	5.72	10

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

Building Use

% Area	Building Type
6	**Retail/Financial and Professional Services**
	Restaurants and Cafes/Drinking Establishments/Takeaways
94	**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
	Residential Spaces
	Non-residential Institutions: Community/Day Centre
	Non-residential Institutions: Libraries, Museums, and Galleries
	Non-residential Institutions: Education
	Non-residential Institutions: Primary Health Care Building
	Non-residential Institutions: Crown and County Courts
	General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger Terminals
	Others: Emergency Services
	Others: Miscellaneous 24hr Activities
	Others: Car Parks 24 hrs
	Others: Stand Alone Utility Block

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

	Actual	Notional
Heating	1.13	1.02
Cooling	2.21	6.36
Auxiliary	2.92	7.16
Lighting	10.62	14.57
Hot water	9.26	8.28
Equipment*	45.53	45.53
TOTAL**	**26.14**	**37.39**

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

Energy Production by Technology [kWh/m^2]

	Actual	Notional
Photovoltaic systems	0.92	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*0.92*	*0*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	104.61	94.66
Primary energy [kWh_{PE}/m^2]	37.2	54.86
Total emissions [kg/m^2]	3.42	4.98

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] Fan coil systems, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	19.8	94.9	0.7	2.4	15	7.51	11.19	7.51	13.9
	Notional	5.5	53.9	0.5	5.3	14.1	2.78	2.84	----	----
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	23.2	59.2	0.9	1.7	2.2	7.51	9.65	7.51	13.9
	Notional	10.9	61.9	1.1	6	8.2	2.78	2.84	----	----
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	41.9	53.2	1.5	1.5	1.8	7.51	9.68	7.51	13.9
	Notional	7.7	22.9	0.8	2.2	7.1	2.78	2.84	----	----
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	99.2	22.7	6	1.2	3.8	4.6	5.29	4.6	7.6
	Notional	16.9	63.4	1.7	3.8	10.3	2.78	4.63	----	----
[ST] Central heating using water: radiators, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	96.5	0	5.8	0	2.3	4.6	0	4.6	0
	Notional	94.4	0	9.4	0	2.3	2.78	0	----	----
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	7.7	193.4	0.5	10.1	5.2	4.6	5.29	4.6	7.6
	Notional	26.4	241.9	2.6	14.5	9.6	2.78	4.63	----	----
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	29.9	136.4	1.1	3.9	2.7	7.51	9.65	7.51	13.9
	Notional	6	171.1	0.6	10.3	6.4	2.78	4.63	----	----
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	50.5	73.3	1.9	2.1	2.1	7.51	9.65	7.51	13.9
	Notional	19.6	69.3	2	6.8	9.2	2.78	2.84	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----

Key to terms

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

Appendix B

GLA Carbon Emissions Spreadsheet

Part L 2021 Performance

Residential

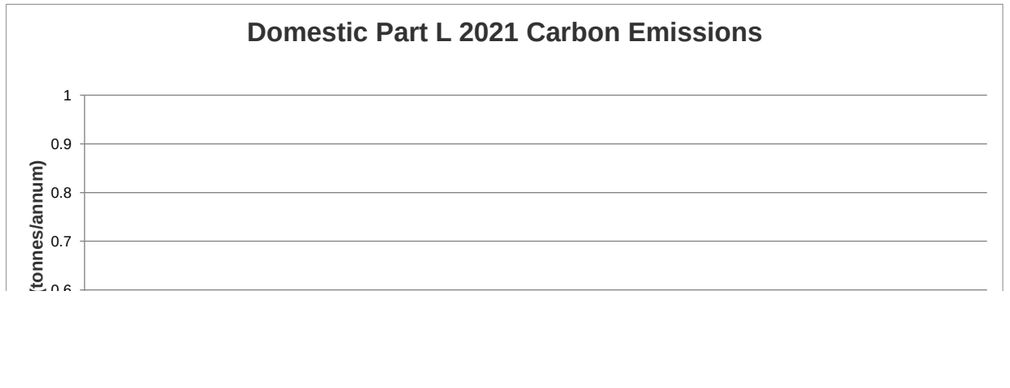
Table 1: Carbon Dioxide Emissions after each stage of the Energy Hierarchy for residential buildings

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

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

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

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



Non-residential

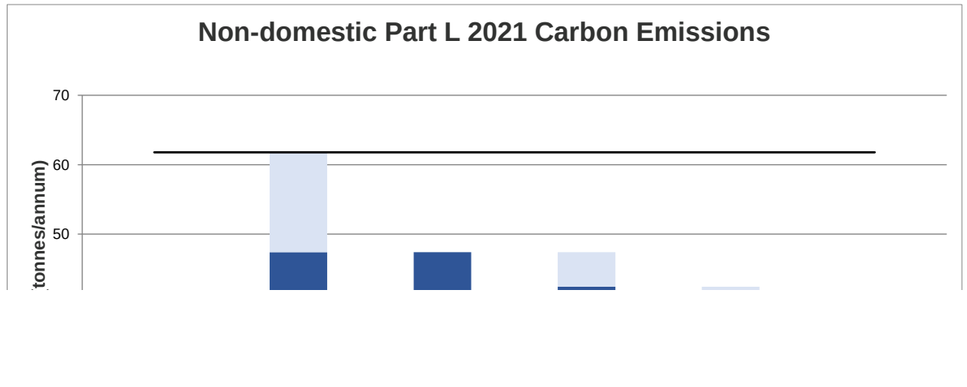
Table 3: Carbon Dioxide Emissions after each stage of the Energy Hierarchy for non-residential buildings

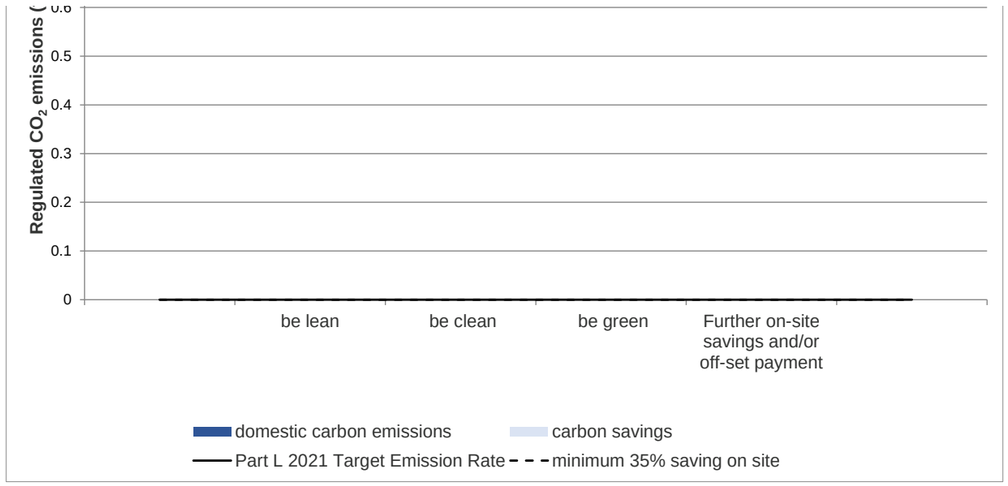
	Carbon Dioxide Emissions for non-residential buildings (Tonnes CO_2 per annum)	
	Regulated	**Unregulated**
Baseline: Part L 2021 of the Building Regulations Compliant Development	61.8	76.8
After energy demand reduction (be lean)	47.4	65.3
After heat network connection (be clean)	47.4	65.3
After renewable energy (be green)	42.4	65.3

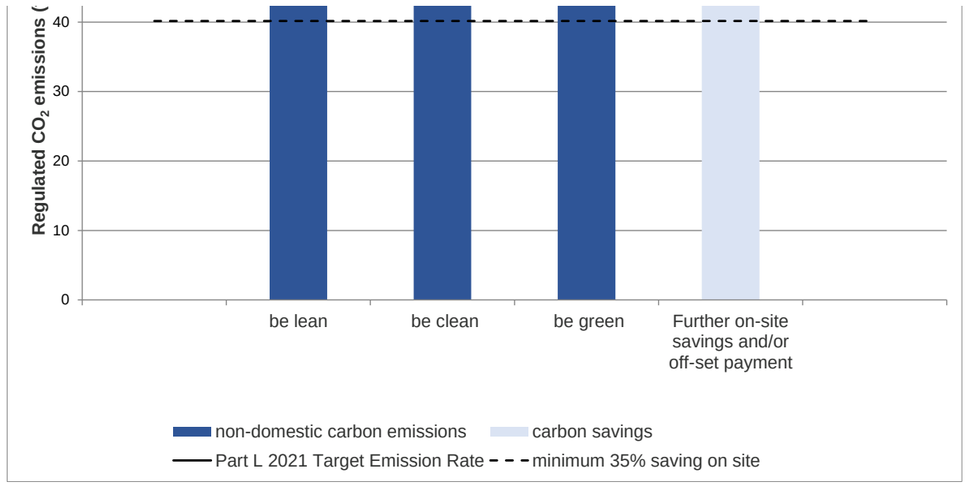
Table 4: Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for non-residential buildings

	Regulated non-residential carbon dioxide savings	
	(Tonnes CO_2 per annum)	**(%)**
Be lean: savings from energy demand reduction	14.4	23%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	5.0	8%
Total Cumulative Savings	**19.4**	**31%**
Annual savings from off-set payment	42.4	-
	(Tonnes CO_2)	
Cumulative savings for off-set payment	**1,273**	-
Cash in-lieu contribution (£)	**120,929**	

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







SITE-WIDE

	Total regulated emissions (Tonnes CO_2 / year)	CO_2 savings (Tonnes CO_2 / year)	Percentage savings (%)
Part L 2021 baseline	61.8		
Be lean	47.4	14.4	23%
Be clean	47.4	0.0	0%
Be green	42.4	5.0	8%
Total Savings	-	19.4	31%
	-	**CO_2 savings off-set (Tonnes CO_2)**	-
Off-set	-	**1,272.9**	-

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

	Area weighted non-residential cooling demand (MJ/m^2)	Total non-residential cooling demand (MJ/year)
Actual	110.5884	1372048.161
Notional	318.2544	3948518.69

EUI & space heating demand (predicted energy use)

Residential

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

Non-residential

Building type	EUI (kWh/m^2/year) (excluding renewable energy)	Space heating demand (kWh/m^2/year) (excluding renewable energy)	EUI value from Table 4 of the guidance (kWh/m^2/year) (excluding renewable energy)	Space heating demand from Table 4 of the guidance(kWh/m^2/year) (excluding renewable energy)	Methodology used (e.g. 'be seen' methodology or an alternative predictive energy modelling methodology)	Explanatory notes (if expected performance differs from the Table 4 values in the guidance)
Office	78.91993592	3.924683755	55	15	Part L2 - approved DSM & CIBSE TM54	

Appendix C

Metering Strategy

GLA ‘Be Seen’ Metering Strategy

19 Charterhouse Street
EC1N 6RA

Change list

Ver:	Date:	Description of the change	Prepared		Reviewed		Approved	
P01	28.02.25	Draft for comment	JA	28.02.25	GR	28.02.25	VK	28.02.25
P02	27.03.25	Final Draft	JA	27.03.25	GR	27.03.25	VK	27.03.25
P03	31.03.25	Final Issue	JA	31.03.25	GR	31.03.25	VK	31.03.25

Project Name: 19 Charterhouse Street
Project Number: 65210714
Client: Farrview Limited
Ver: P03
Date: 31.03.2025
Author: Jugal Ambasana

Table of contents

1 Executive Summary

This report describes the proposed metering and billing strategy for electricity, water, ventilation, heating and cooling services for the 19 Charterhouse Street development.

The report sets out the methodology to be used for monitoring the energy consumption of the services within the building. It broadly follows the recommendations set out, for non-domestic buildings, in CIBSE TM39: 2009 Building Energy Metering, BREEAM 2018 NC, as well as the principles set out in NABERS-UK.

This report demonstrates that all these requirements and those of Part L2 of Building Regulations have been considered as part of the design process, in addition to the GLA Guidance 'Be Seen' Energy Monitoring Guidance – September 2021.

The report has been structured to describe firstly the tariff meter requirements associated with utility suppliers to the landlord's services and then secondly the metering provided to the lettable areas. This includes metering of supplies to the retail areas.

1.1 Building Description

Currently the existing site comprises a dual use of office and educational use, with the latter reverting to office use on the departure of the London College of Accountancy (LCA).

The description of the proposed development is as follows:

“Remodelling, refurbishment and extension of the existing building to provide Use Class E (commercial, retail/restaurant and jewellery workspace), landscaped amenity terraces, balconies, relocated entrances, commuter facilities, on-site loading bay and plant; and other associated works.”

The proposed development seeks to transform the existing building by adding two basement levels, a ground floor, and 10 storeys above ground resulting in a proposed height of 57.725 meters AOD.

This project aims to enhance the urban landscape while adhering to the regulatory frameworks and conservation principles in place.

Table 1-1 Area Schedule –GIA provided in CRIB sheet

Use Typology	Existing (m^2 GIA)	Proposed (m^2 GIA)	Net Change (m^2 GIA)
Office	8,901	12,016	3,115
Retail	-	310	-
Jewellery Workspace	-	520	-
Total	8,901	12,846	3,945

Figure 1-1 3D visualisation of extent of the Proposed Development

2 Recommendations

The guidelines contained within CIBSE publication TM39 provides guidance to assist with the design and application of the metering strategy. Several recommendations can be applied to 19 Charterhouse Street to assist the building management in understanding the building performance characteristics and to provide an effective tool in managing energy usage. There are various reasons for metering within a commercial development building:

- Apportioning the generated LTHW and CHW costs to multiple tenants within the office floors;
- Providing robust data to assist both the landlord team and commercial tenants in reducing their energy consumption and helping the Building Management Team to operate the building efficiently and effectively;
- Providing support to the landlord and commercial tenants who may have carbon reduction obligations or corporate policies related to energy usage, such as ESOS “Energy Saving Opportunity Scheme” and other voluntary sustainability commitments to achieve zero carbon on the first day of operation as per client aspiration.
- Accurate measurement at the point of generation for all the central plants providing, heating, cooling and fresh air ventilation, as well as electricity and heat recovery provided by the usage of heat pumps to measure the added value of this innovative design;
- A clear understanding of the energy consumed by the end of use categories at the office floors (lighting, small power, ventilation and critical missions);
- Useful benchmarking by distinguishing between:

    - The standard office operation energy consumption;
    - The energy used in the amenity and retail areas;
    - The energy consumed within the landlord areas;

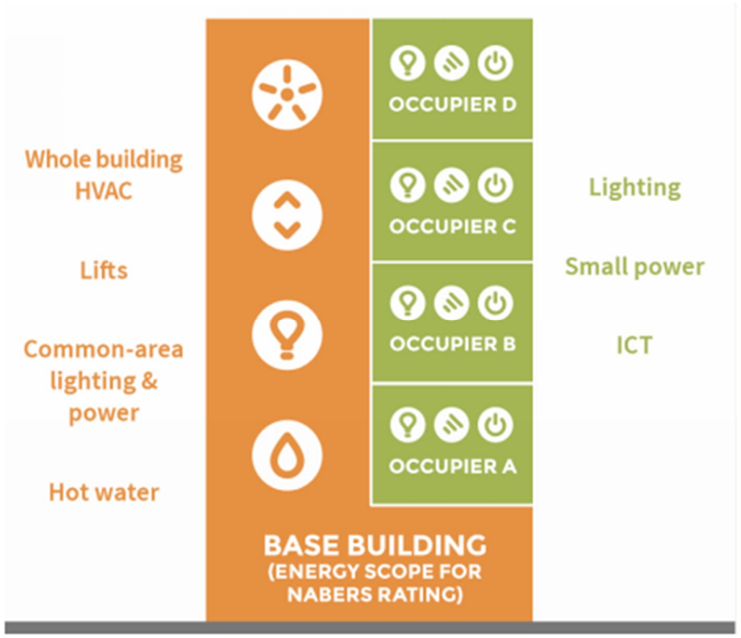


Figure 2-1 NABERS – UK Base Building Rating Scope

3 Guidance & Legislation

Regardless of tenure, the landlord must be able to understand the energy consumption of the buildings and major energy-consuming areas within it. Tenants must be able to view their energy consumption and be able to demonstrate that services are being provided to them at a competitive rate.

3.1 Specific legislation and industry standards guidance applied to commercial buildings

- Electricity and Gas “if needed” - approved tariff-based meters, meeting standards set out by the Office of Gas and Electricity Markets (OFGEM) are required for energy monitoring and billing purposes;
- Water – approved meters for the monitoring and billing of the water consumed are required to meet standards set out by the Office of Water Services (OFWAT);
- Heat Networks – regulations developed by the Department for Business, Energy & Industrial Strategy apply (Heat Network (Metering and Billing) Regulations 2014;
- Part L2-2021 – Building Regulations specific to non-domestic buildings;
- CIBSE TM 39:2009 Building Energy Metering
- BREEAM 2018 – Ene 02 Energy Monitoring;
- CIBSE TM 22 - Energy assessment and reporting method;
- The European Measuring Instruments Directive (MID) 2004/22/EC, Measuring Instruments Directive.
- GLA 'Be Seen' Energy Monitoring Guidance - September 2021.

4 Overview of Metering Methodology

CIBSE Technical Memorandum TM39: 2009 and NABERS Metering Rules guidance has been used to develop a cost-effective and practical approach to the design of the energy metering systems. The metering strategy for 19 Charterhouse Street is aligned with current regulations and guidance for new buildings.

The metering methodology is provided to address the following considerations:

- Building benchmarking to comply with CIBSE TM 54 for Evaluating Operational Energy Performance of Buildings at the Design Stage and CIBSE TM 46 and advanced modelling requirements as set out by NABERS Design for Performance;
- Landlord technical energy analysis by use (i.e. type of plant or equipment);
- Billing of each individual commercial tenants in offices and retail units.

The table in the next page summarises the compliance step with CIBSE TM39 steps and the responsibility of each team member:

Figure 4-1 CIBSE TM39 Guidance

Table 4-1 CIBSE TM39 Framework Checklist

Description		Responsible Team Member	Actions / Progress	Level of Compliance
Step - 1	Select the boundary within which TM39 will be applied	MEP/ESD	Clear boundary provided within the EMS system	**Work in progress**
Step - 2	List all energy that is imported and exported across this boundary, including all the main supplies + Renewables energy and LZC technologies	MEP/ESD	The primary supplies are water and electrical power. There is gas supply to retail tenant. Meters are installed to measure the heat recovery opportunities from the VRFs.	**Work in progress**
Step - 3	List all items within the boundary that will be supplied. These could be end-uses, technologies, tenancies or other activity areas.	MEP/ESD	Will be developed as part of RIBA Stage 3 design	**Work in progress**
Step - 4	Decide which of these items should be metered or sub-metered. Consider how the energy data collected within the boundary might need to be or could best be used	The Applicant & MEP/ESD/Smart Buildings	Will be developed as part of the design progress and will be included in RIBA Stage 3 Schematics.	**Work in progress**
Step - 5	Select the appropriate meters or method for each item to be metered or sub-metered.	MEP/Smart Buildings	Will be developed as part of RIBA Stage 3 design	**Work in progress**
Step - 6	Determine where to locate the meters. Mark the plan to show, within the boundary, which meter is located where.	MEP	Will be developed as part of RIBA Stage 3 design	**Work in progress**
Step - 7	Decide how the meters are to be read. For automatically read meters, ensure that readings can be gathered for analysis, particularly if there is an existing EMS system.	The Applicant & Smart Buildings	The Applicant to advise regarding the level integration between the EMS / BMS and the strategy to be adapted	**Work in progress**
Step - 8	Review metering strategy for appropriateness, complexity and cost-effectiveness. Go back to step 4 if revisions are required.	The Applicant & MEP/ESD/Smart Buildings Appointed contractors	Will be developed as part of RIBA Stage 3 design	Work in progress
Step - 9	Specify, implement and commission the metering and submetering decided in step 8	The Applicant & MEP/ESD/Smart Buildings Appointed contractors	Potential additional review and optimisation work should be scheduled as part of the five years Post Occupancy Evaluation (POE)	Work in progress
Step -10	Ensure a copy of the updated metering strategy is included in the building logbook.	The Applicant & MEP/ESD/Smart Buildings Appointed contractors	The documentation and reporting templates should be agreed upon in advance as part of RIBA Stage 3 specification to comply with the latest industry guidance.	Work in progress

4.1 Proposed Metering Dashboards

Dashboards shall be provided at all graphical interfaces providing interactive visibility of energy and carbon performance data.

The pie charts below summarise the suggested reporting templates to demonstrate achieve the targets listed above:

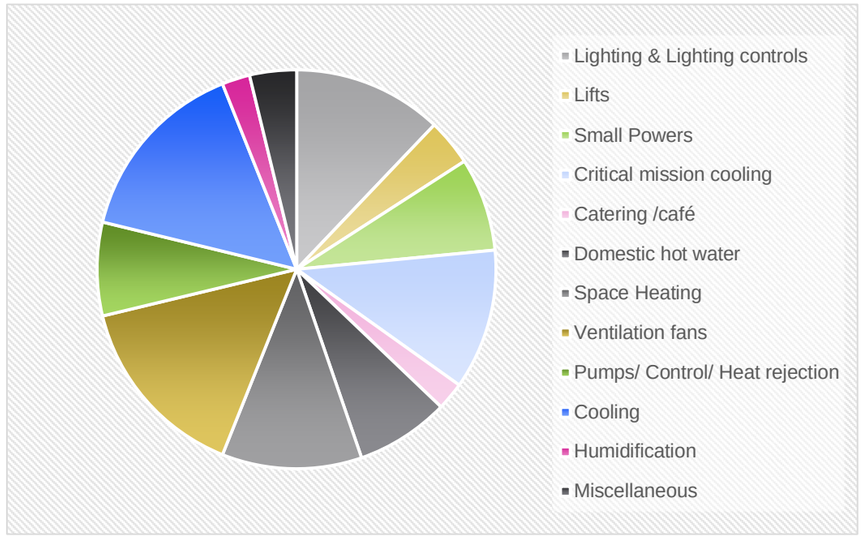


Figure 4-1: EXAMPLE of Energy consumption of commercial areas broken by energy end-usage

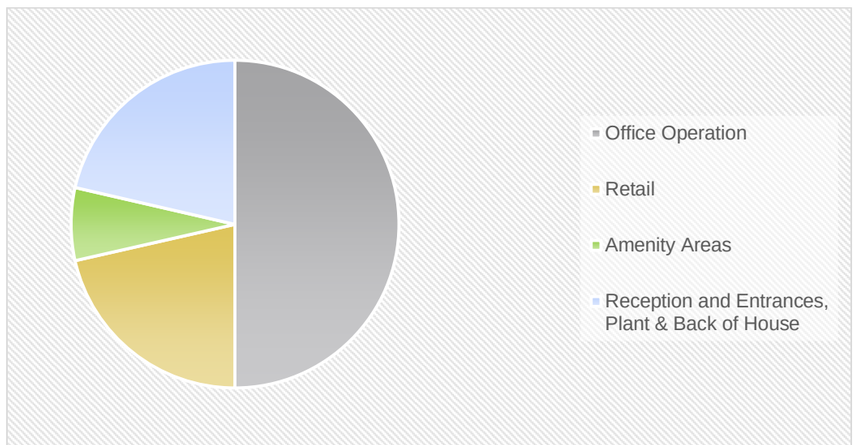


Figure 4-2: EXAMPLE of Different energy consumption broken by function

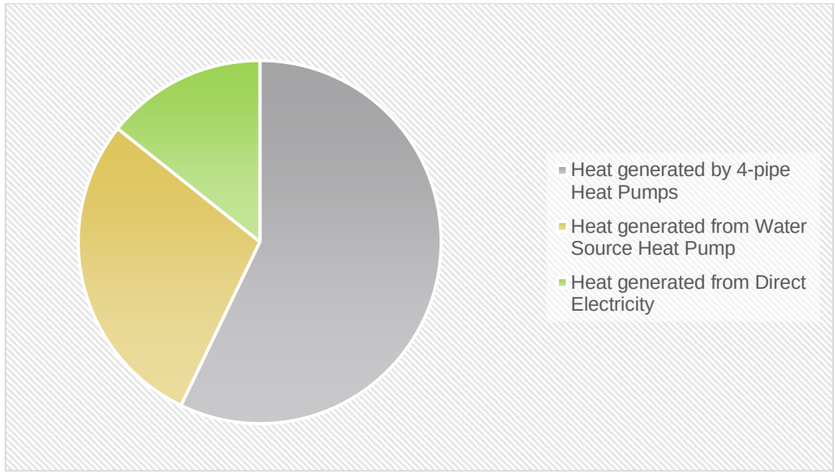


Figure 4-3: EXAMPLE of Heating energy generated broken by sources

5 GLA “Be Seen” Reporting Process

5.1 GLA “Be Seen” Requirements

The Mayor of London has declared a climate emergency and has set an ambition for London to be net zero-carbon. This means all new buildings must target net zero carbon. The Mayor’s London Plan sets the targets and policies required to achieve this. It includes:

A requirement for all major development to ‘be seen’ i.e., to monitor and report its energy performance post-construction to ensure that the actual carbon performance of the development is aligned with the Mayor’s net zero-carbon target. This guidance document explains how to meet this requirement.

