Energy and Sustainability Statement

Client: Platignum Properties Limited
Project Name: 300 Gray’s Inn Road

Revision	Date	Description	Prepared By	Checked By
1	05.05.2023	Draft Issue for Comment	Marion Delaney	Maria Papantoni
2	17.05.2023	Revised Statement following comments	Marion Delaney	Maria Papantoni
3	26.05.23	Final Issue	Marion Delaney	Maria Papantoni
4	28.07.23	Revised to include planning comments	Marion Delaney	Maria Papantoni

Contents

Executive Summary

This Sustainability Statement considers the various sustainability policy requirements and targets for the development, and describes the strategies proposed to deliver 300 Gray's Inn Road sustainably. Key strategies to achieve the various targets and requirements and deliver sustainable outcomes over the lifecycle of the project include:

- **Sustainable Energy**: An energy strategy has been developed and is detailed in the separate section of this report. It follows the GLA energy hierarchy; first applying lean measures such as consideration of highly efficient fabric and low air tightness of the building to reduce energy consumption, before then applying efficient systems, supplying low carbon heat through Air Source Heat Pumps (ASHP). The installation of PVs has been also proposed for the scheme. Through the application of the energy hierarchy, 300 Gray's Inn Road achieves a carbon dioxide emissions reduction of 63%, below the Building Regulations 2021 Baseline Building and based on SAP 10.2 carbon factors.

- **Waste:** Waste sent to landfill will be minimised during the building's construction and operation through the development and implementation of a Resource Management Plan (RMP) and the provision of adequate dedicated storage space for recyclable waste. A strategy for waste reduction and promotion of recycling has been developed which follows a waste hierarchy to minimise waste and promote recycling during operation and construction. The segregation of different waste streams for recycling. Where possible circular economy principles will be used to either reduce, reuse and recycle considering future disassembly and adaptability.

- **Pollution:** A Construction Environmental Management Plan (CEMP) and Resource Management Plan (RMP) will be developed to manage noise and pollution impacts during construction. Night time light pollution will be minimised through best practice design.
  A noise impact assessment has been carried out and found that no negative noise impact will be present.

- **Materials:** A strategy has been developed to minimise demolition, maximise retention and reuse of the existing building; use materials with low embodied carbon & water; use responsibly sourced materials; optimise durability and lifespan; and design flexibility. 100% of timber and timber products will be sourced from accredited Forest Stewardship Council (FSC) or Programme for the Endorsement of Forestry Certification (PEFC) source. A project specific Life Cycle Carbon Assessment (LCA) will be carried out to inform the design and materials specifications.

- **Biodiversity:** planting proposals aim to achieve urban greening factor target (UGF 0.31) through the transformation of the service yard into a landscaped amenity space for the office. Additionally terrace space on the 8th and 9th floor will be used for soft landscaping.

- **Transport:** The development promotes low carbon mobility with the provision of 76 commercial and 24 residential long stay cycle spaces and facilities with 14 short stay spaces on street and pedestrian access. The development will be car free.