To truly achieve net zero-carbon buildings we need to have a better understanding of their actual operational energy performance. Although Part L calculations and Energy Performance Certificates (EPCs) give an indication of the theoretical performance of buildings, it is well established that there is a ‘performance gap’ between design theory and measured reality. By having an integrated Energy Monitoring System, the actual energy consumption of the building can be actively monitored and acted upon appropriately.

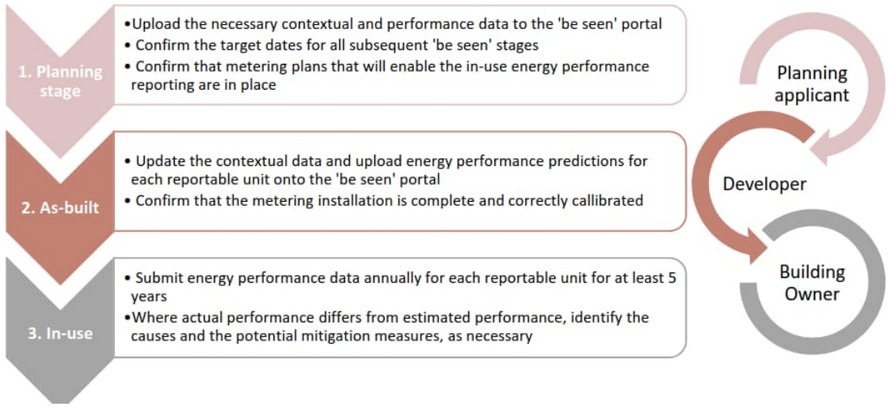


Figure 5-1 "Be Seen" Reporting Process

5.2 “Be Seen” Planning Stage Performance Indicators

The table below summarise the GLA reporting requirement for the current phase of the project:

Table 5-1 Summary of GLA Be Seen Compliance Sheet: Non-Domestic

Performance Indicator Group	Description		Part L2 Calculations	CIBSE TM 54 Calculations	Notes
Contextual data	Location Unique Property Reference Number (UPRN) or Address		19 Charterhouse Street 19 Charterhouse Street, London, EC1N 6RA		
	Site plan		Included in the planning documentation		
	Typology / Planning Use Class		Office and Retail		
	GIA for each Typology / Use Class	m^2	Total: 12,407	Office: 12,016	**Area considered in Part-L**: Whole Development **Area considered in CIBSE TM54**: Office only, Retail spaces are excluded
	Anticipated target dates for each ‘be seen.’ reporting stage	Planning Stage	March 2025		Subject to construction programme
		As-built	August 2027		
		In-use	August 2028		
Building energy use	Grid electricity consumption	kWh/annum	Regulated: 324,314 Unregulated: 564,882	Base building: 447,335 Office Tenant: 500,967	**Part-L**: heating, cooling, auxiliary, lighting, DHW, equipment **CIBSE TM54**: heating, cooling, auxiliary, lighting, DHW, lifts, equipment, servers, security.
	Gas consumption		0	0	
	Other fuels consumption		0	0	
	Energy generation		11,414	11,414	Generated by Photovoltaic systems (PVs)
	District heating consumption		0	0	
	District cooling consumption		0	0	
Carbon emissions	Carbon emissions estimates for the whole development	kg CO_2 /m^2/ annum	Regulated only: 3.42 Regulated + unregulated: 9.59	Base building: 4.93 Tenant: 5.67	Using SAP10.2 Carbon Factors over 60 years Electricity 0.136 kgCO2/kWh
	Carbon shortfall for the entire development	tonnes CO_2 / annum	42.4	N/A	Using SAP10.2 Carbon Factors
	Total carbon offset amount	£	£120,929	N/A	

Appendix A – GLA “Be Seen” Spreadsheet”

Note: 1. The calculations for Part L2A 2021 were given using SAP 10.2 carbon factors

MAYOR OF LONDON

OVERALL PROGRESS 100%

CURRENT REPORTING STAGE ----------->>	Planning	*

CONTEXTUAL DATA *Progress: 100%*

+ ORGANISATION & CONTACT DETAILS

ORGANISATION DETAILS

Organisation Name	Sweco UK	*
Organisation Address	1 Bath Road, Maidenhead, SL6 4AQ	*

CONTACT DETAILS

Contact Name	Jugal Ambasana	*
Email	jugal.ambasana@sweco.co.uk	*
Additional Email(s)	kartik.amrania@sweco.co.uk	
Telephone No.	+44 1628 598 382	*
Mobile No.		

+ DEVELOPMENT INFORMATION

OVERALL DEVELOPMENT DETAILS

Planning Reference Number	TBC	*
Name of Whole Development	19 Charterhouse Street	*

DEVELOPMENT LOCATION

Development Address		
Address Line 1	19 Charterhouse Street	*
Address Line 2		
Address Line 3		
Address Line 4		
London Borough	Camden	*
Postcode	EC1N 6RA	*
Ordnance Survey Reference		
Development UPRN (if available)	TBC	
Geo-Location Coordinates		
Latitude (to 6 decimal places)	51.519	
Longitude (to 6 decimal places, +ve or -ve)	-0.106	

DEVELOPMENT TOTAL AREA BREAKDOWN

Residential			
Total Residential Floor Area	GIA m2	0	*
Dwelling Counts			
Flats	number		
House	number		
Non-Residential			
Non-Residential Floor Area Breakdown		*Please include complete non-resi details below*	
Landlord Circulation (in Residential Blocks)	GIA m2	0	*
General office (A2, B1, B8, D1 planning classes)	GIA m2	12,016	*
High street agency (A2 planning classes)	GIA m2	0	*
General retail (A1, SG planning classes)	GIA m2	830	*
Large non-food shop (A1 planning classes)	GIA m2	0	*
Small food store	GIA m2	0	*
Large food store	GIA m2	0	*
Restaurant (A3, A5 planning classes)	GIA m2	0	*
Bar, pub or licensed club (A4 planning classes)	GIA m2	0	*
Hotel (C1 planning classes)	GIA m2	0	*
Cultural Activities	GIA m2	0	*
Entertainment halls (D2 planning classes)	GIA m2	0	*
Swimming pool centre	GIA m2	0	*
Fitness and health centre	GIA m2	0	*
Dry sports and leisure facility (D2 planning classes)	GIA m2	0	*
Covered car park	GIA m2	0	*
Public buildings with light usage (D1, SG planning classe	GIA m2	0	*
Schools and seasonal public buildings (D1, D2 planning	GIA m2	0	*
University campus	GIA m2	0	*
Clinic (D1 planning classes)	GIA m2	0	*
Hospital (clinical and research)	GIA m2	0	*
Long term residential (C1, C2, C2A planning classes)	GIA m2	0	*
General accommodation (C1, C2, C3 planning classes)	GIA m2	0	*
Emergency services (SG planning classes)	GIA m2	0	*
Laboratory or operating theatre	GIA m2	0	*
Public waiting or circulation (SG planning classes)	GIA m2	0	*
Terminal (B8 planning classes)	GIA m2	0	*
Workshop (B1, B2 planning classes)	GIA m2	0	*
Storage Facility (B8 planning classes)	GIA m2	0	*
Cold Storage (B8 planning classes)	GIA m2	0	*
Overall Development Summary			
Total Development Floor Area			
Residential	GIA m2	0	
Non-Residential	GIA m2	12,846	
Total	GIA m2	12,846	

Total Non-Residential Uses	General office; General retail

+ SUPPLEMENTARY FILES AND UPCOMING REPORTING STAGES

SUPPLEMENTARY FILES

Site Plan		
Does the development have a site plan?	Yes	*
What is the site plan filename?	NGL939143	*
Best Practice Documents		
Does the development have a predicted DEC?	No	*
Is there a base building energy rating (in line with DFP)?	Yes	*
What is the DFP filename?	TBC	*

ANTICIPATED DATES FOR UPCOMING REPORTING STAGES

As-Built Stage	1 Aug 2027	*
Operational Year 1 End	1 Aug 2028	*

DEVELOPMENT PERFORMANCE AND EMISSIONS *Progress: 100%*

+ DEVELOPMENT PERFORMANCE

DEVELOPMENT OVERALL PREDICTED PERFORMANCE

Predicted Performance Calculation Details			
Fuel Carbon Intensity Source (aligned with planning energy statemen		SAP 10.0	*
Residential Elements of the development			
Predicted Annual Energy Use		*Fill in all applicable fuels below*	
Annual Electricity Use	kWh/yr	0	*
Annual Gas Use	kWh/yr	0	*
Annual Oil Use (if applicable)	kWh/yr	0	*
Annual Biomass Use (if applicable)	kWh/yr	0	*
Annual District Htg Use (if applicable)	kWh/yr	0	*
Annual District Clg Use (if applicable)	kWh/yr	0	*
Elec Generation, Gross (if applicable)	kWh/yr	0	*
Solar Thermal Generation (if applicable)	kWh/yr	0	*
Predicted Annual Carbon Emissions	tCO2/yr	0	*
Non-Residential Elements of the development (Part L Calculation)			
Predicted Annual Energy Use		*Fill in all applicable fuels below*	
Annual Electricity Use	kWh/yr	889,195	*
Annual Gas Use	kWh/yr	0	*
Annual Oil Use (if applicable)	kWh/yr	0	*
Annual Biomass Use (if applicable)	kWh/yr	0	*
Annual District Htg Use (if applicable)	kWh/yr	0	*
Annual District Clg Use (if applicable)	kWh/yr	0	*
Elec Generation, Gross (if applicable)	kWh/yr	11,414	*
Solar Thermal Generation (if applicable)	kWh/yr	0	*
Predicted Annual Carbon Emissions	tCO2/yr	119	*
Non-Residential Elements of the development (TM54 Calculation)			
Predicted Annual Energy Use		*Fill in all applicable fuels below*	
Annual Electricity Use	kWh/yr	948,302	*
Annual Gas Use	kWh/yr	0	*
Annual Oil Use (if applicable)	kWh/yr	0	*
Annual Biomass Use (if applicable)	kWh/yr	0	*
Annual District Htg Use (if applicable)	kWh/yr	0	*
Annual District Clg Use (if applicable)	kWh/yr	0	*
Elec Generation, Gross (if applicable)	kWh/yr	11,414	*
Solar Thermal Generation (if applicable)	kWh/yr	0	*
Predicted Annual Carbon Emissions	tCO2/yr	127	*

CARBON OFFSETTING

Predicted Carbon Shortfall (aligned with planning energy st	tCO2	3,571	*
Total Committed Carbon Offset	£	120,929	*

END

Appendix D

BREEAM Thermal Comfort Assessment (Hea04)

SWECO

Thermal Comfort Report

19 Charterhouse Street

April 2025

Contents

Appendices

Appendix A – Detailed results for winter and summer operative temperatures

Appendix B – Detailed results for PMV and PPD study

Revisions & Author Details

Revision no.	Date	Author	Checked/Approved By	Date Approved
01	25/03/2025	Shruti Ganesh	Monika Potomska	27/03/2025

1. Executive Summary

Sweco UK has been instructed by Farrview Limited (‘The Applicant’) to prepare a Thermal Comfort report carried out for the commercial areas within 19 Charterhouse (the "Proposed Development"), located in the London Borough of Camden (LBC).

The report summarises the latest façade optimisation strategies proposed and passive design measures regarding efficient fabric u-values, solar control coatings and external shading elements. These optimisation measures have contributed substantially to increasing the fabric energy efficiency of the building, reducing solar gains, cooling loads and its associated carbon emissions.

Furthermore, this report aims to provide an overview of thermal comfort within the commercial areas at the Proposed Development, demonstrating compliance with GLA’s Cooling Hierarchy, CIBSE Guide A and following the requirements of the Hea 04 Thermal Modelling credit under BREEAM New Construction 2018.

A detailed thermal comfort analysis using dynamic simulation modelling was carried out in terms of summer and winter operative temperatures and HVAC systems response to peak demand. The results show that all commercial areas comply with the BREEAM overheating criteria under current DSY 1 and future summer scenario for year DSY 2 and DSY 3 (with LHR DSY weather file). The occupants will feel the internal environment to be normal, i.e., not cold, or warm, for all the climate predictions assessed with less than 10% of people feeling dissatisfied in most of the operating hours.

Several design features are implemented to minimise energy demand and improve thermal comfort for the occupants:

Passive Measures:

- Shading elements and efficient fabric u-values.
- horizontal projections and vertical columnar shading, along with terraces punctuated with opaque elements.
- Optimised window-to-wall ratio

Active Measures:

- Active cooling is proposed with reduced cooling loads due to passive measures.
- Auxiliary ventilation provided with 14 l/s/person rate.

Figure 1-1 Proposed design for 19 Charterhouse (Source: DSDHA)

2. Introduction

This report summarises results for the commercial areas assessed against the statutory overheating criteria for the Proposed Development. The commercial spaces were analysed in this assessment to determine the expected levels of thermal comfort.

The proposed development description is as follows:

Remodelling, refurbishment and extension of the existing building to provide Use Class E (commercial, retail/restaurant and jewellery workspace), landscaped amenity terraces, balconies, relocated entrances, commuter facilities, on-site loading bay and plant, and other associated works.

The overheating analysis was carried out using IES VE Dynamic Building Simulation tool and conducted in line with Part L 2021 Volume 2 Section 4, CIBSE Guide A and following the requirements of the Hea 04 Thermal Modelling credit under BREEAM New Construction v6.1.

2.1. Policy Context

2.1.1. Building Regulations Part L 2021 – Limiting the effects of solar gains in summer

This section explains the differences and similarities of the Part L 2021 guidance for commercial spaces under Building Regulations. However, it is important to note that meeting this Criterion is not mandatory, and non-compliance can be reasonably justified by Building Control. Frequently, retail areas or spaces with double-height configurations fail to meet the criteria.

The design and performance of the facades of the Proposed Development have been carefully considered to pass Criterion 3.

Commercial Spaces

Part L 2021 considers the amount of solar gains entering the building through glazing. It is understood that the objective of this is to ensure that spaces are not excessively serviced to maintain thermal comfort, and thus to ensure that the energy consumption and carbon dioxide emissions related to those services are minimised. There is no other indication of overheating compliance from Part L 2021 Building Regulations.

However, the GLA encourages developments to assess the risk of overheating in non-residential buildings through dynamic simulation as stated in their SPG, section 3.2.3: “Overheating is not fully assessed by carbon dioxide emission models; therefore, developers are encouraged to undertake dynamic thermal modelling to ensure that their development does not overheat.” The glazing area in the Proposed Development has been optimised to provide sufficient daylighting and minimise solar heat gain in summer.

4.17 The guidance in paragraph 4.18 applies to all other buildings not covered in paragraph 4.16, irrespective of whether they are air-conditioned.

The intention is to limit solar gains during the summer, in order to either:

a. reduce the need for air-conditioning

b. reduce the capacity of any air-conditioning system that is installed.

4.18 For each space in the building that is occupied or mechanically cooled, the solar gains through the glazing – aggregated from April to September inclusive – should be no greater than would occur through the relevant reference glazing systems in Table 4.3 with a defined total solar energy transmittance (g-value) calculated according to **BS EN 410**. In this context, an occupied space means a space that is intended to be occupied by the same person for a substantial part of the day. This excludes circulation spaces and other areas of transient occupancy, such as toilets.

Table 4.3 Reference glazing systems for solar gain calculation

Type of space (as defined in the National Calculation Methodology)	Average zone height	Glazing location for reference space	Glazing area for reference space	Framing factor for reference space	Glazing g-value for reference space
Side-lit	Any	East-facing façade	Full-width to a height of 1000mm	10%	0.48
Top-lit	≤6m	Roof	10% of roof area[1]	25%	0.48
	>6m	Roof	10% of roof area[1]	15%	0.42

NOTE:
1. ‘Roof area’ determined from the inside of the space looking out.

Figure 2-1 Extract from Approved Document L2A (2021)

2.1.2. The cooling hierarchy and local policies

Camden’s Local Plan policy CC2: Adapting to Climate Change as well as Chapter 10 of the CPG mandates that developments implement strategies to mitigate the effects of urban and residential overheating by following the cooling hierarchy. This hierarchy is in accordance with the London Plan’s cooling hierarchy, which emphasizes that active cooling should only be utilized after all passive measures have been applied.

Policy SI4 – Managing heat risk of the London Plan 2021 states that major development proposals should reduce potential overheating and reliance on air-conditioning systems and demonstrate this in accordance with the cooling hierarchy outlined in Figure 2-2 Moreover, Policy SI2 Minimising greenhouse gas emissions of the London Plan (2021) promotes to use passive design and reducing energy demand as part of the “Be Lean” stage of the energy hierarchy.

Table 2-1 presents the strategies proposed for all buildings within the proposed development in line with the policies above.

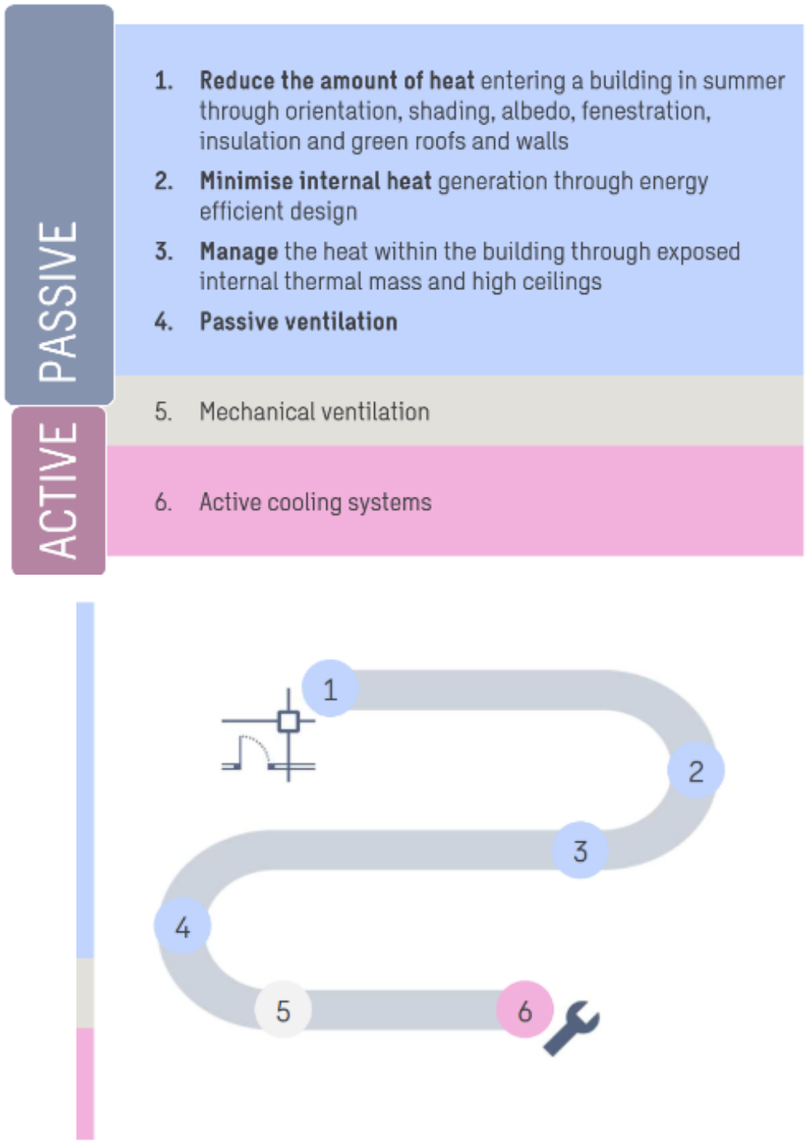


Figure 2-2 London Plan 2021 Cooling Hierarchy

Table 2-1 Proposed Development's response to the cooling hierarchy

London Plan: Policy SI 4 (2021) - Cooling Hierarchy	**Proposed Development Strategy**
1. Reduce the amount of heat entering a building in summer through orientation, shading, albedo, fenestration, insulation and green roofs and walls.	The glazing ratio has been optimised through early-stage design analysis by setting onerous solar gains targets (BCO guidelines). The horizontal and vertical shading along with terraces and roof vegetation contribute to solar mitigation and reduce urban heat island effect.
2. Minimise internal heat generation through energy-efficient design	Efficient lighting has been proposed to reduce heat gains from lighting.
3. Manage the heat within the building through exposed internal thermal mass and high ceilings	Maximising the floor to ceiling height proposed to the office areas.
4. Passive ventilation	Open-able vents have been incorporated into the facade through levels 1-7 to enhance occupant well-being.
5. Mechanical ventilation	Highly efficient mechanical ventilation with efficient heat recovery is proposed for fresh air supply all year round.
6. Active cooling systems	Energy efficient systems to provide cooling.

2.1.3. BREEAM UK New Construction 2018 – Hea 04 Thermal Comfort

This report shows evidence to achieve one credit under Hea 04 Thermal Comfort – Thermal Modelling and Design for Future Thermal Comfort (criteria 1 to 8). The following table summarises where the relevant information is located within this report:

Table 2-2 Hea 04 Modelling Criterion

Hea 04 – Thermal Modelling Criteria	Refer to:
1. Thermal modelling has been carried out using software in accordance with CIBSE AM11 Building Energy and Environmental Modelling.	This has been carried out. See Section 4.1 of this report.
2. The software used to carry out the simulation at the detailed design stage provides full dynamic thermal analysis. For smaller and more basic building designs with less complex heating or cooling systems, an alternative, less complex means of analysis may be appropriate (such methodologies must still be in accordance with CIBSE AM11).	This has been carried out. See Section 4.1 of this report.
3. The modelling demonstrates that: a. For air-conditioned buildings, summer and winter operative temperature ranges in occupied spaces are in accordance with the criteria set out in CIBSE Guide A Environmental Design, Table 1.5; or other appropriate industry standard (where this sets a higher or more appropriate requirement/level for the building type).	This has been carried out. See Section 3.2.3 of this report.
4. For air-conditioned buildings, the PMV (predicted mean vote) and PPD (predicted percentage of dissatisfied) indices based on the above modelling are reported via the BREEAM assessment scoring and reporting tool.	This has been carried out. See Section 5.4 of this report.
5. Criteria 1 to 4 are achieved	Refer to above points – criteria 1-4 have been demonstrably achieved for the Proposed Development thus achieving compliance.
6. The thermal modelling demonstrates that the relevant requirements set out in criterion 3 of Hea04 are achieved for a projected climate change environment.	This has been carried out. Refer to Sections 3.2.5 and 5.2 which demonstrates that the future weather files were use in the modelling process and the proposal meets the requirements.
7. Not applicable – criterion 6 has been met.	n/a – see above.
8. For air-conditioned buildings, the PMV and the PPD indices based on the above modelling are reported via the BREEAM assessment scoring and reporting tool.	The PMV and PPD values calculated within this report will be reflected in the Proposed Development's scoring and reporting tool by the BREEAM assessor.

3. Overheating Assessment

3.1. Thermal Comfort Design and Overheating Criteria

The mixed-use development must assess overheating against the following criteria as further detailed in this section.

Table 3-1 Overheating Criteria

Space	Overheating Criteria
Commercial areas	CIBSE TM52 for naturally ventilated spaces CIBSE Guide A for mechanically ventilated spaces BREEAM New Construction 2018 BCO Guide to Specification (2023)

Figure 3-1 CIBSE Guide A and BREEAM 2018 Manuals

3.2. Mitigating overheating in non-domestic areas

3.2.1. CIBSE Guide A

In a changing climate, overheating in buildings, especially those without mechanical cooling, is a serious and potentially increasing problem. According to CIBSE Guide A, a mechanically cooled building should aim to provide an indoor environment where the PMV index is near to or equal to zero.

It will be considered as overheating if the value of the PMV index is above 0.5 (equivalent to a PPD of 10%). Where a value of PMV is not available, the maximum operative temperatures are given in Table 1.8 in CIBSE Guide A for various types of space, using assumed values of the metabolic rate and an assumed clothing insulation of 1.0 for winter and 0.5 for summer. The predicted indoor temperatures should not exceed the tabulated values for more than 3% of occupied hours. This metric will be used for commercial areas.

For summer conditions, simulations should be made using design summer years as recommended in CIBSE TM49:2014.

For naturally ventilated buildings CIBSE Guide A refers to CIBSE TM52 for means of assessing the risk of overheating, as detailed in the next section.

3.2.2. CIBSE TM52

CIBSE TM 52: 2013 is used to check overheating in non-residential naturally ventilated buildings.

The assessment consists of three criteria which are detailed below. Of which passing two of the three criteria results into compliance essentially indicate low or no risk of overheating.

ΔT is the difference between actual operative room temperature (TOP) and the maximum acceptable room temperature (T_{max}). The T_{max} is calculated by:

$$\mathbf{T_{max} = 0.33 \times T_{rm} + 21.8}$$

Where T_{rm} is the outdoor running mean temperature (°C).

Criterion 1: Hours of Exceedence (H_e)

The number of hours (H_e) during which ΔT is greater than or equal to one degree (K) during the non-heating period (1st May to 30th September inclusive) shall not be more than 3% of occupied hours

Criterion 2: Daily Weighted Exceedence (W_e)

To allow for the severity of overheating, the weighted exceedence (W_e) shall be less than or equal to 6 in any one day, where:

$W_e = (\Sigma h_e) \times WF \quad = (h_{e0} \times 0) + (h_{e1} \times 1) + (h_{e2} \times 2) + (h_{e3} \times 3) + \ldots + (h_{ey} \times y)$

where: $WF = 0$ *if* $\Delta T \leq 0$

otherwise: $WF = \Delta T$ *and* h_{ey} *is the time (hrs) when* $WF = y$

Criterion 3: Upper Limit Temperature (T_{upp})

To set an absolute maximum value for the indoor operative temperature, the value of ΔT shall not exceed 4K

It is recommended that; if naturally ventilated, any commercially occupied spaces pass 2 of the 3 above presented criteria to indicate the absence of overheating within the occupancy space.

The commercial areas within the Proposed Development have mechanical cooling proposed, so CIBSE Guide A criteria should be followed. However, all appropriate steps within the cooling hierarchy have been followed to reduce associated cooling loads.

3.2.3. Mechanically Cooled Areas

BCO (British Council of Office's) Guide to Specification (2023) states that *"Where the system type allows, the winter design air temperature may be reduced to a minimum of 20°C to lower heating energy needs whilst maintaining comfort levels."*

CIBSE Guide A Environmental Design 2015 recommends summer operative temperatures for a range of air-conditioned building types in Table 1.5. For open plan offices, they range between 22-25°C in summer and between 21-23°C in the winter. For retail spaces, they range between 21-25°C in the summer and between 19-21°C in the winter.

These temperature ranges corresponded to a predicted mean vote (PMV) of ±0.5 and predicted percentage dissatisfied of 10%.

This will ensure that the assessment of new developments better reflects the actual carbon emissions associated with their expected operation. The impact of these new emission factors is significant in that technology generating on-site electricity (such as gas-engine CHP) will not achieve the carbon savings they have to date.

Table 1.5 Recommended comfort criteria for specific applications — *continued*

Building/room type	Customary winter operative temperatures for stated activity and clothing levels*			Customary summer operative temperatures (air conditioned buildings†) for stated activity and clothing levels*		
	Temp. / °C	Activity / met	Clothing / clo	Temp. / °C	Activity / met	Clothing / clo
Offices:						
— board room, large conference room	21–23	1.2	0.9	22–25	1.2	0.7
— general, small conference room, executive office	21–23	1.2	0.9	22–25	1.2	0.7
— open–plan	21–23	1.2	0.9	22–25	1.2	0.7
Retailing:						
— shopping malls	12–19[1]	1.8	1.2	21–25[1]	1.8	0.6
— small shops, department stores[23]	19–21	1.4	1.0	21–25	1.3	0.6
— department stores (upper floors)	19–21	1.4	1.0	21–25	1.3	0.6
— supermarkets[30]	19–21	1.4	1.0	21–25	1.3	0.6
Places of public assembly:						
— concert hall, theatre[27]	21–23	1.0	1.0	24–25	1.1	0.6
— cinema	21–23	1.0	1.0	24–25	1.1	0.6
Sports halls[31]:						
— changing rooms	21–24	—	—	22–25	—	—
— hall	13–16	3.0	0.4	14–16	3.0	0.3

Figure 3-2 Table 1.5 Extract from CIBSE Guide A, Operative Temperature Limit – Offices

A mechanically cooled building or space should not exceed the predicted indoor temperature values tabulated in table 1.8 for more than 3% of occupied hours for thermal comfort (CIBSE Guide A, 2015), assuming clothing insulation of 1.0 for winter and 0.5 for summer.

Table 1.8 Maximum temperatures (category II expectation) for indoor environment in indoor spaces; clothing is assumed to be 1.0 clo in winter and 0.5 clo in summer (see Table 1.7 for category definitions) (data source: BS EN 15251 (BSI, 2007)

Type and use of space	Assumed activity level (/ met)	Maximum temperature for stated clothing level	
		Winter clo = 1.0	Summer clo = 0.5
Residential (sedentary)	1.2	24.0	26.0
Residential (active)	1.5	22.0	—
Offices	1.2	24.0	26.0
Public spaces (auditoria, café etc.)	~1.2	24.0	26.0
Classrooms	1.2	24.0	26.0
Kindergarten	1.4	22.5	25.5
Shops	1.6	22.0	25.0

Figure 3-4 Table 1.8, Extract from CIBSE Guide A - Activity and CLO

In this study office areas are mechanically ventilated. The lower and upper temperature limits for those uses for winter and summer respectively is targeted at:

- Office areas: Winter: 21°C / Summer: 25°C
- Retail areas: Winter: 19°C / Summer: 25°C

3.2.4. Predicted Mean Vote (PMV) and Predicted Percentage Dissatisfied (PPD)

"A human being's thermal sensation is mainly related to the thermal balance of his or her body as a whole. This balance is influenced by physical activity and clothing, as well as the environmental parameters: air temperature, mean radiant temperature, air velocity and air humidity. When these factors have been estimated or measured, the thermal sensation of the body as a whole can be predicted by calculating the predicted mean vote (PMV). The PMV is an index that predicts the mean value of the votes of a large group of persons on the 7-point thermal sensation scale (see Table 1), based on the heat balance of the human body. Thermal balance is obtained when the internal heat production in the body is equal to the loss of heat to the environment. In a moderate environment, the human thermoregulatory system will automatically attempt to modify skin temperature and sweat secretion to maintain heat balance."

The predicted percentage dissatisfied (PPD) index provides information on thermal discomfort or thermal dissatisfaction by predicting the percentage of people likely to feel too warm or too cool in each environment. The PPD can be obtained from the PMV, refer to Figure 3-5.

Regarding summer thermal comfort indication of predicted mean vote (PMV) and predicted percentage dissatisfied (PPD), as defined in EN ISO 7730:2005, the results are indicated as a range in the table below in which offices and office lobby were assessed under future weather predictions with a high emission scenario.

Table 1 — Seven-point thermal sensation scale

+ 3	Hot
+ 2	Warm
+ 1	Slightly warm
0	Neutral
– 1	Slightly cool
–2	Cool
– 3	Cold

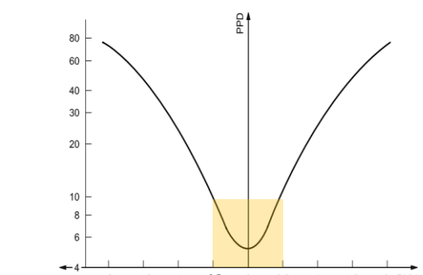


Figure 1 — PPD as function of PMV

Figure 3-5 PMV and PPD criteria (Source: CIBSE Guide A 2015)

3.2.5. Weather Files

In line with the GLA Energy Assessment Guidance (October 2018) this report shows overheating analysis considering 3 weather data scenarios relevant to the site location in accordance with CIBSE TM49: Design Summer Years for London (2014). The Proposed Development in the London Borough of Newham and therefore must use LHR data, in accordance with CIBSE TM49:

- DSY 1 LHR 2020 High 50 percentile
- DSY 2 LHR 2020 High 50 percentile
- DSY 3 LHR 2020 High 50 Percentile

It can be noted that DSY 2 and DSY 3 weather files have prolonged hours of high temperatures over the summer season. The design intention is to comply with 50 percentile weather file and provide recommendations of adaptation measures to achieve thermal comfort for more intense winter and summer periods in the future.

Table 3-2 May to September, London Heathrow weather data.

May to September (LHR)							
Dry-bulb temperature (°C) - % hours in range							
	> 26.0	> 27.0	> 28.0	> 29.0	> 30.0	> 31.0	> 32.0
LHR DSY 1	6.6	3.8	2.2	1.1	0.4	0.1	0.0
LHR DSY 2	9.1	5.9	4.3	3.1	2.3	1.5	1.1
LHR DSY 3	14.5	10.8	7.8	5.3	3.1	2.0	1.0

4. Design Features for Thermal Comfort

4.1. Thermal Modelling

Sweco have used Integrated Environmental Systems (IES VE) dynamic simulation software to produce the simulation results for this report. The IES software has been approved for use as a Dynamic Simulation Model (DSM) software package. As part of its approval process, the IES software had to demonstrate that it satisfies all the tests and other requirements defined within sections 2 and 3 of "CIBSE TM33:2006, CIBSE standard tests for the assessment of building services design software".

IES VE software is also listed within CIBSE AM 11: 2015 Building Energy and Environmental Modelling Appendix D as an accredited tool for dynamic simulation modelling.

The below image has been extracted from the 3D model:

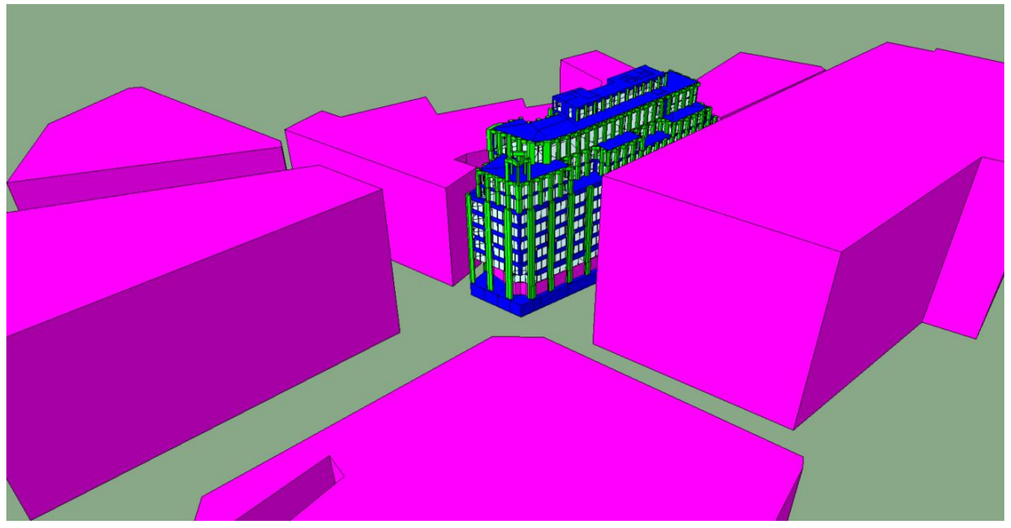


Figure 4-1 3D View of the IES Model for the Proposed Development

4.1.1. Building Envelope and Shading

This section summarises the early design guidance for building fabric and façade design of the proposed development, understanding that complying with Building Regulations Part L 2021 and wider policies is directly reliant upon applying optimum fabric thermal transmittance and good external glazing performance.

The building element properties applied to the thermal model are outlined in the following table.

Table 4-1 Thermal Performance of Opaque Building Elements – Commercial Areas

Parameter – New Fabric Elements		Part L2 Limiting Value	Part L2 Notional Building Parameters	Proposed Values
Building Airtightness (@ 50Pa)		8 $m^3/h/m^2$	3 $m^3/h/m^2$	3 $m^3/h/m^2$
U-values	Wall (Retained)	0.26 W/m^2K	0.18 W/m^2K	0.20 W/m^2K
	Wall (Extension)	0.26 W/m^2K	0.18 W/m^2K	0.15 W/m^2K
	Roof	0.18 W/m^2K	0.15 W/m^2K	0.18 W/m^2K
	Floor	0.18 W/m^2K	0.15 W/m^2K	0.18 W/m^2K
	Curtain wall	1.6 W/m^2K	1.4 W/m^2K	1.3 W/m^2K (Overall: glazing & frame)
Glazing U-value		1.6 W/m^2K	1.4 W/m^2K	1.3 W/m^2K (including frame)
Glazing g-value (BS EN 410)		Office Elevations		0.28
		Shopfront glazing (retail)		0.40
Glazing Visible Light Transmittance		-	71%	50-65%
Thermal Mass		N/A		Low - Medium
Percentage of Glazing (floor average)		1m high window across each elevation		50-60%

4.1.2. Solar Gains Management

Early-stage analysis for the typical floors was carried out to identity passive design measures to improve solar gains performance. The aim for these analysis was to contain solar gains in perimeters zones between 40-50 W/m² (around the single orientation perimeter zones for not more than 3% of the percentage hours during occupied hours, assuming an occupancy profile of 8am-6pm during weekdays and using a CIBSE DSY (Design Summer Year) for London) to ensure appropriate plant sizing for expected cooling loads, while also considering daylight provision, buildability, embodied carbon, and feedback from the planning and pre-application process.

Extensive analyses for both typical as well as upper floors was carried out. Analysis included testing the efficacy of various strategies such as improvised glazing ratios, introduction of shading elements – vertical and horizontal as well as introduction of opacity in the form of spandrel panels.

The result is a façade design that will be responsive to both the context and the environment, targeting an average solid-to-glazing ratio of 55% across different façades. To achieve passive solar shading, the façade has horizontal projections as well as vertical columnar shading along with terraces and opaque elements.

4.1.3. Internal Loads and Operational Profiles

The tables below break down the internal gains and related operational profiles for commercial and residential areas.

Table 4-2 Internal Gains applied to commercial areas.

Location	Lighting	Equipment (W/m²)	Occupant density	Operational Profile
Offices/Amenity	4.5 W/m²	10	8 m²/per	From 8am to 6pm

4.1.4. Auxiliary Ventilation Rates

Fresh air supply is assigned to the areas below as background ventilation. Infiltration rate is around 0.15 air changes per hour for the new build areas in summer and 0.25 air changes per hour in winter.

Table 4-3 Auxiliary Ventilation Rates

Location	Auxiliary Ventilation
Offices/Amenity	14 L/s per person

4.2. Heating, Cooling and Ventilation Strategy

The development will be constructed as a shell and core, with base building services designed to allow for the fit-out of lettable office spaces to either category ‘A’ or category ‘B’ specifications once a tenant is secured. The design team will undertake the category ‘A’ fit-out to ensure spatial compatibility.

The landlord's plant will feature on-floor air handling units (AHUs), with two units per floor on Levels 01-07 and a single unit on Level 09 serving both Levels 08 and 09. These AHUs will be housed in dedicated, acoustically insulated plant rooms. Each unit will include integrated heat pumps to regulate air temperature, allowing for heating and cooling that will be distributed to the office floors via a displacement system.

Additionally, Variable Refrigerant Flow (VRF) units will be installed at roof level to provide heating and cooling to the perimeter areas of office tenancies and landlord spaces as needed. Two VRF units will be allocated per floor, with at least one extra unit designated for landlord areas. BC control units will serve as an interface between the outdoor unit and the indoor terminal units, with these controls located on the respective floors they serve.

The current strategy for the offices is based on a hybrid displacement system. It intends to keep new, and stale are separated and involves introducing the air at low speed directly into the occupied zone at a temperature lower than the room temperature. Displacement ventilation is a passive mechanical cooling strategy whereby the supply air spreads across the floor forming a “reservoir” of cool air. When this cool air gets in contact with heat sources (particularly people and equipment such as computers) it gets warmer and therefore rise up, maintaining temperature comfort conditions within the occupied zone.

5. Thermal Comfort Results

This section summarises the results for the commercial areas assessed against CIBSE's guidance in line with the London Plan's requirements and following BREEAM Hea 04 methodology.

The simulation is carried out on all occupied office commercial areas representing the building performance.

5.1. Analysis Scenarios

The following scenarios presented in *Table 5-1* were considered for the thermal comfort analysis of the Proposed Development.

The analysis considers the commercial areas to be mechanically ventilated to assess thermal comfort. All commercial areas have mechanical cooling, and the thermal comfort assessment considered the following scenarios without any internal blinds.

The compliant scenario under LHR 2020 50% DSY 1 weather file (scenario 1) is then analysed against the other percentile weather files with increased summer temperatures: DSY 2 (scenario 2) and DSY 3 (scenario 3). The cooling and heating capacities for scenarios 3 and 4 are increased accordingly.

Table 5-1 Scenarios of overheating analysis for commercial areas (Offices)

Scenario	Office/Amenity			
	Cooling Setpoint (°C)	Max. cooling capacity W/m²	Heating Setpoint (°C)	Max. heating capacity W/m²
1	23	95*	22	110*
2 (DSY2)	23	95	22	110
3 (DSY3)	23	95	22	110

*Note: 95 and 110 W/m² are the maximum applied cooling and heating respectively. The average across all occupied spaces is 55 and 75 W/m² respectively.

5.2. Results – Summer Thermal Comfort

The thermal modelling results demonstrate that the building design and services strategy for cooling can deliver thermal comfort levels in the office spaces following the criteria set out in CIBSE Guide A, Environmental Design Table 1.5 and BCO Guide to Specification (2023) by using Design Summer Year (DSY) weather file LHR, 2020s, high emissions, 50% scenario. The results are presented below:

Table 5-2 Overheating assessment results – Office areas

Weather Files	Scenario	Rooms Assessed	Rooms Failing	Compliance
		Office	Office	
LHR 2020 50% DSY1	1	79	0	Pass
LHR 2020 50% DSY2	2		7	Fail
LHR 2020 50% DSY3	3		15	Fail

All office areas comply with the criteria for weather scenario LHR 2020 50% DSY 1 when the cooling setpoint is 23°C. As specified by the M&E design, this set point sits within the band 24°C ±2, and the spaces pass with an average cooling capacity of 55 W/m² for all offices areas with a maximum cooling capacity of 95 W/m² required for level 9 in the DSY1 weather scenario. These conditions work to achieve the thermal comfort criteria under more intense summer heat conditions, DSY 2 and DSY 3 as well.

The last two rows illustrate the DSY 2 and DSY 3 weather file scenarios, as they are considered more intense summer periods for assessing projected climate change. While the scenarios are not required for compliance, the assessed scenarios represent future heating periods. The assessments shows that higher cooling capacity would be required to ensure thermal comfort in future heating scenarios.

Further analysis and optimisation will be considered in further design and construction stages to assess the potential to future proof the design from intense climate scenarios.

5.3. Results – Winter Thermal Comfort

Regarding winter heating, most spaces analysed achieve thermal comfort by increasing the setpoint, still in the range of M&E system design to 22°C with an average capacity of 75 W/m². This capacity provides thermal comfort in DSY2 condition, but the capacity would need to increase for DSY3 scenario.

Table 5-3 summarises the results of the scenarios assessed to determine the risk of underheating and thermal comfort conditions during the winter with heating according to CIBSE Guide A which outlines 3% as the maximum allowance of annual occupied hours that the operative temperature can go below **21°C in offices** areas during active hours in winter.

Table 5-3 Winter Thermal Comfort results' summary: Office areas.