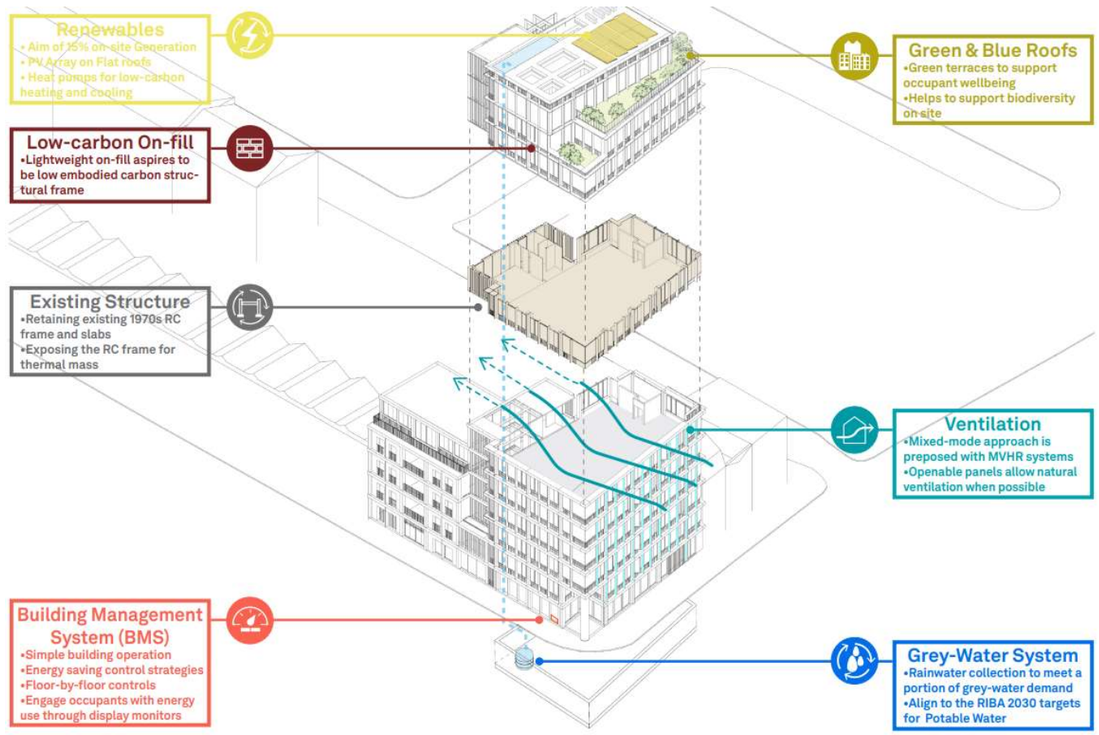
- **Water consumption and flood risk:** A strategy has been developed to reduce water demand through water efficiency measures. Highly efficient water saving fixtures, fittings and appliances will be specified to achieve at least 50% water reduction, which is equivalent to 4 points under BREEAM water consumption credit. The rate of discharge of surface water will be limited to achieve the London Plan requirements and the target agreed with the Environment Agency for the whole masterplan. This will be achieved by incorporating SuDS techniques such as green roof systems and a below ground attenuation tank, etc.

- **Climate change:** The design includes measures that will help mitigation of and adaptation to climate change. Mitigation measures include energy efficiency through on-site low carbon heating plant; reducing embodied carbon; low energy LED lighting; and sustainable transport strategies. Measures to adapt to future climate change include SuDS implementation; best practice flood resilience measures; assessment of the risk of overheating in higher temperatures; use of green infrastructure to minimise and mitigate heating to the urban environment; resilient foundations.

- **BREEAM**: A BREEAM Bespoke Refurbishment and Fit out (RFO) 2104 Shell and Core pre-assessments has been undertaken to demonstrate that the development is on track to achieve BREEAM "Excellent" rating as well as achieving the following percentages:
  - Energy Section – 60%
  - Water Section – 60%
  - Materials Section – 40.

- **Health and wellbeing:** Enhance and promote active and healthy lifestyles, ensuring the development follows principles and exploring WELL Enabled for the commercial tenants.

- **Social value:** Commitment to inclusivity, diversity and giving back to the community. In addition, the building contractor will be contractually required to comply with, and go significantly beyond, best practice principles under the Considerate Constructors Scheme (CCS).



Introduction

The site occupies a prominent corner site on the junction of Acton Street and Gray's Inn Road, in the Bloomsbury Conservation Area in the London Borough of Camden. The existing building is a part 3, part 8 storey building currently occupied by BUPA within a commercial, business and service (Class E) use, a small area of hard standing is located to the rear accessed from Acton Street.