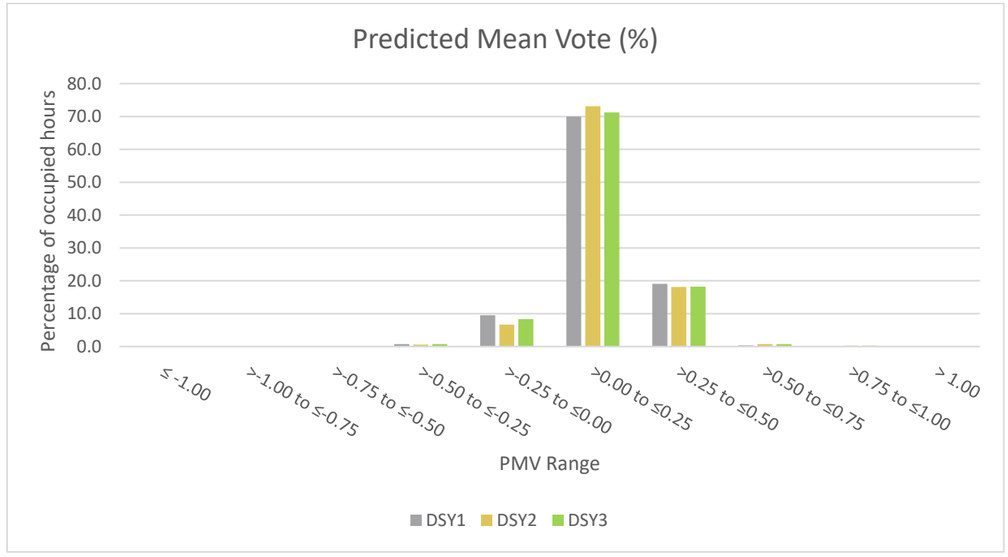
Weather Files	Scenario	Rooms Assessed	Rooms Failing	Compliance
		Office	Office	
LHR 2020 50% DSY1	1	79	0	Pass
LHR 2020 50% DSY2	2		0	Pass
LHR 2020 50% DSY3	3		2	Fail

5.4. PMV and PPD Results

Results indicate that commercial areas at the Proposed Development are within PMV band value of ±0.1 for the compliant thermal analysis scenario under LHR 2020 50% DSY 1 weather file. This reflects the shading strategy in place to reduce the pressure on cooling loads and save energy. The values remain in the comfort range for the other two weather files with higher temperatures in summer making this building futureproof for extreme weather scenarios.

Based on the results, the occupants of the areas assessed will feel the environment to be normal, i.e., not cold or warm under current and future weather conditions. The designed HVAC cooling system can meet the set point rapidly due to high plant response.

Detailed results for PMV and PPD for the Proposed Development can be found in Appendix B.



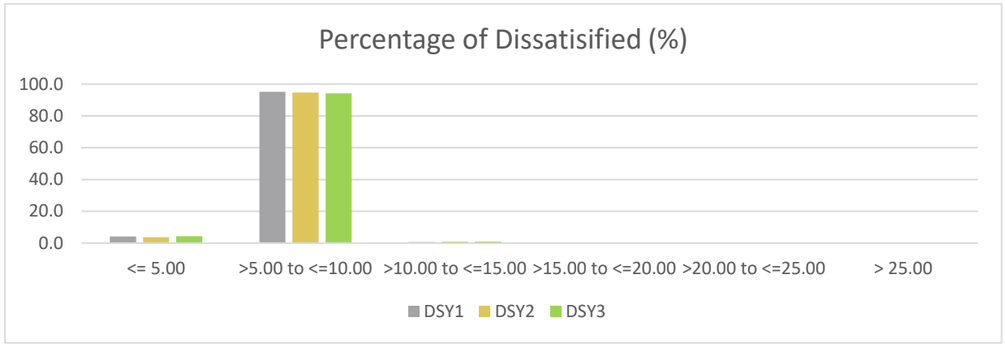


Figure 5-1 PMV and PPD results for the Proposed Development.

6. Conclusion and Recommendations

6.1. Proposed Passive Measures

Policy SI 4 (2021) of The London Plan states that major development proposals should reduce potential overheating, and reliance on air-conditioning systems, and demonstrate this in accordance with the following cooling hierarchy:

Table 6-1: London Plan Cooling Hierarchy, and Proposed Development strategy.

Cooling Hierarchy	Proposed Strategy
Reduce the amount of heat entering a building in summer through orientation, shading, albedo, fenestration, insulation, and green roofs, and walls.	The glazing ratio has been optimised through early-stage design analysis by setting onerous solar gains targets (BCO guidelines). The horizontal and vertical shading along with terraces and roof vegetation contribute to solar mitigation and reduce urban heat island effect.
Minimise internal heat generation through energy-efficient design.	Efficient lighting has been proposed to reduce heat gains from lighting.
Manage the heat within the building through exposed internal thermal mass, and high ceilings	Maximising the floor to ceiling height proposed to the office areas.
Passive ventilation	Open-able vents have been incorporated into the facade through levels 1-7 to enhance occupant well-being.
Mechanical ventilation	Highly efficient mechanical ventilation with efficient heat recovery is proposed for fresh air supply all year round.
Active cooling systems	Energy efficient systems to provide cooling.

6.2. Proposed Active Measures

A thermal comfort assessment is indicative of the building design and services strategy and wherever the comfort cooling can deliver thermal comfort levels in occupied spaces in accordance with the criteria set out in CIBSE Guide A Environmental Design Table 1.5 by using Design Summer Year (DSY) weather file London DSY1, DSY2 and DSY3. Effectively addressing overheating can significantly enhance occupant comfort and energy efficiency. When overheating is not managed, it can lead to challenges such as discomfort for users, increased energy consumption, and potential damage to the building materials.

The measures applied within the scheme proactively reduce the overheating risk through improved insulation, mechanical ventilation, and shading elements. The project can create a healthier and more pleasant indoor environment. This not only enhances the building's sustainability but also contributes to the overall success of the Proposed Development by ensuring that it meets modern standards and user expectations.

A free-running building relying solely on natural ventilation scenario would not be able to reach adequate levels of thermal comfort due to the deep floor plan and high glazing ratio of the building which reduces the ventilation effectiveness.

6.3. Recommendations mitigating overheating for extreme weather

This report shows that the proposed development is at low risk of overheating for commercial areas under weather file DSY 1 however does not comply under DSY 2, and DSY 3.

This when coupled with uncertainties and unpredictability of climate conditions, additional strategies are recommended for future retrofitting to provide desirable levels of comfort in projected years by considering extreme weather conditions due to climate change.

Table 6-2: Recommended measures to mitigate overheating in extreme weather scenarios.

Proposed Strategy	Comments
Plant/Trees	Incorporating greenery at street level would help to reduce temperatures, not just by avoiding radiation to reach below canopy areas, but also from the evapotranspiration process.
Enhance cooling system capacity	Opportunity to upgrade the cooling system capacity in the future, in the event of outdoor temperature increase.
Use of electric fans	Easy to install solution which can significantly improve occupant's thermal comfort perception.
Education/Behaviour	Internal gains can be reduced by switching off equipment and lighting in areas that are not being used.

Appendix A

Detailed results for winter and summer operative temperatures

Design Summer Year (DSY) weather file London Heathrow 2020s, high emissions, 50% DSY 1, DSY 2, and DSY3 scenarios.

PROJECT NUMBER AND NAME

CIBSE Guide A Operative Temperature Check (IES)

Occupied Spaces: OFFICE
Notes:
Weather file: LHR

DSY1

Operative temperature (°C) - % hours in range

Location	Summer	Winter
	SetP 23	SetP 22
	> 25	< 21
L01_Office_Peri_W	0	0
L01_Office_Peri_W	0	0
L01_Office_Peri_SW3	0	0
L01_Office_Peri_E	0	0
L01_Office_Peri_E1	0	0
L01_Office_Peri_E2	0.6	0.7
L01_Office_Peri_S	0.1	0.2
L01_Office_Peri_SW	0.6	0.5
L01_Office_Peri_W1	0.2	0
L01_Office_Peri_W	0	0
L01_Office_Int	0	0
L02_Office_Peri_W1	0.1	0.1
L02_Office_Peri_S1	0.7	0.2
L02_Office_Peri_S2	2.8	0.2
L02_Office_Peri_E1	1.4	0.1
L02_Office_Peri_E2	0	0.1
L02_Office_Peri_W2	0.1	0.1
L02_Office_Peri_N	0	0
L02_Office_Int	0	0.1
L03_Office_Peri_W1	0.1	0
L03_Office_Peri_S1	0.7	0.2
L03_Office_Peri_S2	2.8	0.2
L03_Office_Peri_E1	1.2	0
L03_Office_Peri_E2	0	0.1
L03_Office_Peri_N1	0	0
L03_Office_Peri_W2	0.1	0
L03_Office_Int	0	0
L04_Office_Peri_W1	0.1	0.1
L04_Office_Peri_S1	0.7	0.2
L04_Office_Peri_S2	2.8	0.2
L04_Office_Peri_E1	1.5	0.1
L04_Office_Peri_E2	0.1	0.1
L04_Office_Peri_W1	0.1	0
L04_Office_Peri_N1	0	0
L04_Office_Int	0	0.1
L05_Office_Peri_W1	0.1	0.1

DSY2

Operative temperature (°C) - % hours in range

Location	Summer	Winter
	SetP 23	SetP 22
	> 25	< 21
L01_Office_Peri_W	0.3	0
L01_Office_Peri_W	0.5	0
L01_Office_Peri_SW3	0.6	0.1
L01_Office_Peri_E	0.6	0.1
L01_Office_Peri_E1	0.6	0.1
L01_Office_Peri_E2	2.2	1
L01_Office_Peri_S	1.2	0.2
L01_Office_Peri_SW	2	0.7
L01_Office_Peri_W1	0.8	0.1
L01_Office_Peri_W	0.3	0
L01_Office_Int	0.2	0.8
L02_Office_Peri_W1	0.9	0.1
L02_Office_Peri_S1	2.5	0.3
L02_Office_Peri_S2	4.1	0.4
L02_Office_Peri_E1	2.3	0.2
L02_Office_Peri_E2	0.7	0.1
L02_Office_Peri_W2	0.7	0.1
L02_Office_Peri_N	0.3	0
L02_Office_Int	0.3	0.8
L03_Office_Peri_W1	0.8	0
L03_Office_Peri_S1	2.5	0.2
L03_Office_Peri_S2	4	0.2
L03_Office_Peri_E1	2.2	0.1
L03_Office_Peri_E2	0.7	0.1
L03_Office_Peri_N1	0.3	0
L03_Office_Peri_W2	0.7	0
L03_Office_Int	0.3	0.7
L04_Office_Peri_W1	0.9	0.1
L04_Office_Peri_S1	2.4	0.2
L04_Office_Peri_S2	4	0.3
L04_Office_Peri_E1	2.4	0.2
L04_Office_Peri_E2	0.7	0.1
L04_Office_Peri_W1	0.7	0.1
L04_Office_Peri_N1	0.3	0
L04_Office_Int	0.3	0.7
L05_Office_Peri_W1	0.7	0.1

DSY3

Operative temperature (°C) - % hours in range

Location	Summer	Winter
	SetP 23	SetP 22
	> 25	< 21
L01_Office_Peri_W	0	0.1
L01_Office_Peri_W	0.3	0.1
L01_Office_Peri_SW3	0.3	0.1
L01_Office_Peri_E	0.4	0.1
L01_Office_Peri_E1	0.4	0.1
L01_Office_Peri_E2	2.9	1.5
L01_Office_Peri_S	0.9	0.4
L01_Office_Peri_SW	2.4	1.3
L01_Office_Peri_W1	1	0.1
L01_Office_Peri_W	0	0.1
L01_Office_Int	0	1.3
L02_Office_Peri_W1	0.7	0.1
L02_Office_Peri_S1	3.8	0.5
L02_Office_Peri_S2	4.6	0.6
L02_Office_Peri_E1	2.9	0.3
L02_Office_Peri_E2	0.5	0.2
L02_Office_Peri_W2	0.7	0.1
L02_Office_Peri_N	0.2	0.1
L02_Office_Int	0.1	1.2
L03_Office_Peri_W1	0.7	0.1
L03_Office_Peri_S1	3.7	0.3
L03_Office_Peri_S2	4.6	0.4
L03_Office_Peri_E1	2.8	0.1
L03_Office_Peri_E2	0.7	0.2
L03_Office_Peri_N1	0.2	0.1
L03_Office_Peri_W2	0.7	0.1
L03_Office_Int	0.1	0.9
L04_Office_Peri_W1	0.9	0.1
L04_Office_Peri_S1	3.7	0.4
L04_Office_Peri_S2	4.6	0.4
L04_Office_Peri_E1	3.1	0.2
L04_Office_Peri_E2	0.8	0.3
L04_Office_Peri_W1	0.8	0.1
L04_Office_Peri_N1	0.2	0.1
L04_Office_Int	0.2	1.1
L05_Office_Peri_W1	0.7	0.1

L05_Office_Peri_W1	0.1	0.1	L05_Office_Peri_W1	0.8	0.1	L05_Office_Peri_W1	0.7	0.1
L05_Office_Peri_S1	0.7	0.2	L05_Office_Peri_S1	2.5	0.3	L05_Office_Peri_S1	3.7	0.4
L05_Office_Peri_S2	3	0.2	L05_Office_Peri_S2	4.2	0.3	L05_Office_Peri_S2	4.8	0.5
L05_Office_Peri_E1	1.5	0.1	L05_Office_Peri_E1	2.4	0.1	L05_Office_Peri_E1	3.1	0.2
L05_Office_Peri_E2	0	0.2	L05_Office_Peri_E2	0.7	0.1	L05_Office_Peri_E2	0.7	0.3
L05_Office_Peri_N	0	0	L05_Office_Peri_N	0.3	0	L05_Office_Peri_N	0.2	0.1
L05_Office_Peri_N	0	0	L05_Office_Peri_N	0.3	0	L05_Office_Peri_N	0.1	0
L06_Office_Peri_W1	0.1	0.1	L06_Office_Peri_W1	0.8	0.1	L06_Office_Peri_W1	1	0.1
L06_Office_Peri_W1	0.1	0.1	L06_Office_Peri_W1	1	0.1	L06_Office_Peri_W1	1.4	0.1
L06_Office_Peri_S1	0.8	0.2	L06_Office_Peri_S1	2.6	0.2	L06_Office_Peri_S1	4.2	0.4
L06_Office_Peri_S2	2.8	0.2	L06_Office_Peri_S2	4	0.2	L06_Office_Peri_S2	4.9	0.4
L06_Office_Peri_E1	1.5	0.1	L06_Office_Peri_E1	2.5	0.1	L06_Office_Peri_E1	3.1	0.2
L06_Office_Peri_E2	0.2	0.2	L06_Office_Peri_E2	0.8	0.1	L06_Office_Peri_E2	1.2	0.3
L06_Office_Peri_N	0	0	L06_Office_Peri_N	0.4	0	L06_Office_Peri_N	0.3	0.1
L06_Office_Int	0	0.1	L06_Office_Int	0.3	0.8	L06_Office_Int	0.2	1.2
L07_Office_Peri_E	0	0.3	L07_Office_Peri_E	0.3	0.7	L07_Office_Peri_E	0.3	0.9
L07_Office_Peri_W2	0.9	1.1	L07_Office_Peri_W2	1.5	1.5	L07_Office_Peri_W2	1.9	2.1
L07_Office_Peri_E4	0	0.3	L07_Office_Peri_E4	0.7	0.8	L07_Office_Peri_E4	0.4	1.1
L07_Office_Peri_E2	0	1.4	L07_Office_Peri_E2	0.7	1.8	L07_Office_Peri_E2	0.8	2.4
L07_Office_Peri_E1	0	0.2	L07_Office_Peri_E1	0.1	0.7	L07_Office_Peri_E1	0.1	1
L07_Office_Int	0	0.2	L07_Office_Int	0.2	1.1	L07_Office_Int	0	1.8
L08_Office_Peri_E1	0	0.1	L08_Office_Peri_E1	0	0.3	L08_Office_Peri_E1	0	0.6
L08_Office_Peri_E2	0	0.7	L08_Office_Peri_E2	0.3	1.1	L08_Office_Peri_E2	0.3	1.6
L08_Office_Peri_S	0	1.1	L08_Office_Peri_S	0.7	1.3	L08_Office_Peri_S	0.4	1.8
L08_Office_Peri_W1	0	0.8	L08_Office_Peri_W1	0.6	1.2	L08_Office_Peri_W1	0.4	1.7
L08_Office_Peri_W2	0	0.5	L08_Office_Peri_W2	0.3	0.9	L08_Office_Peri_W2	0.1	1.3
L08_Office_Int	0	1.4	L08_Office_Int	0.1	3	L08_Office_Int	0	3.4
L08_Office_Int	0	0.8	L08_Office_Int	0.3	1.9	L08_Office_Int	0.3	2.5
L08_Office_Int	0	0.2	L08_Office_Int	0.1	1.5	L08_Office_Int	0	2.1
L08_Office_Peri_E4	0	0.9	L08_Office_Peri_E4	0.4	1.2	L08_Office_Peri_E4	0.4	1.7
L08_Office_Peri_E3	0	0.3	L08_Office_Peri_E3	0.1	0.7	L08_Office_Peri_E3	0.1	1
L09_Office DH_Peri_E1	0.1	1.3	L09_Office DH_Peri_E1	0.2	1.4	L09_Office DH_Peri_E1	0.4	2
L07_Office_Peri_N3	0.1	0.8	L07_Office_Peri_N3	0.7	1.1	L07_Office_Peri_N3	0.8	1.6
L07_Office_Peri_S	0	1.7	L07_Office_Peri_S	0.7	2	L07_Office_Peri_S	0.4	2.7
L07_Office_Int	0	1.2	L07_Office_Int	0.6	2.3	L07_Office_Int	0.5	3
L08_Office_Peri_E6	0	0.9	L08_Office_Peri_E6	0	0.9	L08_Office_Peri_E6	0.1	1.3
L08_Office_Peri_E5	0	1.4	L08_Office_Peri_E5	0	1.7	L08_Office_Peri_E5	0	2.4
L08_Office_Peri_E7	0	1.3	L08_Office_Peri_E7	0	1.4	L08_Office_Peri_E7	0	2
L09_Office DH_Peri_W2	0.1	1.4	L09_Office DH_Peri_W2	0.7	1.4	L09_Office DH_Peri_W2	0.8	2
L09_Office DH_Peri_W2	0	1.2	L09_Office DH_Peri_W2	0.5	1.3	L09_Office DH_Peri_W2	0.6	1.9
L09_Office DH_Peri_W1	2.3	2.5	L09_Office DH_Peri_W1	5.2	2.6	L09_Office DH_Peri_W1	5.8	3.1
L09_Office DH_Peri_W1	1.7	2.4	L09_Office DH_Peri_W1	3.3	2.4	L09_Office DH_Peri_W1	4.3	3
L09_Office DH_Peri_W1	0	1.2	L09_Office DH_Peri_W1	0.3	1.2	L09_Office DH_Peri_W1	0.2	1.8

Appendix B

Detailed results for PMV and PPD study

Design Summer Year (DSY) weather file London Heathrow 2020s, high emissions, 50% DSY 1, DSY 2, and DSY3 scenarios.

PROJECT NUMBER AND NAME

CIBSE Guide A Operative Temperature Check (IES)

Occupied Spaces: OFFICE
Thermal model:
Weather file: LHR

OFFICE - DSY1

London_LHR_DSY1_2020High50.epw

Predicted mean vote (PMV) - % of hours in range

Room Name	<= -1.00	>-1.00 to <=-0.75	>-0.75 to <=-0.50	>-0.50 to <=-0.25	>-0.25 to <=0.00	>0.00 to <=0.25	>0.25 to <=0.50	>0.50 to <=0.75	>0.75 to <=1.00	> 1.00
L01_Office_Peri_W	0	0	0	0.2	13.5	72.6	13.7	0	0	0
L01_Office_Peri_W	0	0	0	0.2	8.8	74.7	16.3	0	0	0
L01_Office_Peri_SW3	0	0	0	0.4	11.8	73.1	14.7	0	0	0
L01_Office_Peri_E	0	0	0	0.3	8.8	74.7	16.2	0	0	0
L01_Office_Peri_E1	0	0	0	0.2	8.2	74	17.6	0	0	0
L01_Office_Peri_E2	0	0	0.2	1.3	8.8	68.1	21	0.5	0.2	0
L01_Office_Peri_S	0	0	0	0.7	9.1	68.2	21.9	0.1	0	0
L01_Office_Peri_SW	0	0	0.1	1.4	10.2	66.4	21.4	0.4	0.2	0
L01_Office_Peri_W1	0	0	0	0.4	10.9	71.7	16.9	0.2	0	0
L01_Office_Peri_W	0	0	0	0.3	14	73.1	12.6	0	0	0
L01_Office_Int	0	0	0.2	0.8	10.2	71.9	17	0	0	0
L02_Office_Peri_W1	0	0	0	0.2	6.4	72.9	20.4	0.1	0	0
L02_Office_Peri_S1	0	0	0	0.5	7.5	67	24.1	0.7	0.2	0
L02_Office_Peri_S2	0	0	0	0.7	8.3	65.5	22.8	1.7	0.5	0.4
L02_Office_Peri_E1	0	0	0	0.4	9.2	69.1	20.2	0.6	0.4	0
L02_Office_Peri_E2	0	0	0	0.4	12.5	72.8	14.3	0	0	0
L02_Office_Peri_W2	0	0	0	0.2	7.2	73.7	18.9	0	0	0
L02_Office_Peri_N	0	0	0	0.1	11.4	73.2	15.3	0	0	0
L02_Office_Int	0	0	0.2	0.7	7.8	70.9	20.3	0	0	0
L03_Office_Peri_W1	0	0	0	0.2	6.2	72.7	20.9	0.1	0	0
L03_Office_Peri_S1	0	0	0	0.4	6.7	66.5	25.6	0.6	0.2	0
L03_Office_Peri_S2	0	0	0	0.5	7.6	65.2	24	1.7	0.6	0.4
L03_Office_Peri_E1	0	0	0	0.4	8.4	69.6	20.8	0.6	0.3	0
L03_Office_Peri_E2	0	0	0	0.4	12.2	72.9	14.6	0	0	0
L03_Office_Peri_N1	0	0	0	0.1	10.7	73.7	15.5	0	0	0
L03_Office_Peri_W2	0	0	0	0.2	6.6	73.4	19.8	0	0	0
L03_Office_Int	0	0	0.2	0.5	7.5	70.9	20.8	0	0	0
L04_Office_Peri_W1	0	0	0	0.2	6.2	72.8	20.7	0.1	0	0
L04_Office_Peri_S1	0	0	0	0.5	7.1	66.4	25.3	0.6	0.2	0
L04_Office_Peri_S2	0	0	0	0.6	8	65.5	23.2	1.7	0.5	0.4
L04_Office_Peri_E1	0	0	0	0.4	8.8	68.8	20.8	0.7	0.4	0
L04_Office_Peri_E2	0	0	0	0.4	12.6	72.5	14.5	0	0	0
L04_Office_Peri_W1	0	0	0	0.2	6.5	73.4	19.8	0.1	0	0
L04_Office_Peri_N1	0	0	0	0.1	11	73.5	15.4	0	0	0
L04_Office_Int	0	0	0.2	0.7	7.4	70.9	20.8	0	0	0
L05_Office_Peri_W1	0	0	0	0.2	7	73.5	19.3	0	0	0
L05_Office_Peri_W1	0	0	0	0.2	6.5	72.8	20.3	0.1	0	0
L05_Office_Peri_S1	0	0	0	0.6	7.2	66.4	25.1	0.6	0.2	0
L05_Office_Peri_S2	0	0	0	0.7	8.2	65.1	23.2	1.8	0.5	0.5
L05_Office_Peri_E1	0	0	0	0.4	9.1	68.8	20.6	0.7	0.4	0
L05_Office_Peri_E2	0	0	0	0.4	13.1	72.4	14	0	0	0
L05_Office_Peri_N	0	0	0	0.1	11.4	73.4	15.1	0	0	0
L05_Office_Peri_N	0	0	0	0	7.5	73.2	19.3	0	0	0
L06_Office_Peri_W1	0	0	0	0.2	6.8	74.3	18.6	0.1	0	0
L06_Office_Peri_W1	0	0	0	0.2	6.7	74.6	18.3	0.2	0	0
L06_Office_Peri_S1	0	0	0	0.4	7.1	67.9	23.6	0.8	0.2	0
L06_Office_Peri_S2	0	0	0	0.5	8.6	66.8	21.4	1.8	0.7	0.3
L06_Office_Peri_E1	0	0	0	0.4	8.9	69.2	20.4	0.7	0.5	0
L06_Office_Peri_E2	0	0	0	0.4	12.7	72.1	14.6	0.2	0	0
L06_Office_Peri_N	0	0	0	0.1	10.9	75.4	13.5	0	0	0
L06_Office_Int	0	0	0.2	0.8	7.2	71.5	20.3	0	0	0
L07_Office_Peri_E	0	0	0.1	0.8	6.5	71.1	21.3	0.2	0	0
L07_Office_Peri_W2	0	0.1	0.3	1.6	7.1	66.4	23.6	0.8	0.1	0
L07_Office_Peri_E4	0	0	0.2	0.9	6.4	69.2	23.2	0.1	0	0
L07_Office_Peri_E2	0	0.2	0.4	1.4	5.9	67.4	24.2	0.4	0	0
L07_Office_Peri_E1	0	0	0.1	0.8	6.6	71.3	21.1	0.1	0	0
L07_Office_Int	0	0	0.3	1	7.4	72	19.3	0	0	0
L08_Office_Peri_E1	0	0	0	0.5	11.3	74.3	13.9	0	0	0
L08_Office_Peri_E2	0	0	0.3	1.2	12.1	72.8	13.5	0	0	0
L08_Office_Peri_S	0	0.1	0.3	1.5	14.7	67.1	16.2	0	0	0
L08_Office_Peri_W1	0	0.1	0.2	1.4	12.4	70.3	15.6	0	0	0
L08_Office_Peri_W2	0	0	0.2	1.1	9.6	72.3	16.7	0	0	0
L08_Office_Int	0.1	0.3	0.9	1.7	8.5	73.2	15.2	0	0	0
L08_Office_Int	0	0.2	0.6	1.2	7.1	71.8	19.1	0	0	0
L08_Office_Int	0	0.1	0.3	1.3	9.5	74	14.8	0	0	0
L08_Office_Peri_E4	0	0.1	0.2	1.3	12.2	71.5	14.8	0	0	0
L08_Office_Peri_E3	0	0	0.1	0.9	8.3	73.7	17	0	0	0
L09_Office DH_Peri_E1	0	0	0.3	1.3	26.3	53.6	18.1	0.4	0	0
L07_Office_Peri_N3	0	0.1	0.2	1.2	10.3	70.3	17.8	0.1	0	0
L07_Office_Peri_S	0.1	0.3	0.6	1.7	7.4	66.8	23.1	0.1	0	0
L07_Office_Int	0.2	0.3	0.8	1.3	5.1	67.8	24.6	0	0	0
L08_Office_Peri_E6	0	0	0.2	1.2	14.7	69.9	14.1	0	0	0
L08_Office_Peri_E5	0	0.1	0.3	1.9	9.4	70.5	17.8	0	0	0
L08_Office_Peri_E7	0	0	0.3	1.7	10.5	73	14.6	0	0	0
L09_Office DH_Peri_W2	0	0.1	0.2	1.3	16.1	61.4	20.2	0.7	0	0
L09_Office DH_Peri_W2	0	0.1	0.3	1.2	14.1	63.2	20.6	0.5	0	0
L09_Office DH_Peri_W1	0.2	0.3	0.8	1.7	15.9	50.6	25.4	4.3	0.6	0.1
L09_Office DH_Peri_W1	0.2	0.3	0.7	1.6	14.1	56.5	23.4	2.6	0.5	0
L09_Office DH_Peri_W1	0	0	0.3	1.3	6.9	67	24.1	0.3	0	0
Average	0.01	0.04	0.14	0.72	9.54	69.98	19.10	0.36	0.09	0.03

OFFICE - DSY2

London_LHR_DSY2_2020High50.epw

Predicted mean vote (PMV) - % of hours in range

Room Name	<= -1.00	>-1.00 to <=	>-0.75 to <=	>-0.50 to <=	>-0.25 to <=	>0.00 to <=	>0.25 to <=	>0.50 to <=	>0.75 to <=	> 1.00
L01_Office_Peri_W	0	0	0	0.1	9.8	79.8	10.1	0.2	0	0
L01_Office_Peri_W	0	0	0	0.2	5.8	79.1	14.3	0.4	0.1	0
L01_Office_Peri_SW3	0	0	0	0.2	8.7	78.1	12.6	0.3	0.3	0
L01_Office_Peri_E	0	0	0	0.2	5.6	79.1	14.6	0.3	0.2	0
L01_Office_Peri_E1	0	0	0	0.2	5.2	77.9	16.2	0.3	0.2	0.1
L01_Office_Peri_E2	0	0	0.2	1	7	68.1	20.9	1.5	0.6	0.7
L01_Office_Peri_S	0	0	0	0.6	5.7	69.7	22.5	0.8	0.3	0.3
L01_Office_Peri_SW	0	0	0.1	1	7.6	67.8	21.1	1.3	0.5	0.6
L01_Office_Peri_W1	0	0	0	0.3	7.4	75.7	15.7	0.5	0.2	0.2
L01_Office_Peri_W	0	0	0	0.1	10.7	79.9	9.2	0.2	0	0
L01_Office_Int	0	0	0.2	0.7	6.2	78.5	14.3	0.1	0	0
L02_Office_Peri_W1	0	0	0	0.2	4.1	74.4	20.4	0.4	0.3	0.1
L02_Office_Peri_S1	0	0	0	0.6	4.9	66.4	24.8	1.8	0.6	0.8
L02_Office_Peri_S2	0	0	0	0.6	5.5	66.5	23.3	1.6	1.1	1.3
L02_Office_Peri_E1	0	0	0	0.3	6.1	71.5	19.8	1.3	0.5	0.5
L02_Office_Peri_E2	0	0	0	0.2	9.4	78.4	11.5	0.4	0.3	0
L02_Office_Peri_W2	0	0	0	0.2	4.4	75.9	18.7	0.4	0.2	0.1
L02_Office_Peri_N	0	0	0	0.1	7.8	80.5	11.4	0.2	0.1	0
L02_Office_Int	0	0	0.2	0.7	4.1	75.9	18.8	0.2	0.1	0
L03_Office_Peri_W1	0	0	0	0.2	3.7	74.5	20.9	0.4	0.3	0.1
L03_Office_Peri_S1	0	0	0	0.4	4.5	65.1	26.9	1.7	0.7	0.7
L03_Office_Peri_S2	0	0	0	0.5	4.9	66.1	24.5	1.6	1.2	1.2
L03_Office_Peri_E1	0	0	0	0.2	5.6	71.8	20.3	1.2	0.5	0.4
L03_Office_Peri_E2	0	0	0	0.2	9	78.4	11.8	0.4	0.3	0
L03_Office_Peri_N1	0	0	0	0.1	7.3	80.7	11.6	0.2	0.1	0
L03_Office_Peri_W2	0	0	0	0.2	3.8	76.1	19.2	0.4	0.2	0.1
L03_Office_Int	0	0	0.1	0.6	3.8	75.4	19.7	0.2	0.1	0
L04_Office_Peri_W1	0	0	0	0.2	4	74	20.9	0.5	0.3	0.1
L04_Office_Peri_S1	0	0	0	0.5	4.6	65.8	26	1.7	0.6	0.7
L04_Office_Peri_S2	0	0	0	0.6	5.2	66.3	24	1.5	1.2	1.2
L04_Office_Peri_E1	0	0	0	0.3	5.8	71.3	20.1	1.4	0.6	0.6
L04_Office_Peri_E2	0	0	0	0.2	9.5	78	11.6	0.4	0.4	0
L04_Office_Peri_W1	0	0	0	0.2	4	75.5	19.6	0.4	0.2	0.1
L04_Office_Peri_N1	0	0	0	0.1	7.7	80.4	11.5	0.3	0.1	0
L04_Office_Int	0	0	0.2	0.6	3.9	75.5	19.5	0.2	0.1	0
L05_Office_Peri_W1	0	0	0	0.2	4.2	76	18.8	0.4	0.2	0.1
L05_Office_Peri_W1	0	0	0	0.2	4.2	74.6	20.2	0.4	0.3	0.1
L05_Office_Peri_S1	0	0	0	0.6	4.9	65.5	26	1.7	0.6	0.7
L05_Office_Peri_S2	0	0	0	0.6	5.4	65.9	23.9	1.6	1.2	1.4
L05_Office_Peri_E1	0	0	0	0.3	6.1	71.4	19.7	1.4	0.5	0.6
L05_Office_Peri_E2	0	0	0	0.2	10.2	77.9	11	0.4	0.3	0
L05_Office_Peri_N	0	0	0	0.1	8	80.5	11.1	0.3	0.1	0
L05_Office_Peri_N	0	0	0	0	4.1	78.2	17.4	0.2	0.1	0
L06_Office_Peri_W1	0	0	0	0.2	4	76.7	18.3	0.5	0.2	0.1
L06_Office_Peri_W1	0	0	0	0.2	3.9	76.8	18.1	0.5	0.4	0.2
L06_Office_Peri_S1	0	0	0	0.4	4.5	67	24.6	1.9	0.7	0.8
L06_Office_Peri_S2	0	0	0	0.4	6.4	68	21	1.8	1.2	1.2
L06_Office_Peri_E1	0	0	0	0.2	5.7	71.8	19.8	1.3	0.6	0.6
L06_Office_Peri_E2	0	0	0	0.2	10	77	11.8	0.5	0.3	0.1
L06_Office_Peri_N	0	0	0	0.1	7.2	82.8	9.5	0.3	0.1	0
L06_Office_Int	0	0	0.1	0.6	3.8	76.6	18.5	0.2	0.1	0
L07_Office_Peri_E	0	0	0.1	0.7	3.9	73.1	21.7	0.5	0	0
L07_Office_Peri_W2	0	0.1	0.4	1.1	5	66.5	24.9	1.2	0.3	0.4
L07_Office_Peri_E4	0	0	0.2	0.8	3.9	69.2	25.1	0.7	0.2	0
L07_Office_Peri_E2	0.1	0.2	0.4	1.1	4	67.3	25.8	0.9	0.3	0
L07_Office_Peri_E1	0	0	0.1	0.7	4.3	73.3	21.4	0.3	0	0
L07_Office_Int	0	0.1	0.3	0.8	3.9	76.8	18.1	0.1	0	0
L08_Office_Peri_E1	0	0	0	0.6	7.4	82.1	9.9	0	0	0
L08_Office_Peri_E2	0	0.1	0.2	1	10.6	77.7	10.2	0.2	0	0
L08_Office_Peri_S	0	0.1	0.3	1	10.9	73.3	13.7	0.4	0.3	0
L08_Office_Peri_W1	0	0.1	0.1	1.1	9.9	74.6	13.3	0.5	0.2	0
L08_Office_Peri_W2	0	0	0.2	0.8	6	77.2	15.5	0.3	0	0
L08_Office_Int	0.1	0.4	0.6	1.6	5.1	79.3	12.8	0	0	0
L08_Office_Int	0.1	0.1	0.6	1	3.9	76.2	17.7	0.4	0	0
L08_Office_Int	0	0.1	0.4	1.1	5.8	81.2	11.5	0	0	0
L08_Office_Peri_E4	0	0.1	0.1	1.1	10.3	76.6	11.2	0.4	0.1	0
L08_Office_Peri_E3	0	0	0.1	0.7	5	79.7	14.5	0	0	0
L09_Office DH_Peri_E1	0	0.1	0.2	1.3	22.1	58.3	17.5	0.6	0	0
L07_Office_Peri_N3	0	0.1	0.1	1.1	9.8	71.3	16.6	0.5	0.4	0.1
L07_Office_Peri_S	0.1	0.3	0.4	1.3	5.5	65.9	25.5	0.5	0.2	0.2
L07_Office_Int	0.2	0.4	0.5	1.3	3.2	66.6	27.2	0.3	0.3	0
L08_Office_Peri_E6	0	0	0.1	0.9	12.1	76.2	10.6	0	0	0
L08_Office_Peri_E5	0	0.1	0.5	1.3	7.7	72.5	17.8	0.2	0	0
L08_Office_Peri_E7	0	0.1	0.2	1.2	9.6	76.4	12.4	0	0	0
L09_Office DH_Peri_W2	0	0.1	0.3	1.1	13.3	61.7	22.2	1.1	0.1	0
L09_Office DH_Peri_W2	0	0.1	0.3	1.1	11.1	64.6	21.8	1	0	0
L09_Office DH_Peri_W1	0.2	0.4	0.6	1.5	12.1	52.9	24.4	4.9	1.7	1.3
L09_Office DH_Peri_W1	0.2	0.3	0.6	1.4	11.4	56	25.5	2.9	0.9	0.8
L09_Office DH_Peri_W1	0	0.1	0.2	1	5.7	64.3	27.1	1.6	0	0
Average	0.01	0.04	0.12	0.59	6.70	73.11	18.15	0.73	0.31	0.24

OFFICE - DSY3

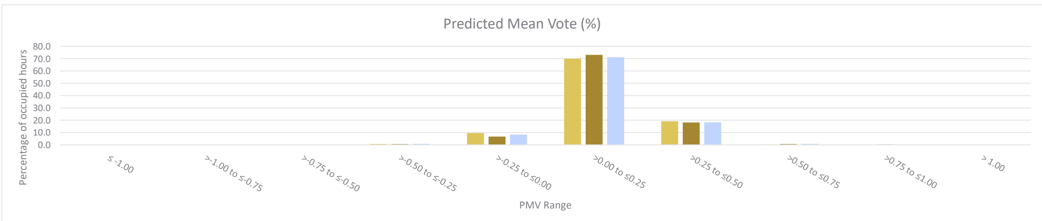
London_LHR_DSY3_2020High50.epw

Predicted mean vote (PMV) - % of hours in range

Room Name	<= -1.00	>-1.00 to <=	>-0.75 to <=	>-0.50 to <=	>-0.25 to <=	>0.00 to <=	>0.25 to <=	>0.50 to <=	>0.75 to <=	> 1.00
L01_Office_Peri_W	0	0	0	0.2	10.2	76.6	13.1	0	0	0
L01_Office_Peri_W	0	0	0	0.3	7.1	77.4	14.9	0.3	0	0
L01_Office_Peri_SW3	0	0	0	0.3	9.1	76.4	14	0.2	0	0
L01_Office_Peri_E	0	0	0	0.3	7.1	76.9	15.4	0.3	0	0
L01_Office_Peri_E1	0	0	0	0.3	6.5	77	15.9	0.3	0	0
L01_Office_Peri_E2	0	0	0.3	1.4	9.1	67.5	19.2	1.9	0.4	0.3
L01_Office_Peri_S	0	0	0.1	0.7	7.3	71.7	19.4	0.5	0.2	0
L01_Office_Peri_SW	0	0	0.1	1.5	8.9	68.6	18.6	1.6	0.4	0.3
L01_Office_Peri_W1	0	0	0	0.4	8.9	73.8	16.5	0.4	0.1	0
L01_Office_Peri_W	0	0	0	0.1	11	76.7	12.2	0	0	0
L01_Office_Int	0	0	0.2	1.2	7.7	75.2	15.7	0	0	0
L02_Office_Peri_W1	0	0	0	0.4	5.2	74.2	19.6	0.4	0.2	0
L02_Office_Peri_S1	0	0	0.1	0.9	6	67.5	22.1	2.7	0.5	0.3
L02_Office_Peri_S2	0	0	0.1	1	6.5	66.4	21.4	2.2	1.2	1.2
L02_Office_Peri_E1	0	0	0	0.4	7.4	70.7	19.1	1.4	0.7	0.3
L02_Office_Peri_E2	0	0	0	0.4	10.5	74.4	14.3	0.4	0	0
L02_Office_Peri_W2	0	0	0	0.3	6.1	74.7	18.3	0.5	0.1	0
L02_Office_Peri_N	0	0	0	0.2	8.8	76.7	14.3	0.1	0	0
L02_Office_Int	0	0.1	0.3	1	5.6	74.2	18.9	0	0	0
L03_Office_Peri_W1	0	0	0	0.3	4.9	74	20.2	0.4	0.2	0
L03_Office_Peri_S1	0	0	0.1	0.4	5.4	66.5	24.3	2.7	0.4	0.2
L03_Office_Peri_S2	0	0	0.1	0.5	6.1	65.9	22.9	2.2	1.2	1.1
L03_Office_Peri_E1	0	0	0	0.3	6.6	71	20	1.3	0.6	0.2
L03_Office_Peri_E2	0	0	0	0.3	10.4	74.4	14.5	0.3	0.1	0
L03_Office_Peri_N1	0	0	0	0.1	8.4	76.9	14.5	0.1	0	0
L03_Office_Peri_W2	0	0	0	0.3	5.5	74.6	19.2	0.5	0.1	0
L03_Office_Int	0	0.1	0.2	0.8	5.4	74	19.5	0	0	0
L04_Office_Peri_W1	0	0	0	0.3	5	73.8	20.1	0.6	0.2	0
L04_Office_Peri_S1	0	0	0.1	0.5	5.6	67	23.6	2.6	0.4	0.2
L04_Office_Peri_S2	0	0	0.1	0.7	6.3	66.3	22.1	2.1	1.2	1.1
L04_Office_Peri_E1	0	0	0	0.4	6.8	70.7	19.5	1.5	0.7	0.4
L04_Office_Peri_E2	0	0	0	0.4	11.1	73.6	14.6	0.3	0.1	0
L04_Office_Peri_W1	0	0	0	0.3	5.6	74.3	19.2	0.5	0.1	0
L04_Office_Peri_N1	0	0	0	0.2	8.7	76.7	14.4	0.1	0	0
L04_Office_Int	0	0.1	0.3	0.9	5.5	73.9	19.3	0	0	0
L05_Office_Peri_W1	0	0	0	0.3	5.7	74.7	18.7	0.4	0.1	0
L05_Office_Peri_W1	0	0	0	0.3	5.2	74.4	19.5	0.4	0.2	0
L05_Office_Peri_S1	0	0	0.1	0.7	5.8	67	23.2	2.6	0.5	0.2
L05_Office_Peri_S2	0	0	0.1	0.9	6.4	66	21.9	2.2	1.3	1.3
L05_Office_Peri_E1	0	0	0	0.4	7.2	70.8	19.1	1.5	0.6	0.4
L05_Office_Peri_E2	0	0	0	0.4	11.7	73.4	14.1	0.3	0.1	0
L05_Office_Peri_N	0	0	0	0.2	9	76.6	14.2	0.1	0	0
L05_Office_Peri_N	0	0	0	0.1	5.5	76.7	17.8	0	0	0
L06_Office_Peri_W1	0	0	0	0.3	5.6	75.4	18	0.5	0.2	0
L06_Office_Peri_W1	0	0	0	0.3	5.3	75.1	18.1	0.9	0.3	0
L06_Office_Peri_S1	0	0	0.1	0.5	5.8	67.8	22.2	2.8	0.5	0.4
L06_Office_Peri_S2	0	0	0.1	0.5	8.2	66.2	20.2	2.2	1.4	1.2
L06_Office_Peri_E1	0	0	0	0.4	6.8	71.2	18.9	1.6	0.7	0.4
L06_Office_Peri_E2	0	0	0	0.4	12.3	72	14.8	0.4	0.2	0
L06_Office_Peri_N	0	0	0	0.1	8.7	77.9	13.1	0.2	0	0
L06_Office_Int	0	0.1	0.3	0.9	5.4	74.1	19.1	0.1	0	0
L07_Office_Peri_E	0	0	0.2	1	4.9	72.9	20.7	0.3	0	0
L07_Office_Peri_W2	0.1	0.1	0.6	1.5	5.7	67.4	22.8	1.3	0.4	0.1
L07_Office_Peri_E4	0	0.1	0.3	1	5	70.2	23	0.4	0	0
L07_Office_Peri_E2	0.1	0.2	0.8	1.1	4.4	68.5	23.8	1	0.1	0.1
L07_Office_Peri_E1	0	0	0.1	1.1	5.1	73.4	20.1	0.2	0	0
L07_Office_Int	0	0.1	0.5	1.3	5.2	74.7	18.2	0	0	0
L08_Office_Peri_E1	0	0	0	0.9	9.3	76.6	13.2	0	0	0
L08_Office_Peri_E2	0	0.1	0.4	1.3	13.9	71.2	13	0.2	0	0
L08_Office_Peri_S	0.1	0.1	0.5	1.4	16.1	68	13.3	0.4	0.1	0
L08_Office_Peri_W1	0.1	0	0.5	1.3	13.1	70.1	14.6	0.2	0.1	0
L08_Office_Peri_W2	0	0.1	0.3	1.3	7.3	75.6	15.4	0.1	0	0
L08_Office_Int	0.1	0.6	1.2	1.5	6.8	74.6	15.2	0	0	0
L08_Office_Int	0.1	0.3	0.8	1.2	5.1	74.6	17.8	0.1	0	0
L08_Office_Int	0	0.1	0.6	1.4	7.9	75.3	14.7	0	0	0
L08_Office_Peri_E4	0.1	0	0.5	1.2	14	70	13.7	0.4	0	0
L08_Office_Peri_E3	0	0	0.2	1.1	6.5	76.6	15.5	0.1	0	0
L09_Office DH_Peri_E1	0	0.1	0.5	1.6	26.9	50.5	19.9	0.3	0.1	0.1
L07_Office_Peri_N3	0	0.1	0.4	1.4	11.6	68.5	17.3	0.4	0.2	0
L07_Office_Peri_S	0.1	0.4	0.9	1.3	6.6	69.3	20.9	0.4	0.1	0
L07_Office_Int	0.2	0.5	1	1.1	3.6	68.9	24.4	0.3	0	0
L08_Office_Peri_E6	0	0.1	0.3	1.2	15.8	69.3	13.3	0.1	0	0
L08_Office_Peri_E5	0	0.1	0.7	1.7	8.6	72.5	16.3	0.1	0	0
L08_Office_Peri_E7	0	0.1	0.5	1.5	11.4	73.5	13	0	0	0
L09_Office DH_Peri_W2	0.1	0.1	0.5	1.5	17.8	57.1	22.1	0.6	0.1	0.1
L09_Office DH_Peri_W2	0.1	0	0.6	1.3	15.6	60	21.6	0.6	0.1	0.1
L09_Office DH_Peri_W1	0.4	0.4	0.9	1.2	17.3	48.6	24.1	4.3	1.7	1.1
L09_Office DH_Peri_W1	0.3	0.4	0.9	1.4	15.6	52.5	24.2	3.1	0.9	0.7
L09_Office DH_Peri_W1	0	0.1	0.5	1.4	6.8	65.8	24.8	0.6	0	0
Average	0.02	0.06	0.23	0.77	8.34	71.21	18.24	0.76	0.24	0.15

PMV - % of hours in range

Weather file	≤ -1.00	>-1.00 to ≤-0.75	>-0.75 to ≤-0.50	>-0.50 to ≤-0.25	>-0.25 to ≤0.00	>0.00 to ≤0.25	>0.25 to ≤0.50	>0.50 to ≤0.75	>0.75 to ≤1.00	> 1.00
DSY1	0.0	0.0	0.1	0.7	9.5	70.0	19.1	0.4	0.1	0.0
DSY2	0.0	0.0	0.1	0.6	6.7	73.1	18.2	0.7	0.3	0.2
DSY3	0.0	0.1	0.2	0.8	8.3	71.2	18.2	0.8	0.2	0.1