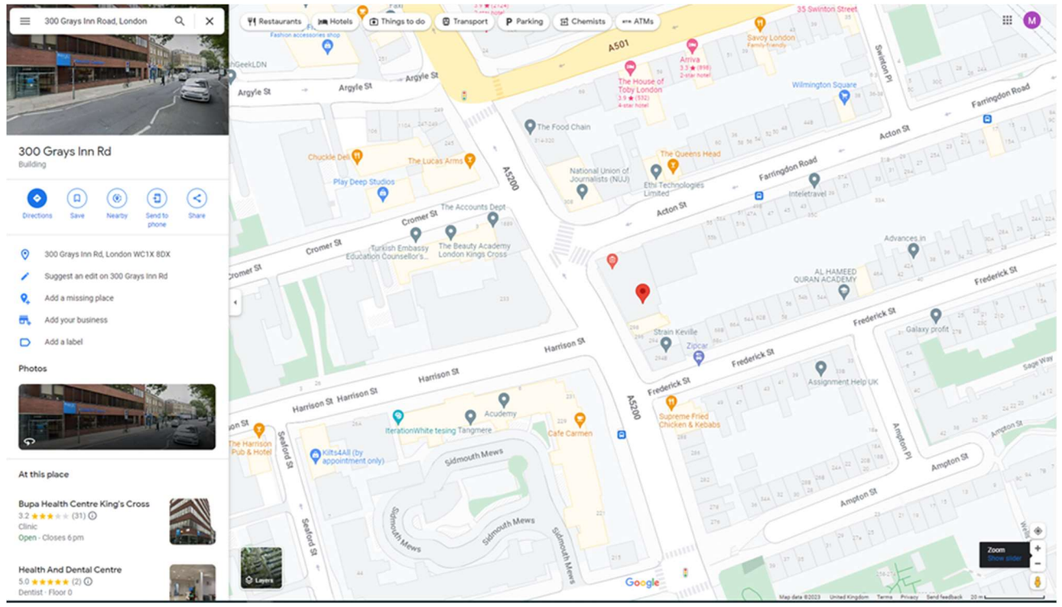


Figure 1 Google maps image showing 300 Gray's Inn Road location

This Sustainability Statement has been prepared in support of an application at 300 Gray's Inn Road, London, WC1X 8DX for full planning permission for:-

"Refurbishment and extension of the building to provide residential flats (Class C3) and commercial, business and service use (Class E) including external alterations for new façades to all elevations, the introduction of terraces, reconfiguration of entrances and servicing arrangements, new hard and soft landscaping, provision of cycle parking and other ancillary works."

Development Description

300 Gray's Inn Road is a 1970's office building 500m south of Kings Cross Station. Located on a corner site, the existing building is a 7-storey block, with a lower 3 storey block to the east, straddling a varied townscape of Gray's Inn Road, and the uniform historic street frontage of Acton Street.

The existing building is tired, deteriorating and out of date. The EPC rating is 'G', making it unlettable, due to the poor façade. It's appearance within the Conservation Area is detrimental, and the internal office space is far from the quality expected within the growing Knowledge Quarter. However, the building sits within a rich vibrant location, and provides an opportunity to transform the current building, and give it a new lease of life.

The brief for 300 Gray's Inn Road is to substantially refurbish and extend the existing building, placing high quality design, and sustainability at the project's core.

The proposal retains the superstructure of the building, carefully removing the underperforming façade, subtly altering the core layout to enable better office space and inserting the residential component. A low carbon extension will create 2 new floors to the taller block, and 2 new floors to the shorter block.

The increase in height still sits within the established height of the neighbouring Acorn House, and targeted set backs to the upper floors mitigate any impact on the neighbouring residential streets. At street level, the congested corner entrance is relocated to the centre of its west façade, where a stepped double height cut away creates an inviting doorway in. The current defensive façade will be opened up at the street level, providing views into the ground floor ancillary café space.

Figure 2 Haptic Architects 300 Gray's Inn Road Image

Gray's Inn Road is of a varied nature and character. There is a larger mass and scale when compared to the neighbouring residential streets. A range of heights occur along the street, and new consented schemes increase the average height. The corner composition of the building means it must respond to two different road characters. The lower residential block helps to step down and transition to the townhouses along Acton Street.

Care has been taken with the design to mitigate any impact on the wider residential streets. The stepping of the mass on the upper floors reduces the proposed building's visibility.

Access strategy

Located within a 20minute walking distance to Kings Cross, Euston, Angel, and many more key areas of the city. The proposals promote Active Travel.

The proposals remove the existing courtyard and the associated vehicular access and crossover to deliver active residential frontage to Acton Street. The development will be car free, with the provision for an on street disabled parking space for the commercial development. For servicing the proposals envisage circa 15m of the existing bus stop on Acton Street (Stop HA) moving further east and part of the existing red-route loading bay relocated to within 10 metres of the site boundary.

Cycling will become a celebrated component of the building. A cycle entrance will be located on Acton Street, with cycle parking in excess of the London Plan (2021); totalling 76 cycle spaces for the commercial development, 24 spaces for the residential block, and an additional 14 short stay spaces on street. Changing facilities, maintenance station and lockers will also be provided.

Inclusive design is fundamental to the proposed scheme. Level access will be provided throughout to both offices and residential areas with accessible stands located at ground floor within the cycle stores. Residential homes will be designed to meet Part M4(2) for accessible and adaptable dwellings.