PROJECT NUMBER AND NAME

CIBSE Guide A Operative Temperature Check (IES)

Occupied Spaces: OFFICE
Thermal model:
Weather file: LHR

OFFICE - DSY1

London_LHR_DSY1_2020High50.epw

Percentage Dissatisfied - % of hours in range

Room Name	<= 5.00	>5.00 to <=10.00	>10.00 to <=15.00	>15.00 to <=20.00	>20.00 to <=25.00	> 25.00
L01_Office_Peri_W	5.7	94.3	0	0	0	0
L01_Office_Peri_W	4.1	95.9	0	0	0	0
L01_Office_Peri_SW3	5	95	0	0	0	0
L01_Office_Peri_E	3.8	96.2	0	0	0	0
L01_Office_Peri_E1	3.5	96.5	0	0	0	0
L01_Office_Peri_E2	3.7	95.5	0.7	0.1	0.1	0
L01_Office_Peri_S	2.9	96.9	0.2	0	0	0
L01_Office_Peri_SW	3.4	95.8	0.5	0.1	0.1	0
L01_Office_Peri_W1	4.2	95.6	0.2	0	0	0
L01_Office_Peri_W	6.3	93.7	0	0	0	0
L01_Office_Int	4.2	95.6	0.2	0	0	0
L02_Office_Peri_W1	2.6	97.2	0.2	0	0	0
L02_Office_Peri_S1	2.1	96.9	0.8	0.1	0.1	0
L02_Office_Peri_S2	2.5	94.6	1.7	0.4	0.3	0.5
L02_Office_Peri_E1	3.7	95.2	0.6	0.4	0.1	0
L02_Office_Peri_E2	5.6	94.4	0	0	0	0
L02_Office_Peri_W2	2.7	97.3	0.1	0	0	0
L02_Office_Peri_N	5.7	94.3	0	0	0	0
L02_Office_Int	3.3	96.5	0.2	0	0	0
L03_Office_Peri_W1	2.5	97.3	0.2	0	0	0
L03_Office_Peri_S1	2.1	96.9	0.8	0.1	0.1	0
L03_Office_Peri_S2	2.6	94.5	1.7	0.4	0.3	0.5
L03_Office_Peri_E1	3.4	95.7	0.5	0.4	0.1	0
L03_Office_Peri_E2	5.6	94.4	0	0	0	0
L03_Office_Peri_N1	5.7	94.3	0	0	0	0
L03_Office_Peri_W2	2.5	97.4	0.1	0	0	0
L03_Office_Int	3.3	96.6	0.2	0	0	0
L04_Office_Peri_W1	2.6	97.3	0.2	0	0	0
L04_Office_Peri_S1	2	97	0.8	0.1	0.1	0
L04_Office_Peri_S2	2.4	94.9	1.6	0.4	0.3	0.5
L04_Office_Peri_E1	3.5	95.1	0.9	0.3	0.2	0
L04_Office_Peri_E2	5.5	94.5	0	0	0	0
L04_Office_Peri_W1	2.6	97.3	0.1	0	0	0
L04_Office_Peri_N1	5.7	94.3	0	0	0	0
L04_Office_Int	3.2	96.6	0.2	0	0	0
L05_Office_Peri_W1	2.5	97.4	0.1	0	0	0
L05_Office_Peri_W1	2.6	97.2	0.2	0	0	0
L05_Office_Peri_S1	2	97	0.8	0.1	0.1	0
L05_Office_Peri_S2	2.3	94.5	1.8	0.6	0.3	0.5
L05_Office_Peri_E1	3.8	94.9	0.8	0.3	0.2	0
L05_Office_Peri_E2	5.7	94.3	0	0	0	0
L05_Office_Peri_N	5.6	94.4	0	0	0	0
L05_Office_Peri_N	3.5	96.5	0	0	0	0
L06_Office_Peri_W1	2.7	97.1	0.2	0	0	0
L06_Office_Peri_W1	2.7	97.1	0.2	0	0	0
L06_Office_Peri_S1	2.4	96.4	0.9	0.1	0.2	0
L06_Office_Peri_S2	3.6	93.4	1.9	0.4	0.3	0.4
L06_Office_Peri_E1	3.4	95.2	0.8	0.4	0.2	0
L06_Office_Peri_E2	5.9	93.9	0.2	0	0	0
L06_Office_Peri_N	5.4	94.6	0	0	0	0
L06_Office_Int	3	96.8	0.2	0	0	0
L07_Office_Peri_E	2.1	97.2	0.7	0	0	0
L07_Office_Peri_W2	2.3	95.8	1.4	0.4	0	0
L07_Office_Peri_E4	2.2	97.5	0.3	0	0	0
L07_Office_Peri_E2	2.1	96.4	1.2	0.2	0.1	0
L07_Office_Peri_E1	2.2	97.5	0.2	0	0	0
L07_Office_Int	3	96.6	0.3	0.1	0	0
L08_Office_Peri_E1	4.9	95.1	0	0	0	0
L08_Office_Peri_E2	7.6	92.1	0.2	0.1	0	0
L08_Office_Peri_S	8.5	91.1	0.3	0.2	0	0
L08_Office_Peri_W1	6.6	93.1	0.2	0.1	0	0
L08_Office_Peri_W2	3.3	96.5	0.2	0	0	0
L08_Office_Int	3.4	95.2	0.8	0.3	0.1	0.2
L08_Office_Int	2.3	96.9	0.5	0.1	0.1	0
L08_Office_Int	3.9	95.7	0.3	0.1	0	0
L08_Office_Peri_E4	7.3	92.5	0.1	0.1	0	0
L08_Office_Peri_E3	3.1	96.7	0.2	0	0	0
L09_Office DH_Peri_E1	9.6	89.6	0.8	0	0	0
L07_Office_Peri_N3	5.7	93.9	0.3	0.1	0	0
L07_Office_Peri_S	2.1	96.8	0.7	0.1	0.1	0.1
L07_Office_Int	1.4	97.3	0.8	0.2	0.1	0.2

OFFICE - DSY2

London_LHR_DSY2_2020High50.epw

Percentage Dissatisfied - % of hours in range

Room Name	<= 5.00	>5.00 to <=	>10.00 to <	>15.00 to <	>20.00 to <	> 25.00
L01_Office_Peri_W	6.3	93.5	0.2	0.1	0	0
L01_Office_Peri_W	3.4	96	0.3	0.2	0.1	0
L01_Office_Peri_SW3	5.4	94.1	0.2	0.2	0.2	0
L01_Office_Peri_E	3.3	96.1	0.3	0.2	0.1	0.1
L01_Office_Peri_E1	2.9	96.5	0.3	0.2	0	0.1
L01_Office_Peri_E2	3.7	93.1	1.7	0.5	0.3	0.7
L01_Office_Peri_S	2.1	96.2	1	0.1	0.2	0.4
L01_Office_Peri_SW	4.2	93.1	1.4	0.5	0.3	0.6
L01_Office_Peri_W1	3.8	95.2	0.5	0.1	0.2	0.2
L01_Office_Peri_W	7	92.8	0.2	0	0	0
L01_Office_Int	4.9	94.9	0.3	0	0	0
L02_Office_Peri_W1	2.1	96.9	0.4	0.2	0.2	0.2
L02_Office_Peri_S1	1.6	95	1.8	0.6	0.3	0.8
L02_Office_Peri_S2	2.1	93.7	1.3	0.9	0.5	1.4
L02_Office_Peri_E1	2.6	94.9	1.2	0.6	0.2	0.6
L02_Office_Peri_E2	6	93.3	0.3	0.2	0.2	0
L02_Office_Peri_W2	2.4	96.7	0.4	0.3	0	0.1
L02_Office_Peri_N	5.8	93.8	0.2	0.1	0	0
L02_Office_Int	2.4	97.1	0.4	0.1	0	0
L03_Office_Peri_W1	2	97.1	0.4	0.3	0.1	0.1
L03_Office_Peri_S1	1.8	94.8	1.8	0.5	0.3	0.8
L03_Office_Peri_S2	1.7	94.2	1.3	0.9	0.5	1.4
L03_Office_Peri_E1	2.6	95.1	1.1	0.6	0.2	0.5
L03_Office_Peri_E2	6.3	92.9	0.4	0.2	0.2	0
L03_Office_Peri_N1	6	93.7	0.2	0.1	0	0
L03_Office_Peri_W2	2.1	97.1	0.5	0.2	0.1	0.1
L03_Office_Int	2.2	97.3	0.3	0.1	0	0
L04_Office_Peri_W1	2.3	96.6	0.5	0.3	0.2	0.2
L04_Office_Peri_S1	1.5	95.2	1.7	0.5	0.3	0.8
L04_Office_Peri_S2	1.7	94.2	1.4	0.8	0.6	1.4
L04_Office_Peri_E1	2.5	94.9	1.2	0.6	0.2	0.6
L04_Office_Peri_E2	6.6	92.6	0.4	0.2	0.2	0
L04_Office_Peri_W1	2.2	96.8	0.4	0.4	0	0.1
L04_Office_Peri_N1	6	93.6	0.2	0.1	0	0
L04_Office_Int	2.2	97.3	0.4	0.1	0	0
L05_Office_Peri_W1	2.3	96.9	0.4	0.3	0	0.1
L05_Office_Peri_W1	2	97	0.4	0.2	0.2	0.1
L05_Office_Peri_S1	1.4	95.2	1.8	0.5	0.4	0.8
L05_Office_Peri_S2	2	93.7	1.3	0.9	0.6	1.5
L05_Office_Peri_E1	2.7	94.7	1.3	0.5	0.2	0.6
L05_Office_Peri_E2	7.1	92.2	0.4	0.2	0.2	0
L05_Office_Peri_N	5.9	93.8	0.2	0.1	0	0
L05_Office_Peri_N	3.2	96.4	0.3	0.1	0	0
L06_Office_Peri_W1	2.2	96.8	0.5	0.3	0.1	0.1
L06_Office_Peri_W1	2.1	96.7	0.6	0.3	0.2	0.2
L06_Office_Peri_S1	1.7	94.8	1.6	0.7	0.4	0.8
L06_Office_Peri_S2	3.6	92	1.5	0.9	0.5	1.5
L06_Office_Peri_E1	2.4	94.9	1.2	0.5	0.3	0.6
L06_Office_Peri_E2	8	91	0.5	0.2	0.2	0.2
L06_Office_Peri_N	5.8	93.7	0.3	0.1	0.1	0
L06_Office_Int	2.1	97.4	0.4	0.1	0	0
L07_Office_Peri_E	1.2	98	0.8	0	0	0
L07_Office_Peri_W2	1.8	95.6	1.7	0.3	0.2	0.4
L07_Office_Peri_E4	1.5	97.1	1.1	0.2	0.1	0
L07_Office_Peri_E2	1.5	96.3	1.5	0.4	0.2	0.1
L07_Office_Peri_E1	1.5	98.1	0.4	0	0	0
L07_Office_Int	1.4	98.1	0.4	0.1	0	0
L08_Office_Peri_E1	5.2	94.8	0	0	0	0
L08_Office_Peri_E2	7.4	92	0.5	0	0	0
L08_Office_Peri_S	6.5	92.1	0.9	0.2	0.3	0
L08_Office_Peri_W1	6.2	92.8	0.5	0.3	0.2	0.1
L08_Office_Peri_W2	2.9	96.6	0.4	0.1	0	0
L08_Office_Int	3.2	95.6	0.5	0.4	0.1	0.1
L08_Office_Int	1.6	97.2	0.8	0.3	0	0.1
L08_Office_Int	4.1	95.4	0.4	0.1	0	0
L08_Office_Peri_E4	6.4	92.8	0.5	0.2	0	0
L08_Office_Peri_E3	2.7	97.2	0.1	0	0	0
L09_Office DH_Peri_E1	8.6	90.5	0.8	0.1	0	0
L07_Office_Peri_N3	6	92.6	0.8	0.4	0.2	0.1
L07_Office_Peri_S	2.7	95.1	1.1	0.4	0.2	0.4
L07_Office_Int	1.1	97.2	0.8	0.4	0.3	0.2

OFFICE - DSY3

London_LHR_DSY3_2020High50.epw

Percentage Dissatisfied - % of hours in range

Room Name	<= 5.00	>5.00 to <=	>10.00 to <	>15.00 to <	>20.00 to <	> 25.00
L01_Office_Peri_W	5	95	0	0	0	0
L01_Office_Peri_W	3.8	95.9	0.3	0	0	0
L01_Office_Peri_SW3	4.1	95.7	0.2	0	0	0
L01_Office_Peri_E	4	95.7	0.3	0	0	0
L01_Office_Peri_E1	3.4	96.3	0.3	0	0	0
L01_Office_Peri_E2	5.5	91.4	2.1	0.4	0.3	0.3
L01_Office_Peri_S	3	95.9	0.9	0.1	0.2	0
L01_Office_Peri_SW	4.6	92.8	1.6	0.6	0.1	0.3
L01_Office_Peri_W1	4	95.4	0.4	0.1	0.1	0
L01_Office_Peri_W	5.9	94.1	0	0	0	0
L01_Office_Int	4.1	95.7	0.2	0.1	0	0
L02_Office_Peri_W1	3	96.2	0.5	0.3	0	0
L02_Office_Peri_S1	2.5	93.7	2.8	0.4	0.3	0.3
L02_Office_Peri_S2	2.6	92.5	2.1	0.9	0.7	1.3
L02_Office_Peri_E1	3.5	93.9	1.3	0.7	0.2	0.4
L02_Office_Peri_E2	6.4	93.2	0.3	0.1	0	0
L02_Office_Peri_W2	3.3	96.1	0.4	0.2	0	0
L02_Office_Peri_N	4.5	95.4	0.1	0	0	0
L02_Office_Int	3	96.6	0.2	0.1	0	0
L03_Office_Peri_W1	2.9	96.5	0.4	0.3	0	0
L03_Office_Peri_S1	2.2	94	2.9	0.4	0.2	0.3
L03_Office_Peri_S2	2.6	92.4	2.2	0.8	0.7	1.2
L03_Office_Peri_E1	3.3	94.4	1.2	0.5	0.3	0.3
L03_Office_Peri_E2	6.5	93.1	0.3	0.1	0	0
L03_Office_Peri_N1	4.3	95.6	0.1	0	0	0
L03_Office_Peri_W2	3.1	96.2	0.4	0.2	0	0
L03_Office_Int	3.4	96.4	0.2	0.1	0	0
L04_Office_Peri_W1	2.8	96.4	0.5	0.3	0	0
L04_Office_Peri_S1	2.4	93.9	2.8	0.4	0.2	0.3
L04_Office_Peri_S2	2.5	92.5	2.1	0.9	0.6	1.3
L04_Office_Peri_E1	3.5	93.6	1.4	0.7	0.3	0.5
L04_Office_Peri_E2	6.5	93.1	0.3	0.2	0	0
L04_Office_Peri_W1	3.1	96.2	0.4	0.2	0	0
L04_Office_Peri_N1	4.5	95.3	0.2	0	0	0
L04_Office_Int	3.1	96.6	0.2	0.1	0	0
L05_Office_Peri_W1	3.2	96.2	0.4	0.2	0	0
L05_Office_Peri_W1	2.7	96.6	0.4	0.3	0	0
L05_Office_Peri_S1	2.3	93.9	2.8	0.4	0.2	0.3
L05_Office_Peri_S2	2.4	92.6	2	1	0.5	1.5
L05_Office_Peri_E1	3.5	93.7	1.4	0.7	0.3	0.5
L05_Office_Peri_E2	6.6	93	0.3	0.1	0	0
L05_Office_Peri_N	4.5	95.4	0.2	0	0	0
L05_Office_Peri_N	3.4	96.5	0.1	0	0	0
L06_Office_Peri_W1	3.1	96	0.6	0.3	0	0
L06_Office_Peri_W1	2.7	95.9	0.9	0.2	0.2	0
L06_Office_Peri_S1	2.6	93.4	2.7	0.6	0.3	0.4
L06_Office_Peri_S2	5.3	89.6	2.1	0.8	0.8	1.3
L06_Office_Peri_E1	3.6	93.5	1.4	0.7	0.3	0.5
L06_Office_Peri_E2	7.5	91.7	0.5	0.1	0.1	0
L06_Office_Peri_N	4.7	95.1	0.2	0	0	0
L06_Office_Int	3.1	96.5	0.4	0.1	0	0
L07_Office_Peri_E	2.3	96.9	0.6	0.1	0.1	0
L07_Office_Peri_W2	2.4	94.6	2	0.5	0.3	0.2
L07_Office_Peri_E4	2.5	96.6	0.8	0.1	0	0
L07_Office_Peri_E2	1.8	95.6	2	0.4	0	0.2
L07_Office_Peri_E1	2.3	97.4	0.2	0.1	0	0
L07_Office_Int	2.9	96.5	0.5	0.1	0.1	0
L08_Office_Peri_E1	5.2	94.7	0.1	0	0	0
L08_Office_Peri_E2	8.9	90.3	0.7	0.1	0	0
L08_Office_Peri_S	7.3	91.5	0.7	0.4	0.1	0.1
L08_Office_Peri_W1	7.6	91.4	0.7	0.2	0.1	0.1
L08_Office_Peri_W2	4	95.6	0.3	0	0.1	0
L08_Office_Int	4.3	93.8	1	0.5	0.3	0.2
L08_Office_Int	2.4	96.2	0.9	0.3	0.2	0.1
L08_Office_Int	4.5	94.8	0.6	0.1	0	0
L08_Office_Peri_E4	8.2	90.7	0.8	0.2	0.1	0.1
L08_Office_Peri_E3	3.2	96.6	0.2	0.1	0	0
L09_Office DH_Peri_E1	7.7	91.2	0.9	0.1	0.1	0.1
L07_Office_Peri_N3	7.2	91.5	0.9	0.1	0.2	0.1
L07_Office_Peri_S	3.4	94.3	1.5	0.4	0.2	0.1
L07_Office_Int	1.4	96.5	1.1	0.6	0.3	0.2

L08_Office_Peri_E6	9.1	90.7	0.2	0	0	0
L08_Office_Peri_E5	3.6	96	0.3	0.1	0	0
L08_Office_Peri_E7	5.6	94.1	0.2	0.1	0	0
L09_Office DH_Peri_W2	8.5	90.2	1.2	0.2	0	0
L09_Office DH_Peri_W2	8.5	90.4	1	0.2	0	0
L09_Office DH_Peri_W1	7.2	85.5	5.6	0.9	0.4	0.4
L09_Office DH_Peri_W1	7.5	87.6	3.7	0.7	0.3	0.2
L09_Office DH_Peri_W1	2.8	96.3	0.9	0.1	0	0
Average	4.10	95.15	0.55	0.12	0.05	0.04

L08_Office_Peri_E6	6.9	92.8	0.2	0	0	0
L08_Office_Peri_E5	4.6	94.5	0.7	0.1	0.1	0
L08_Office_Peri_E7	6.5	93	0.4	0.1	0	0
L09_Office DH_Peri_W2	6.9	91.2	1.5	0.2	0.1	0.1
L09_Office DH_Peri_W2	6.8	91.6	1.5	0.1	0	0
L09_Office DH_Peri_W1	6	84.5	5	1.7	1.1	1.7
L09_Office DH_Peri_W1	5.8	88.2	3.4	1.1	0.5	1
L09_Office DH_Peri_W1	3.4	94.2	2.2	0.1	0.1	0
Average	3.75	94.67	0.84	0.31	0.16	0.28

L08_Office_Peri_E6	9.1	90.5	0.3	0.1	0	0
L08_Office_Peri_E5	5.3	93.6	0.9	0.1	0	0.1
L08_Office_Peri_E7	7.2	92.2	0.5	0.1	0	0
L09_Office DH_Peri_W2	7.4	90.8	1.4	0.3	0.1	0.1
L09_Office DH_Peri_W2	8	90.4	1.3	0.1	0.1	0.1
L09_Office DH_Peri_W1	6.8	83.8	4.8	1.9	1.1	1.7
L09_Office DH_Peri_W1	6.6	86.5	3.9	1.2	0.6	1.1
L09_Office DH_Peri_W1	4.9	93.4	1.5	0.1	0	0.1
Average	4.29	94.12	0.98	0.29	0.14	0.20

PPD - % of hours in range						
Weather file	<= 5.00	>5.00 to <=10.00	>10.00 to <=15.00	>15.00 to <=20.00	>20.00 to <=25.00	> 25.00
DSY1	4.1	95.1	0.5	0.1	0.1	0.0
DSY2	3.8	94.7	0.8	0.3	0.2	0.3
DSY3	4.3	94.1	1.0	0.3	0.1	0.2

Appendix E

BREEAM Pre-Assessment

BREEAM NC (Non-Domestic)

Design Stage Assessment (DSA)

19 Charterhouse St

65210714-SWE-XX-XX-T-O-001-P06

09.04.2025
P06

Issue	Date	Reason for Issue	Prepared	Checked	Approved
1	05.06.2024	For planning	AN	KC	DP/KA
2	28.02.2025	For planning	AN	KC	KA
3	12.03.2025	For planning	AN	KC	DP/KA
4	27.03.2025	For planning	AN	KC	KA
5	28.03.2025	For planning	AN	KC	DP/KA
6	09.04.2025	For planning	AN	KC	KA

BREEAM NC (Non-Domestic) - Design Stage Assessment (DSA)
19 Charterhouse St
09.04.2025
P06

BREEAM NC V6.1 Credit Review

09.04.2025 Rev.6

Project Name **19 Charterhouse St**

Building Type **Office**

Project Type **Shell and Core**

Assessment Stage **Design Stage Assessment (DSA)**

Building Floor Area 12,846 m² (GIA) / 8,154 m² (NIA)

Targeted BREEAM rating %	**80.89**	**Excellent**
Potential BREEAM rating %	**90.27**	**Outstanding**
Achieved scoring %	**21.03**	**Unclassified**

Credit awarded
Credit not targeted
Potential additional credit
Further information required

Credit Ref.	Credit Title	Credit Name	Credits Available	Credits Targeted	Potential Additional	Credits Achieved	Mandatory Elements	Responsibilities	Deadline / RIBA Stage	Status	Evidence Required
MANAGEMENT		0.61%									
Man 01	**Project brief and design**	Project Delivery Planning	1	1				Client*PM*	2		Design team meetings, scope of work & formal agreements on performance targets with project team members. Evidence Required: - Initial Project Brief - Project Exaction Plan - Communication Strategy - Roles and Responsibilities Matrix - Construction programme - Meeting minutes & the contributions from the team
		Stakeholder Consultation (Interested Parties)	1	1				Client*PM*	2		All relevant third parties (e.g. planning consultation with local authority, local residents, FM staff, representative consultation group from existing community, and any input from end user, etc) been consulted by the design team. Evidence Required: - Stakeholder Consultation covering minimum content - Statement of Community Involvement - Design Access Statement - Planning boards and other content used - Consultation plan / schedule - Consultation feedback to influence the design
		Have project team, including the client, formally agree strategic performance targets?					Yes	Client*Design Team*			Pre-requisite requirement for AP is closed
		BREEAM AP (Concept Design)	1	1		1		BREEAM AP*	2		BREEAM AP was appointed prior to RIBA Stage 2 and BREEAM target formally agreed with design team.
		BREEAM AP (Developed Design)	1	1				BREEAM AP*	3		BREEAM AP is appointed and monitor progress against target throughout the project up to PC Stage. Evidence Required: - BREEAM AP is appointment - BREEAM AP Greenbook Live confirmation - BREEAM AP Stage 3 report - Stage 3 Meeting minutes

Credit Ref.	Credit Title	Credit Name	Credits Available	Credits Targeted	Potential Additional	Credits Achieved	Mandatory Elements	Responsibilities	Deadline / RIBA Stage	Status	Evidence Required
Man 02	**Life cycle cost and service life planning**	Elemental LCC	2	2				LCC Specialist*	2		An Elemental LCC analysis is required to be carried out at RIBA Stage 2 for 20, 30, 50 or 60 years LCC analysis. Evidence Required: - Stage 2 Elemental LCC analysis (20, 30, 50 or 60 years LCC analysis) - Professional CV of LCC consultant
		Component Level LCC options appraisal	1	1				LCC Specialist*	4		A Component LCC analysis at RIBA Stage 4 including Envelope, e.g. cladding, window, roof. Services, Finishes, e.g. floors or ceilings. External spaces, e.g. landscaping. Evidence Required: - Stage 4 Component LCC analysis (covering Envelope, Services Finished and External Spaces) - Professional CV of LCC consultant - Confirmation with supporting evidence recommendation are included in the final design. Where not justification as to why provided.
		Capital Cost Reporting	1	1				Client*QS*	4		Report a capital cost in £/m2 for BRE purpose only. Evidence Required: - Signed better of confirmation, on letter headed paper, confirming the capital cost in £/m2 GIA.

Credit Ref.	Credit Title	Credit Name	Credits Available	Credits Targeted	Potential Additional	Credits Achieved	Mandatory Elements	Responsibilities	Deadline / RIBA Stage	Status	Evidence Required
Man 03	Responsible construction practices	**Legal and sustainable timber**					Yes/No?	Contractor*			This is a minimum requirement for achieving any BREEAM rating. Evidence Required: - Signed better of confirmation, on letter headed paper, confirming all timber is FSC or PEFC sourced and certificates, delivery notes and full chain of custardy documents will be provided at PC.
		Environmental Management	1	1				Contractor*	4		Contractor operates EMS: certificate of ISO 14001 /EMAS and implement best practice pollution prevention policies and procedures on site in accordance with working at construction and demolition sites: PPG6, Pollution Prevention Guidelines. Evidence Required: - Demolition and Principle Contractor EMS certified (ISO 14001) - Letter of commitment form Demolition and Principle contract to adhere to PPG6 Pollution Prevention Guidelines
		Have the client & the contractor formally agreed performance targets?					Yes/No?	Client*Contractor*			Pre-requisite requirement for AP credits (Site) - BREEAM contract including target or letter on signed headed paper confirming BREEAM rating
		BREEAM AP (Site)	1	1				Contractor*	4		A Site Sustainability Manager / BREEAM AP should be appointed to monitor targets during the RIBA Stages 5 & 6. Evidence Required: - BREEAM Site AP is appointment letter (including number) - Letter of commitment for BREEAM Site AP reporting for Stage 5&6
		Responsible Construction Management **(Minimum Standard: 1 credit for Excellent, 2 for Outstanding)**	2	2			Yes/No?	Contractor*	4		Minimum Standard: E-1; O-2. The principal contractor evaluates the risks (on site and off site), plans and implements actions to minimise the identified risks i.e. Considerate Constructors Scheme, Fleet Operator Recognition Scheme. For one credit: Achieve all items listed in Table 4.1 as "Required for one credit". For two credits: As per one credit, plus any six additional items. Evidence Required: - Letter of commitment the principle contractor will sign up to Considerate Constructors Scheme and achieve a minimum score of 39 with 13 in each section. - Letter of commitment the principle contractor will sign up to CLOC's and FORS - Letter of commitment the principle contractor will demonstrate compliance with items g, p and q of the BREEAM table.
		Monitoring of Construction Site Impacts - Utility Consumption	1	1				Contractor*	4		Site-based energy and water usage to be monitored. Display figures on site. Evidence Required: - Letter of commitment the AP or site manager will set targets and monitor the energy and water usage on site
		Monitoring of Construction Site Impacts - Transport of Construction Materials & Waste	1	1				Contractor*	4		Vehicle monitoring of materials deliveries from point of supply and vehicle monitoring of waste to establish carbon figures. Evidence Required: - Letter of commitment the AP or site manager will set targets and monitor vehicles delivering materials from point of supply and vehicle monitoring of waste to establish carbon figures

Credit Ref.	Credit Title	Credit Name	Credits Available	Credits Targeted	Potential Additional	Credits Achieved	Mandatory Elements	Responsibilities	Deadline / RIBA Stage	Status	Evidence Required
Man 04	**Commissioning & Handover**	Commissioning - Testing Schedule & Responsibilities **(Minimum Standard: 1 credit for Very Good / Excellent / Outstanding)**	1	1			Yes/No?	Contractor*Specialist*	4		Minimum Standard: VG/E/O - 1. Third party commissioning manager to be appointed. Testing schedule and responsibilities to be provided. Evidence Required: - Letter of commitment that a Third party commissioning manager will be appointed and will produce a testing schedule
		Commissioning - design and preparation	1	1				Contractor*Specialist*	4		Appointment of an appropriate project team member, provided they are not involved in the general installation works provide commissioning management. Evidence Required: - Appointment of an specialist commissioning manager at the design stage - Letter of commitment that the commissioning manager will monitor, review and provide design advise for commissioning in accordance with Building Regulations, BSRIA and CIBSE guidelines and/or other appropriate standards - Commissioning schedule & commissioning programme
		Testing & Inspecting Building Fabric	1		1			Contractor*Specialist*	4		Thermographic survey as well as an airtightness test and inspection required. Evidence Required: - Letter of confirmation the contractor will a complete a Thermographic survey as well as an airtightness test with any defect fixed.
		Building User Guide					Yes/No?	Client*Contractor*			Minimum Standard: VG/E/O - 1. A technical and non-technical building user guides to be developed. Evidence Required: - Letter of confirmation the contractor will produce 2 separate building user guides: A technical and non-technical.
		Handover	1	1				Contractor*	4		Building User Guides as above and a non-technical training schedule for the building occupiers. A technical training schedule for the premises facilities managers. Evidence Required: - Letter of confirmation the contractor will conduct 2 separate training scheduled: A technical and non-technical
Man		**TOTAL:**	**18**	**17**	**1**	**1**					
		% of total score:	**11.00%**	**10.39%**	**0.61%**	**0.61%**					

Credit Ref.	Credit Title	Credit Name	Credits Available	Credits Targeted	Potential Additional	Credits Achieved	Mandatory Elements	Responsibilities	Deadline / RIBA Stage	Status	Evidence Required
HEALTH & WELLBEING 0.73%											
Hea 01	**Visual comfort**	Daylighting	2		2			Architect*Specialist*	3		Daylighting study to be carried out and achieve average daylight factor of 2% over 80% (100% room dependant) of the floor plate and a uniformity ratio of at least 0.3. Evidence Required: - Provide daylight calculations and detailed floor plans confirming daylighting criteria to be met as outlined in Table 5.1 and Table 5.2 and daylighting uniformity criteria. OR - Provide daylight calculations and detailed floor plans confirming the relevant building areas meet good practice average and minimum point daylight illuminance criteria as outlined in Table 5.3. - Carry out a daylighting study. - Design drawings.
		View Out	1	1				Architect*	3		95% of the floor area in 95% of spaces for each relevant building area is within 8m of an external wall. The window or opening must be ≥ 20% of the surrounding wall area. Or compliance is sought via BS 8206: part 2. Evidence Required: - Provide design drawings demonstrating appropriate view-out in relevant areas (with area information) - Window schedule
		Internal & External Lighting Levels, Zoning & Controls	1	1				M&E Consultant*	4		Evidence Required: - Provide design drawings, and either relevant specification clauses or a formal letter confirming compliance with all standards in relevant areas. - Provide design drawings/specifications demonstrating external lighting is zoned to allow for occupant control in accordance with the relevant standards. - External lighting schedules with luminaire information
Hea 02	**Indoor air quality**	**Indoor Air Quality Plan**					Yes/No?	Specialist*			Prerequisite requirement when VOC credits are pursued. IAQ Plan to be developed in line with the relevant local authority plans or policies. Evidence Required: - Provide a copy of Indoor Air Quality Plan
		Ventilation	1	1				M&E Consultant*	4		Evidence Required: For Shell&Core assessment, drawings and confirmation that ventilation system will be design according to BS 17772 and that fresh air flow will be 14l/person/second.
Hea 04	**Thermal comfort**	Thermal modelling	1	1				Energy Consultant*	3		Compliant thermal modelling report received. Evidence Required: - Letter of confirmation from the M&E consultants - Relevant clauses of the building specification/contract or correspondence from the team - Drawings/schematics showing thermal zoning
		Design for future thermal comfort	1		1			Energy Consultant*	3		Compliant thermal modelling report received. Evidence Required: - Letter of confirmation from the M&E consultants - Relevant clauses of the building specification/contract or correspondence from the team - Drawings/schematics showing thermal zoning

Credit Ref.	Credit Title	Credit Name	Credits Available	Credits Targeted	Potential Additional	Credits Achieved	Mandatory Elements	Responsibilities	Deadline / RIBA Stage	Status	Evidence Required
Hea 05	**Acoustic performance**	Acoustic performance	1	1				Acoustician*	3		Appointment of suitably qualified acoustician to undertake calculation & testing requirements. The contractor to confirm that they will remediate any non-conformation. Evidence Required: - Professional CV of SQA - Provide a professional report from the appointed SQA confirming that the building meets the appropriate acoustic performance standards and testing requirements for all relevant areas for the acoustic principles of: A. Sound insulation B. Indoor ambient noise level C. Room acoustics - Letter of confirmation the contractor will remediate any non-conformation.
Hea 06	**Security**	Security of Site & Building	1	1		1		Security Specialist*	2		Stage 2 items closed, Stage 4 items required to fully close the credit: - Letter of confirmation the contractor will implement the recommendations or solutions proposed by the SQSS.
Hea 07	**Safe and healthy surroundings**	Safe Access	1	1				Architect*	4		Dedicated and safe cycle paths are provided from the site entrance to any cycle storage, and connect to off-site cycle paths where applicable. Suitable lighting also required. Evidence Required: - Provide a design landscape drawing - Relevant clauses of the building specification/contract - A letter/report explaining the safe access measures
		Outside Space	1	1				Architect*	4		There is an outside space providing building users with an external amenity area. Evidence Required: - Provide a marked up landscape drawing demonstrates the following: A. be an outdoor landscaped area B. have appropriate seating areas and be non-smoking C. be located to ensure it is accessible to all building users and avoids areas that will have disturbances from sources of noise.
Hea	**TOTAL:**		**11**	**8**	**3**	**1**					
	% of total score:		**8.00%**	**5.82%**	**2.18%**	**0.73%**					

Credit Ref.	Credit Title	Credit Name	Credits Available	Credits Targeted	Potential Additional	Credits Achieved	Mandatory Elements	Responsibilities	Deadline / RIBA Stage	Status	Evidence Required
ENERGY		0.67%									
Ene 01	**Reduction of Energy Use & Carbon Emissions**	Energy Performance Commissioning - implementation **(Minimum Standard: 4 credits for Excellent / 6 credits for Outstanding)**	9	5	1		Yes/No?	Energy Consultant*	4		Minimum Standard: E-4; O-6 Credits achieved through IES Modelling Tool and reduction in regulated CO_2 emissions, in accordance with 2021 building regulations. Evidence Required: - BRUKL listing energy assessor - BRUKL inp.file - Energy Assessor CIBSE Low Carbon Design Confirmation - Output document from design model.
		Prediction of operational energy consumption **(Minimum Standard: 4 credits for Outstanding)**	4	4			Yes/No?	Energy Consultant*	4		Compliant thermal modelling report received. Evidence Required: - Energy Modeller confirmation (degree, experience and member of CIBSE).
Ene 02	**Energy Monitoring**	Sub-Metering of End-use Categories	1	1			Yes/No?	M&E Consultant*Contractor*	4		Minimum Standard: VG/E/O-1. Energy metering systems of at least 90% of the estimated annual energy consumption of each fuel is assigned to the end-use categories. Evidence Required: - Confirmation or completed tool confirming end use categories metered, connected to the BMS and estimated percentage load - Schematics showing energy (gas and/or electric) connected to end us. - Specification confirming meters connected to BMS.
		Sub-Metering of High Energy Load & Tenancy Areas	1	1				M&E Consultant*Contractor*	4		Sub-metering on a floor by floor basis and tenancy areas. Evidence Required: - Schematics showing meter per tenancy and per floor plate. - Specification confirming meters connected to BMS.
Ene 03	**External Lighting**	External Lighting	1	1				M&E Consultant*Specialist*	4		Average initial luminous efficacy of not less than 70 luminaire lumens per circuit Watt. Automatic control to prevent operation during daylight hours and presence detection in areas of intermittent pedestrian traffic. Evidence Required: - Data collection tool showing all external lighting types, quantities and locations. - Datasheets confirming LL/cW entered into the tool - External lighting drawings showing location of lighting type - Luminaire schedule.

Credit Ref.	Credit Title	Credit Name	Credits Available	Credits Targeted	Potential Additional	Credits Achieved	Mandatory Elements	Responsibilities	Deadline / RIBA Stage	Status	Evidence Required
Ene 04	**Low Carbon Design**	Passive Design Analysis	1	1				Energy Consultant*	2		Thermal modelling to be achieved first. Implement passive design measures to reduce the total heating, cooling, mechanical ventilation, lighting loads and energy consumption in line with the passive design analysis findings. Evidence Required: - Passive Design Analysis completed at Stage 2 - Implement passive design measures to reduce the total heating, cooling, mechanical ventilation, lighting loads and energy consumption. The result should be quantified and presented as a percentage reduction in CO2 emissions.
		Low Zero Carbon Feasibility Study	1	1				Energy Consultant*	2		LZC Study to establish the most appropriate low or zero carbon energy sources and report the reduction on regulated CO_2 emissions. Evidence Required: - LZC report listing LZC assessor - Energy Assessor CIBSE Low Carbon Design Confirmation - Specification confirming LZC - Drawings / Schematics confirming LZC - The result should be quantified and demonstrate a percentage saving in CO2 emissions in the report.
Ene 06	**Energy Efficient Transportation Systems**	Energy Consumption	1	1				Lift Specialist*	4		Lift analysis to determine transportation demand and usage patterns in compliance with BS EN ISO 25745 Part 2 and 3. Evidence Required: - VT analysis report of at least 2 options in accordance with BS EN ISO 25745 Part 2 and 3. - VT Specification following analysis of lowest energy consuming system. - VT specification of regulative drives where practical
		Lifts	1	1				Lift Specialist*	4		Energy-efficient features offering the greatest potential energy savings will be part of the system i.e. a standby condition for off-peak periods. Evidence Required: - VT Specification confirming standby condition, VVVF and lighting is > 70 luminaire lumens per circuit Watt - Where recommended specify regenerative drives
Ene		**TOTAL:**	**21**	**16**	**1**	**0**					
		% of total score:	**14.00%**	**10.67%**	**0.67%**	**0.00%**					

Credit Ref.	Credit Title	Credit Name	Credits Available	Credits Targeted	Potential Additional	Credits Achieved	Mandatory Elements	Responsibilities	Deadline / RIBA Stage	Status	Evidence Required
TRANSPORT		0.96%									
Tra 01	**Transport assessment and travel plan**	Transport assessment and travel plan **(The existing AI needs to be calculated and be in the Travel Assessment)**	2	2		2	**AI >= 40**	Transport Consultant*	2		Copies of the site-specific Transport Survey/Assessment and Travel Plan were received. Requirement is closed.
Tra 02	**Sustainable transport measures**	**Prerequisite: Achieve criteria 3-5 in the Tra 01**					Yes	Transport Consultant*			Copies of the site-specific Transport Survey/Assessment and Travel Plan were received. Requirement is closed.
		1. The existing AI calculated in Tra 01 **(The existing AI ≥ 8 for all other building types;** **AI ≥ 4 for prison/MOD sites, rural location sensitive buildings)**	10	10		10	**1**	Transport Consultant*	2		Copies of the site-specific Transport Survey/Assessment and Travel Plan were received. Requirement is closed.
		3. Provide a public transport information system in a publicly accessible area, to allow building users access to up-to-date information on the available public transport and transport infrastructure.					**5**	Transport Consultant*Client*			Evidence Required: - Provide specification clauses, design drawing or details as appropriate confirming that a public transport information system located in a publicly accessible area - This may include signposting to public transport, cycling, walking infrastructure or local amenities.
		7. Install compliant cycle storage spaces to meet the minimum levels set out in Table 7.5					**13**	Transport Consultant *Client*Architect*			Copies of the site-specific Transport Survey/Assessment and Travel Plan were received. Requirement is closed.
		8. Provide at least two compliant cyclists' facilities for the building users, (including pupils where appropriate to the building type) – Showers; – Changing facilities; – Lockers; – Drying spaces.					**14-15**	Transport Consultant *Client*Architect*			Copies of the site-specific Transport Survey/Assessment and Travel Plan were received. Requirement is closed.
		9. At least three existing accessible amenities are present, see Table 7.6.					**16**	Transport Consultant*Client*			Compliant evidence collected
		10. Enhanced amenities					**17**	Transport Consultant*Client*			Design floor plans plus copies of the site-specific Transport Survey/Assessment and Travel Plan were received. Private outdoor open space suitably sized and accessible to building users will be provided. Requirement is closed.
Tra		**TOTAL:**	**12**	**12**	**0**	**12**					
		% of total score:	**11.50%**	**11.50%**	**0.00%**	**11.50%**					

Credit Ref.	Credit Title	Credit Name	Credits Available	Credits Targeted	Potential Additional	Credits Achieved	Mandatory Elements	Responsibilities	Deadline / RIBA Stage	Status	Evidence Required
WATER		0.78%									
Wat 01	**Water Consumption**	Water Consumption	5	3	1		Yes/No?	M&E Consultant* Architect*Contractor*	4		Minimum Standard: VG/E-1; O-2 To reduce the consumption of potable water for sanitary use in new buildings through the use of water efficient components and water recycling systems. Evidence Required: - Sanitaryware schedule - Manufacturer's technical data sheets - Completed Wat01 calculator
Wat 02	**Water Monitoring**	Water Monitoring	1	1			Yes/No?	M&E Consultant*	4		Minimum Standard: G/VG/E/O- Criterion 1 only - water meter on mains. Install water meters: - On the mains water supply. - On water-consuming plant or building areas consuming 10% or more of the building's total water demand. Each water meter is - Installed with a pulsed or other open protocol communication output and - Connected to BMS. Evidence Required: - Domestic water schematic drawings - Manufacturer's technical data sheets - Documents/reports/letters explaining pulsed or other open protocol communication output and BMS connection.
Wat 03	**Water Leak Detection**	Leak Detection System	1	1				M&E Consultant*	4		Install a leak detection system - On the utilities water supply within the buildings, to detect any major leaks within the building and - Between the buildings and the utilities water supply, to detect any major leaks between the utilities supply and the buildings under assessment Evidence Required: - Domestic water schematic drawings - Manufacturer's technical data sheets - Documents/reports/letters explaining leak detection system
		Flow Control Devices	1	1				M&E Consultant*	4		Install sanitary supply shut-off valves specified for each toilet area. Evidence Required: - Domestic water schematic drawings - Specification on flow control devices on WCs.
Wat 04	**Water Efficient Equipment**	Water Efficient Equipment	1	1				M&E Consultant*	4		Mitigate 'unregulated water usage' (water consumption for uses not assessed under Wat 01) – Swimming pools – Recreational hot tubs and hydrotherapy pools – Equipment used for irrigation – Vehicle wash equipment – Project-specific industrial processes – Water filtration and treatment processes – Building services (e.g. cooling towers and humidification systems) Evidence Required: - Schematic drawings. - Specification on unregulated water usage. - Documents/reports/letters explaining unregulated water usage.
Wat		**TOTAL:**	**9**	**7**	**1**	**0**					
		% of total score:	**7.00%**	**5.44%**	**0.78%**	**0.00%**					

Credit Ref.	Credit Title	Credit Name	Credits Available	Credits Targeted	Potential Additional	Credits Achieved	Mandatory Elements	Responsibilities	Deadline / RIBA Stage	Status	Evidence Required
MATERIALS		1.25%									
Mat 01	**Environmental impacts from construction products - Building life cycle assessment (LCA)**	Superstructure (all building types)	4	2		2	Yes/No?	LCA Specialist*	2		Compliant report received. No further evidence required.
		Superstructure - Technical Design	2	1	1			LCA Specialist*	4		Carry out a building LCA on of the superstructure design using either the BREEAM Simplified Building LCA tool or an IMPACT Compliant LCA tool Identify opportunities for reducing environmental impact. Evidence Required: - Life cycle assessment report - Mat 01/02 Results Submission Tool
		Substructure and hard landscaping options appraisal during Concept Design	1	1		1		LCA Specialist*	2		Compliant report received. No further evidence required.
Mat 02	**Environmental impacts from construction products - Environmental Product Declarations (EPD)**	Specification of products with a recognised environmental product declaration (EPD)	1	1		0		Landscape Architect* LCA Specialist*	4		Specify construction products with EPD that achieve a total EPD points score of at least 20, according to BREEAM technical manual. Evidence Required: - Mat 01/02 Results Submission Tool - Material specifications - EPDs of the materials specified.
Mat 03	**Responsible Sourcing of construction products**	**Pre-requisite: Legal and sustainable timber**					Yes/No?	Client*Contractor*	4		Minimum Standard 100% of timber and timber-based products used on the project are 'Legal' and 'Sustainable' as per the UK Government's Timber Procurement Policy (TPP). Evidence Required: - Commitment/confirmation letter. - List of the timber and timber-based products used on the project. - Certificates & chain of custody documentation. - Delivery notes/tickets/PO no.
		Enabling Sustainable Procurement	1	1				Client*Contractor*	2		A sustainable procurement plan to be issued (before concept design) and used by the design team to guide specification towards sustainable construction products. Evidence Required: - Sustainable procurement plan
		Measuring Responsible Sourcing	3	1				Architect*Contractor*	4		Materials specified and procured from manufacturers who can provide EMS Certification (ISO 14001 etc.). Evidence Required: - Mat 03 Calculator Tool. - Certificates & chain of custody documentation. - Delivery notes/tickets/PO no.