Architecture

The existing red and yellow brick building is out of character and has a negative impact on the Bloomsbury Conservation Area. The proposed scheme uses the opportunity for the replacement of the poor performing façade, to not only replace it with a high performing, low carbon, passive façade, but to also create a positive contribution to the Conservation Area, establishing a new standard for developments along Gray's Inn Road.

Through research into the existing differing local character areas, a calm and light material palette is proposed to both blend in with the local vernacular and create a high-quality contemporary building. A textured concrete façade is being used to create a tactile envelope.

The façade's proportions reference the neighbouring Telephone Exchange fenestration and the townhouses to Acton Street. A rhythmic pattern is established to the horizontal and vertical grids to establish an order to the design, creating a positive contribution to the Conservation Area.

Landscape

The existing development has no greenspace and provides no beneficial contribution to ecology in the area. The proposal seeks to rectify this through the transformation of the service yard into a landscaped amenity space for the office. Additionally terrace space on the 8th and 9th floor will be used for soft landscaping.

Sustainability

A key component of the project brief is to create an exemplar sustainable building. At the start of the design process, we embedded the following sustainability principles:

- Minimise demolition, maximise retention and reuse of the existing building. Reducing embodied carbon.
- Low Carbon first approach to new material choices, everything from the new structure down to wall finishes.
- Adopt passive measures to cooling, heating and ventilation, and create a high-performance façade. Reducing operational energy.
- Increase biodiversity and ecology on the site. Improving the Urban Greening Factor.
- Design for circularity. Maximise reuse of any waster material and consider future disassembly.
- Create a high-quality internal space that considers the health and wellbeing of its occupants, exploring WELL Enabled for the commercial tenants.

Alongside these principles the project is committed to BREEAM target of Excellent, achieving an EPC rating of A, going beyond the statutory requirements for a broad range of items.
Camden requires major developments to achieve an "Excellent" ratings as well as achieving the following percentages:

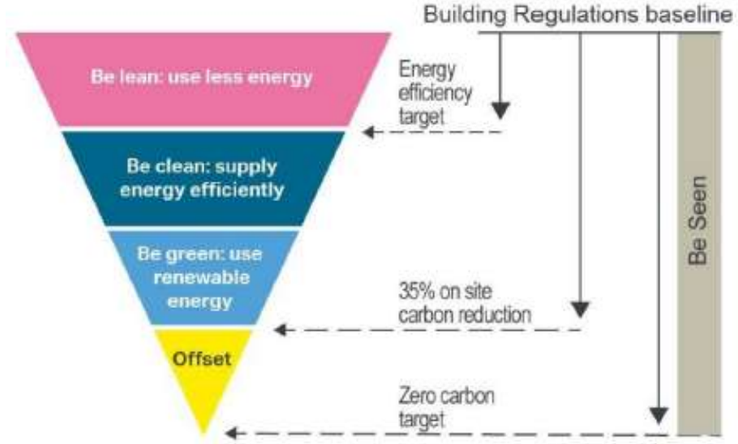
- Energy Section – 60%
- Water Section – 60%
- Materials Section – 40.

Major developments are regarded as developments of 10 or more homes or a floorspace of 1,000m^2 or more, including student housing and non-residential development.

The Energy strategy for the proposed scheme and services has been developed to meet both the planning requirements of the London Borough of Camden and the London Plan 2021 requirements using the GLA's (Greater London Authority) 'Energy Assessment Guidance' on preparing energy assessments as part of planning applications (June 2022). Accordingly, SAP10.2 carbon factors have been used for all calculations associated on these assessments.

The National Planning Policy Framework (NPPF) was revised on 20 July 2021 and sets out the Government's planning policies for England and how these should be applied. Approved Document Part L 2021 of the Building Regulations of took effect on 15 June 2022.

The London Plan 2021, the GLA's Energy Assessment Guidance (June 2022), is the benchmark for London planning regulation. A minimum on-site reduction of at least 35% beyond Building Regulations is required for major development. Residential development should achieve 10%, and Non-residential development should achieve 15% 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.



Source: Greater London Authority

Figure 3 The London Plan energy hierarchy

Specific consideration has been given to the London Plan 2021 Policy SI 2: Minimising Greenhouse Gas Emissions requires that all major development be net zero-carbon. This means reducing greenhouse gas emissions in operation and minimising both annual and peak energy demand in accordance with the 'Energy Hierarchy' as set forth by the GLA.

- **Baseline**: Part L 2021 of the Building Regulations compliant development.
- **Energy Demand Reduction – Be Lean**: The energy demand of the development is minimised through prioritisation of passive design.
- **Heat Networks/ Combined Heat and Power (CHP) – Be Clean**: The use of a decentralised heating network utilising a Combined Heat and Power to reduce emissions.
- **Low & Zero Carbon Technologies – Be Green**: On site renewable energy generation should be prioritised and where this is not possible, off-site renewable energy should be procured.
- **Be Seen:** Monitor, verify and report on energy performance of the development.
- **Offsetting carbon:** Any remaining carbon emissions balance is offset.

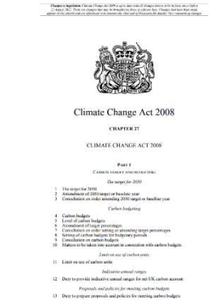
An Overheating assessment was also undertaken in accordance with CIBSE TM 52 (commercial) and TM59 (residential) to determine the seriousness of a potential threat to health from exposure to high temperatures and provide guidance on preventative measures to reduce overheating.

In addition, Part L calculations / EPC: Energy Performance Certificates are required on construction, point of sale or rental for all domestic and non-domestic buildings. The aim is to provide potential buyers or tenants with an indication of the energy performance rating of the building or subunits by comparing the potential CO_2 emissions against those for a reference building.

Legislation, and Planning Policies

Legislation

Climate Change Act 2008 (2050 Target Amendment)


Climate Change Act 2008

CHAPTER 27

CLIMATE CHANGE ACT 2008

The Climate Change Act sets legally binding greenhouse gas emission reductions targets of 100% by 2050 (with an interim target of 26% by 2020) 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.

Building Regulations Part L 2021 Edition


ONLINE VERSION

HM Government

The Building Regulations 2010

Conservation of fuel and power

L

APPROVED DOCUMENT

Volume 2: Buildings other than dwellings

Requirement L1: Conservation of fuel and power
Requirement L2: On-site generation of electricity
Regulations: 6, 22, 23, 24, 25, 25A, 25B, 26, 26C, 27, 27C, 28, 40, 40A, 43, 44 and 44ZA

2021 edition – for use in England

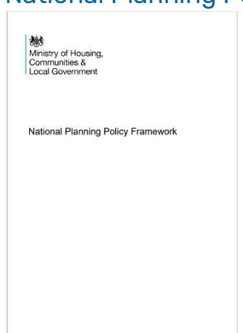
ONLINE VERSION

The Proposed Development will need to conform to the requirements set out in Part L (Conservation of Fuel, and Power) of the Building Regulations 2010. Approved Documents are issued by the Secretary of State to provide guidance on compliance with specific aspects of building regulations in some of the more common building situations. They set out what, in ordinary circumstances, may be accepted as a reasonable provision for compliance with the relevant requirement(s) of the Building Regulations to which they refer.

Approved Document Part L of the Building Regulations covers the carbon emissions that are attributable to buildings in use, resulting from lighting, heating, cooling, and ventilation, excluding small power.

Planning Polices

National Planning Policy Framework (NPPF), England


Ministry of Housing, Communities & Local Government

National Planning Policy Framework

In July 2021, 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. This chapter provides a framework for local authorities to address the following issues as regards planning applications:

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.

Local Policies – Camden Council

Camden's Local Plan, adopted in July 2017 sets out the Council's planning policies providing further detailed guidance on polices within the Local Plan.

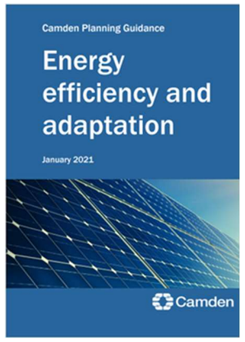

Camden Local Plan
2017

Camden

Relevant policies in the Local Plan include:

- CC1 Climate change mitigation
- CC2 Adapting to climate change
- C1 Health and wellbeing
- C2 Community Facilities
- C5 Safety & Security
- C6 Access for All
- D1 Design
- D2 Heritage
- CC3 Water and flooding
- CC4 Air quality
- CC5 Waste
- A3 Biodiversity.

Camden Planning Guidance Energy Efficiency and Adaptation


Camden Planning Guidance

Energy efficiency and adaptation

January 2021

Camden

The Camden Planning Guidance Energy Efficiency and Adaptation provides information on key energy and resource issues within the borough and supports Local Plan Policies CC1 Climate change mitigation and CC2 Adapting to climate change.