Credit Ref.	Credit Title	Credit Name	Credits Available	Credits Targeted	Potential Additional	Credits Achieved	Mandatory Elements	Responsibilities	Deadline / RIBA Stage	Status	Evidence Required
Mat 05	**Designing for Durability & Resilience**	Designing for Durability & Resilience	1	1				Architect*	4		Protecting vulnerable parts of the building from damage and exposed parts of the building from material degradation. Evidence Required: - Mat05 matrix - Specification of measures specified to protect the building from damage and material degradation. - Design drawings of measures to protect against high pedestrian traffic / internal trolley movement / external protection against potential vehicular collision / service yard robustness measures.
Mat 06	**Material Efficiency**	Preparation and Brief	1		1	0	Yes/No?	Design Team*	1		Set targets and report on opportunities and methods to optimize the use of materials for each of the project stages. Develop and record the implementation of material efficiency during developed design, technical design, and construction. Report the targets and actual material efficiencies achieved. Evidence Required: - Mat06 matrix - Technical drawings - Report/letter explaining how the material efficiency measures have been implemented during the developed design, technical design, and construction - Report/letter explaining the material efficiency targets and the actual material efficiencies achieved. - Commitment letter
		Concept Design					Yes/No?		2		
		Developed Design					Yes/No?		3		
		Technical Design					Yes/No?		4		
		Construction					Yes/No?		5		
Mat		**TOTAL:**	**14**	**8**	**2**	**3**					
		% of total score:	**17.50%**	**10.00%**	**2.50%**	**3.75%**					

Credit Ref.	Credit Title	Credit Name	Credits Available	Credits Targeted	Potential Additional	Credits Achieved	Mandatory Elements	Responsibilities	Deadline / RIBA Stage	Status	Evidence Required
WASTE		0.64%									
Wst 01	**Construction Waste Management**	Pre-demolition audit	1	1		1		Demolition Contractor*	2		Minimum Standard: O-1 A copy of pre-demolition audit report received. Requirement is closed.
		Construction Resource Efficiency	3	1	1		Yes/No?	Contractor*	4		RMP to be prepared covering the targets of non-hazardous waste arising from site construction . Contractor to limit waste to less than 6.5tonnes per 100m² gross internal area. Evidence Required: - Letter of confirmation the contractor will prepare a Resource Management Plan confirming the number of credits they are targeted.
		Diversion of Resources from Landfill	1	1				Contractor*	4		Contractor to limit waste to landfill. 90% (tonnes) of demolition and 80% non-demolition waste to be diverted from landfill. Evidence Required: - Letter of confirmation the contractor will prepare a Resource Management Plan confirming the number of credits they are targeted.
Wst 02	**Recycled Aggregates**	Project Sustainable Aggregate Points	1	1				Structural Engineer*	4		If demolition occurs check pre-demolition audit. Aggregate types, quantities and uses to be identified and achieve 3.5-6 sustainable aggregate points. Evidence Required: - Provide specification clauses/contract/calculation document as appropriate confirming that the uses and types of recycled/secondary aggregates, and the the required project sustainable aggregate points can be achieved.
Wst 03	**Operational Waste**	Operational Waste	1	1			Yes/No?	Architect*Client*	4		Minimum Standard: E/O-1 At least 2 sqm per 1000m² of NIA for recycling bins is required for building <5000m². Additional 2 sqm per 1000m² of NIA when catering is provided. A minimum of 10m² for buildings ≥ 5000m². Evidence Required: - Provide specification clauses/contract/Letter of commitment confirming that dedicated space is provided for the segregation and storage of operational recyclable waste volumes generated by the assessed building/unit. - Provide drawings indicating the location of external waste & recycling storage areas to be accessible and clearly labelled.
Wst 04	**Speculative Finishes (Offices only)**	Speculative Floor and Ceiling Finishes	1	1				Architect*	4		To install floor and ceiling finishes selected by the known occupant or if occupant not known in show area only. Evidence Required: - Letter of confirmation the client to confirm the future occupant/tenants - Relevant clauses of the building specification/drawings or correspondence from the team
Wst 05	**Adaptation to Climate Change**	Resilience of structure, fabric, building services and renewables installation	1	1				Design Team*Specialist*	2		Conduct a climate change adaptation strategy of new & existing fabric and it's durability to deal with extremes in weather condition. Develop recommendations/ solutions at RIBA Stage 2. Provide an update at RIBA Stage 4. Evidence Required: - Provide a climate change adaptation strategy
Wst 06	**Design for disassembly and adaptability**	Design for disassembly and functional adaptability - recommendations	1	1				Design Team*	2		Conduct study by the end of RIBA Stage 2 and develop recommendations prior to RIBA Stage 2. (i.e. alternative building uses, functions, major plant replacement, ventilation strategy to adapt to future building occupant needs, adaptability to changes of in-use etc. Evidence Required: - A copy of study to explore the ease of disassembly and the functional adaptation potential of different design scenarios by the end of Concept Design.
		Disassembly and functional adaptability – implementation	1	1				Design Team*	4		Provide an update during RIBA Stage 4, how the recommendations have been implemented - horizontally or vertically expandability, refurbishment potential, local plant and service distribution routes etc. Evidence Required: - Provide an update during RIBA Stage 4, how the recommendations or solutions have been implemented.
Wst		**TOTAL:**	**11**	**9**	**1**	**1**					
		% of total score:	**7.00%**	**5.73%**	**0.64%**	**0.64%**					

Credit Ref.	Credit Title	Credit Name	Credits Available	Credits Targeted	Potential Additional	Credits Achieved	Mandatory Elements	Responsibilities	Deadline / RIBA Stage	Status	Evidence Required
LAND USE & ECOLOGY 1.15%											
LE 01	**Site Selection**	Previously Occupied Land	1	1				Architect*	4		At least 75% of the proposed development is on previously occupied land. Evidence Required: - Site plan showing the previously occupied part of the land and the assessed building's footprint.
LE 02	Comprehensive Route	**Prerequisite - Statutory obligations**					Yes	Client*Contractor*			Prerequisite: The client or contractor confirms compliance is monitored against all relevant UK and EU or international legislation relating to the ecology of the site. Evidence Required: - Commitment/confirmation letter
	Ecological risks and opportunities	Survey and evaluation	1	1		1		Ecologist*	1		Compliant preliminary ecology report is received. Requirement is closed.
		Determining ecological outcomes of the site	1	1				Ecologist*	2		Evidence Required: - GN40 - SQE resume - Letters/meeting minutes/reports/correspondence
LE 03	**Managing impacts on ecology**	**Prerequisite - Ecological risks and measures on-site**					Yes	Client*Contractor*			Prerequisite: LE 02 has been achieved.
		Planning and measures on-site	1	1		1		Ecologist*	2		Compliant preliminary ecology report is received. Requirement is closed.
		Managing negative impacts	2	2				Ecologist*	4		Route 1 - Negative impacts from site preparation and construction works have been managed according to the hierarchy and no net impact has resulted (1 credit) Route 2 - SQE to provide recommendation on avoidance of negative impact of the site preparation and construction works according to the hierarchy and no net impact has resulted (1 or 2 credits). Evidence Required: Route 1 - Letters/meeting minutes/reports/correspondence. Route 2 - Ecology report and letters/meeting minutes/reports/correspondence.

Credit Ref.	Credit Title	Credit Name	Credits Available	Credits Targeted	Potential Additional	Credits Achieved	Mandatory Elements	Responsibilities	Deadline / RIBA Stage	Status	Evidence Required
LE 04	**Ecological change and enhancement**	**Prerequisite - Managing negative impacts on ecology**					Yes/No?	Client*Contractor*			Prerequisite: - The client or contractor confirms compliance is monitored against all relevant UK, EU or international legislation relating to the ecology of the site. - Criterion 6 (for Foundation route) or 8 (for Comprehensive route) in LE 03 has been achieved.
		Ecological enhancement	1	1				Ecologist*	4		Measures have been implemented that enhance ecological value, which are based on input from the project team and SQE in collaboration with representative stakeholders. Evidence Required: - Ecology report - SQE resume - Letters/meeting minutes/reports/correspondence - Drawings/schematics - Technical specification.
		Change and enhancement of ecology (Route 2)	3	3				Ecologist*	4		SQE to provide calculations of the change in ecological value. Evidence Required: - GN40 - Letters/meeting minutes/reports/correspondence - Drawings/schematics - Technical specification - Completed BREEAM Change in Ecological Value Calculator.
LE 05	**Long Term ecology management and maintenance**	**Prerequisite - Statutory obligations, planning and site implementation**					Yes/No?	Client*Contractor*	4		Prerequisite: - The client or contractor has confirmed that compliance is being monitored against all relevant UK, EU and international standards relating to the ecology of the site. - Foundation route (Route 1) - Criterion 6 in LE 03 has been achieved. - Comprehensive route (Route 2) - Criterion 8 in LE 03 has been achieved, and at least one credit under LE 04 for 'Change and Enhancement of Ecology' has been awarded.
		Management and maintenance throughout the project	1	1				Ecologist*	4		Measures have been implemented to manage and maintain ecology throughout the project. A section on Ecology and Biodiversity has been included as part of the tenant or building owner information supplied. Evidence Required: -Confirmation letter/appointment letter explaining arrangements for the ongoing management of landscape and habitat connected to the project. - Ecology section at the BUG (Building user guide).
		Landscape and ecology management plan	1	1				Landscape Architect*Ecologist*	4		Landscape and ecology management plan, or similar, is developed in accordance with BS 42020:2013 covering as a minimum the first five years after project completion. Evidence Required: - A copy of the Landscape Habitat Management plan.
LE		**TOTAL:**	**13**	**12**	**0**	**2**					
		% of total score:	**15.00%**	**13.85%**	**0.00%**	**2.31%**					

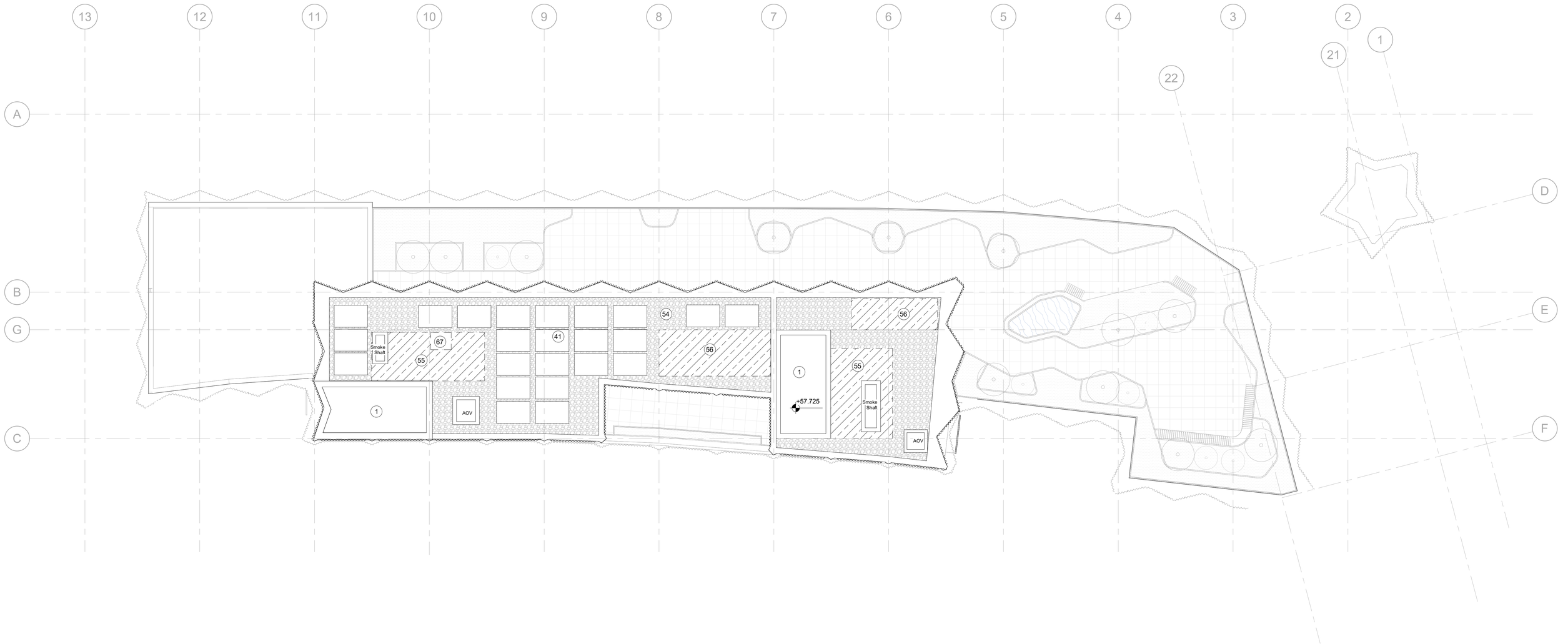
Credit Ref.	Credit Title	Credit Name	Credits Available	Credits Targeted	Potential Additional	Credits Achieved	Mandatory Elements	Responsibilities	Deadline / RIBA Stage	Status	Evidence Required
POLLUTION		0.75%									
Pol 01	**Impact of Refrigerants**	**Pre-Requisite: systems with electric compressors**					Yes/No?	M&E Consultant*	4		Prerequisite: All systems with electric compressors comply with the requirements of BS EN 378:2016 (parts 2 and 3). Refrigeration systems containing ammonia comply with the Institute of Refrigeration Ammonia Refrigeration Systems code of practice. Evidence Required: - Confirmation no refrigerants or Manufacture confirmation of BS EN378:2016 part 2 and installer confirmation of BS eN378: 2016 part 3. - Confirmation no ammonia or ammonia comply with the Institute of Refrigeration Ammonia Refrigeration Systems code of practice.
		Impact of Refrigerants	2	1				M&E Consultant*	4		1 credit - Refrigerant's Direct Effect Life Cycle CO_2 equivalent emissions (DELC CO_2e) of ≤ 1000 kgCO_2e/kW cooling/heating capacity. 2 credits - ≤ 100 kgCO_2e/kW. Evidence Required: - Completed POL01 tool, with supporting technical datasheets to confirm chain of custardy for information. - Mechanical schedule that aligns with the above.
		Leak Detection	1	1				M&E Consultant*	4		All systems are hermetically sealed or only use environmentally benign refrigerants or a permanent automated refrigerant leak detection system is required. Evidence Required: - Specification confirming system is hermetically sealed OR - Specification confirming automated refrigerant leak detection system, capable of continuously monitoring and capable of automatically responding to limit refrigerant leaks.
Pol 02	**Local air quality**	**Pre-Requisite:**					Yes/No?	M&E Consultant*	4		Is the project required to connect to a District Heating system, that is outside the control of the design team? Evidence Required: - Confirmation of how all heating and hot water is supplied, e.g. all electric or gas boilers.
		Local air quality	2	2				M&E Consultant*	4		Emissions from all installed combustion plant that provide space heating and domestic hot water do not exceed the levels as set in BREEAM manual i.e. gas boilers NOx = 24mg/kWh. Evidence Required: - Specification & schedule of space heating system with supporting datasheet of the system. This should confirm NOx and Particulate matter and VOCs measured at 10% & 13% O_2 dry basis

Credit Ref.	Credit Title	Credit Name	Credits Available	Credits Targeted	Potential Additional	Credits Achieved	Mandatory Elements	Responsibilities	Deadline / RIBA Stage	Status	Evidence Required
Pol 03	**Flood and surface water management**	Flood Resilience	2	2		2		Flood Risk Consultant*	4		Site specific Flood Risk Assessment prepared by specialist to confirmed that the site is a low probability of flooding. Requirement is closed.
		Surface Water Run Off	2	2				Flood Risk Consultant*	4		Compliant site specific drainage strategy report is received. Evidence required: - SUDS Assessor CV - Confirmation letter Suds management & LT ownership in O&M's.
Pol 04	**Reduction of Night Time Light Pollution**	Reduction of Night Time Light Pollution	1	1				M&E Consultant*	4		External lighting design is in line with ILP guidance of obtrusive light and can be automatically switched off. Illuminated advertisements are designed in compliance with ILP PLG05 The Brightness of Illuminated Advertisements. Evidence Required: - Data collection tool showing all external lighting types, quantities and locations. - External lighting drawings showing location of lighting type. - Luminaire schedule. - Specification confirming compliance to ILP guidance including security lighting where present. - Specification confirming all lighting can be automatically switched off 23:00-7:00. - Specification confirming Illuminated advertisements are designed in compliance with ILP PLG05 The Brightness of Illuminated Advertisement.
Pol 05	**Reduction of Noise Pollution**	Reduction of Noise Pollution	1	1				Acoustician*	4		A BS 4142:2014 compliant noise impact assessment to be carried out by Acoustician. Evidence Required: - Plant noise impact assessment compliant with BS 4142:2014 confirming existing background noise and noise rating from the assessed building - Noise impact of proposed plant confirmed at least 5 dB lower than the background noise throughout the day and night or attenuation measures are fitted to reduce this. - SQA CV confirming 3 yrs. experience within the last 5 yr & member of Institute of Acoustics.
Pol		**TOTAL:**	**12**	**10**	**0**	**2**					
		% of total score:	**9.00%**	**7.50%**	**0.00%**	**1.50%**					

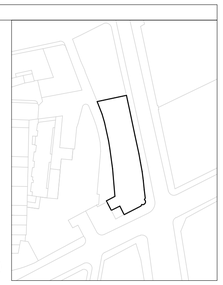
Credit Ref.	Credit Title	Credit Name	Credits Available	Credits Targeted	Potential Additional	Credits Achieved	Mandatory Elements	Responsibilities	Deadline / RIBA Stage	Status	Evidence Required
EXEMPLARY		1.00%									
Inn 01	**Man 03**	Responsible construction practices	1		1			Contractor*			CCS certificate scoring 39 point or more as well as FORS scheme certificate (The Fleet Operator Recognition Scheme) is a voluntary accreditation scheme that promotes best practice for commercial vehicle operators.
Inn 11	**Wst 05**	Responding to Climate Change	1		1			BREEAM Assessor*			Achieve the credits of the assessment issues outlined below: - Hea 04 Thermal comfort - achieve Criterion 6 - Ene 01 Reduction of energy use and carbon emissions - achieve minimum 6 credits - Ene 04 Low carbon design - achieve the passive design analysis credit - Wat 01 Water consumption - achieve minimum 3 credits - Mat 05 Designing for durability and resilience - achieve Criteria 2–4 - Pol 03 Flood and surface water management – achieve Flood resilience minimum of 1 credit AND Surface water run-off 2 credits
Inn 13	**LE 04**	Ecological change and enhancement	1		1			Ecologist*			The change in ecological value calculated under criterion 6 above confirms significant net gain has been achieved as set out in GN36 - BREEAM, CEEQUAL, and HQM Ecology Calculation Methodology
Inn		**TOTAL:**	**10**	**0**	**2**	**0**					
		% of total score:	**10.00%**	**0.00%**	**2.00%**	**0.00%**					

Appendix F

Indicative PV Layout



NOTES



Scale at 1:100

0 1 2 5m

GENERAL NOTES:

The internal layouts and ancillary areas of buildings will be subject to design development.

The precise location of walls, internal doors, columns, risers and the detailed layout of bathroom and kitchen areas will be the subject of non-material changes and may vary from the internal layouts set out in these plans.

These minor alterations will not affect the position and arrangements of external doors and windows nor will they affect the relative relationship between habitable rooms and windows.

All materials shown or highlighted are indicative only and may be subject to changes made during detailed design development.

CCTV and external lighting on the external facade

All structure is subject to ongoing design co-ordination and development.

Existing Retained Structure

Proposed

Key:

1. Lift overrun
2. Lift Pit
3. Passenger/Firefighters lift
4. Passenger/Evacuation lift
5. Passenger lift
6. Firefighters/ Evacuation lift
7. Goods lift
8. Tranfer lift
9. Goods and attendant lifting platform
10. Riser
11. Firefighters stair core
12. Plant utility stair
13. Lobby metal stair
14. Weelchair refuge
15. WC's
16. Accessible WC
17. Cleaners cupboard
18. Bin store
19. Loading bay
20. UKPN station
21. Plant space
22. Coms room
23. BOH management/Post room
24. Shower/Changing facilities
25. Storage
26. Accessible WC with shower
27. Shower/Changing Facilities for BMT
28. Bike store
29. Electrical bike store
30. Polished concrete
31. Rough texture concrete
32. GRC/Precast concrete
33. GRC/Precast concrete lantern
34. Metal louvred plant screen
35. Metal balustrade
36. Existing concrete column
37. New steel column
38. Pavilion
39. Pavilion BOH
40. Bridge garden terrace
41. PV Panels
42. Biodiverse landscaping and tree planting
43. Pump tanks
44. Switchroom
45. BNO substation
46. Existing foundation walls
47. Existing piling
48. District heating plant
49. Double height space
50. Semicircular sliding doors
51. Glazing enclosure
52. Air Handling Unit room
53. Balcony
54. Gravel
55. Smoke plant
56. Satellite area
57. Welfare room
58. Roach bed Portland stone
59. Natural smoke ventilation
60. Climbing plant wall
61. Void to below
62. Outline of floor below mezzanine
63. Bollards
64. Secondary office door entrance
65. Fire exit door
66. Water fixture
67. Maintenance ladder
68. Granite bench
69. Art work in pavement
70. Gate door

rev	date	author / check	comments
-	31/03/25	MMP/MN	Planning Issue

PLANNING

DSDHA
357 Kennington Lane London SE11 5QY
T 020 7703 3555
W www.dsdha.co.uk

project

19 Charterhouse Street
19 Charterhouse, London, EC1N 6RA

Farrview Limited

drawing title

Proposed Roof Floor Plan

drawn	date	size	scale
MN	31/03/25	A1	1 : 100

DSDHA Project Ref	revision
369	Suitability Code: - / Revision: -

drawing number

19CS -DSD -MB -12 -DR -A -02112

Appendix G

District Heat Network Mark-up

NOTES

Scale at 1:100

0 1 2 5m

GENERAL NOTES:

Detail drawings show layouts and design intent and should be read in accordance with Architectural General Arrangement drawings, Architectural Outline Specification, and any Schedules.
Drawings may indicate elements to be designed and specified by other Consultants for coordination purposes. Please also refer to these drawings, schedules and specifications. Please report any discrepancies to the Architect for confirmation.
Full fabrication drawings to be provided for approval of all elements, details and interfaces.
All details and interfaces within Contractor Design Portion to be developed with Contractor and key Subcontractors. Sealant and weathertightness joints may be omitted for clarity.
All insulation thicknesses, levels and calculations to be confirmed as part of Stage 4 design.
All materials shown may be subject to change during Stage 4 design.
All drawings to be read in conjunction with other consultants' information (drawings, reports, specification)
Existing structure based on survey.
Structure shown is indicative. Please refer to structural engineer's information.
Areas are approximate and subject to change throughout design development of the proposals. Any areas measured from these plans relate to the areas of the building at the current stage of the design. Any decisions to be made on the basis of these predictions, whether as to forecast viability, pre-letting, lease agreements or the like should include due allowance for the increases and decreases inherent in the design development and construction processes.
Do not scale off drawing. Use figured dimensions only.
All dimensions to be verified on site before proceeding.
All discrepancies to be notified in writing to architect

- 31/01/25 MN/MMP Desing freeze Issue

INFORMATION

rev	date	author / check	comments

DSDHA
357 Kennington Lane London SE11 5QY
T 020 7703 3555
W www.dsdha.co.uk

project

19 Charterhouse Street
19 Charterhouse, London, EC1N 6RA

Morgan Capital

drawing title

Proposed Lower Ground Floor

drawn	date	size	scale
MN	31/01/25	A1	As indicated

DSDHA Project Ref: 369 — revision: Suitability Code - / Revision -

drawing number: 19CS -DSD -MB -LG -DR -A -20099

REPORT DISCREPANCIES DO NOT SCALE FROM THIS DRAWING
COPYRIGHT DSDHA

USE LATEST REVISION
CHECK DIMENSIONS ON SITE