Energy

CC1 – Climate Change Mitigation

In accordance with the GLA's Energy Assessment Guidance (June 2022), for the carbon emissions and reductions calculations SAP 10.2 emission factors have been used to present the results. The energy strategy has been developed by following the GLA energy hierarchy:

- **Baseline:** For the refurbished element, this is the performance of the existing building with an assumed baseline specification. For the new-build element, the baseline is a building regulations compliant 'notional' building.
- **Be Lean**: Energy demand will be reduced by achieving a well-insulated envelope which is both airtight and thermal bridge free. High performance glazing provides a positive energy balance whilst mechanical ventilation with heat recovery maintains good air quality with minimal heat loss. Energy efficient building systems such as LED lighting and low-power fans and pumps will further drive down regulated energy use. Robust quality control, commissioning and handover procedures on site will further drive down energy use.
- **Be Clean:** Combined heat & power was considered however this has been discounted due to poor base load and desire to avoid on-site combustion of fossil fuels. Connection to the district heating scheme was also considered however there are no existing and connection to a proposed district heating networks within 500m of the site requires further investigation.
- **Be Green**: The remaining energy demand will be met through low and zero carbon energy sources. The development's heating, cooling and hot water needs will be provided through efficient air-source heat pumps.
- **Be Seen:** The energy performance of the development will be monitored, verified and reported in line with the 'be seen' policy and relevant guidance document.

Any remaining carbon balance will be **offset.** Note this is only applicable to the new extension elements of the development.

To calculate carbon emissions and reductions, the design was assessed under 'Part L 2021: Conservation of Fuel and Power' of the UK Building Regulations, using the National Calculation Methodology (NCM). A detailed energy model was created for the commercial building using Government approved software Integrated Environmental Solutions: Virtual Environment (IES: VE) 2022, in line with CIBSE AM11. Residential has been calculated using a government approved SAP 10 software. The models were revised for each of the steps of the Energy Hierarchy to establish expected performance and satisfaction of the policy requirements. As per the GLA Energy Assessment Guidance (June 2022) document, calculations incorporate SAP 10.2 emission factors with the adjusted figures where the Grid electricity fuel carbon factor is 0.136 (kgCO2/kWh).

The 3D Views of Thermal Model can be found in **Appendix A**.

Carbon Reduction

The area-weighted calculation for the refurbished and new extension elements indicates that the proposed Commercial development is achieving a **60%** improvement over the Building Regulations Part L 2021 Target Emission Rate with the Residential development achieving **76%**. Both elements of the development therefore exceed the GLA minimum on-site reduction of 35% target, complying with Policy SI 2 of the London Plan.

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

Part L 2021 Building Regulations	Commercial Development		Residential Development	
	Carbon Dioxide Emissions (Tonnes CO_2 per annum)			
	Regulated	Non Regulated	Regulated	Non Regulated
Baseline: Part L 2021 of the Building Regulations Compliant	35.4	10.7	7.5	3.4
After energy demand reduction	15.7	10.7	6.4	3.4
After heat network / CHP	15.7	10.7	6.4	3.4
After renewable energy	14.1	10.7	1.8	3.4

Table 2 Regulated Carbon Dioxide Emissions from each stage of the Energy Hierarchy for the development

Part L 2021 Building Regulations	Commercial Development		Residential Development	
	Regulated carbon dioxide savings			
	(Tonnes CO_2 per annum)	%	(Tonnes CO_2 per annum)	%
Savings from energy demand reduction	19.7	56	1.1	14
Savings from heat network / CHP	0.0	0	00	0
Savings form renewable energy	1.7	5	4.6	62
Total cumulative savings	**21.3**	**60**	**5.7**	**76**

Carbon Reduction – Site Wide

The site-wide development is achieving a **63%** improvement over the Building Regulations Part L 2021 Target Emission Rate.

Based on The London Plan's carbon off-set price of £95 per tonne, the required contribution to off-set carbon is **£45,150** over a 30-year period. This will be met through cash in lieu contribution to the London Borough of Camden.

Total regulated emissions (Tonnes CO2 / year)		Regulated carbon dioxide savings	
		(Tonnes CO_2 per annum)	(%)
Part L 2021 baseline	42.9		
Be Lean: savings from energy demand reduction	22.0	20.9	49%
Be Clean: savings from heat network	22.0	0.0	0%
Be Green: savings from renewable energy	15.8	6.2	14%
Total Cumulative Savings	-	27.1	**63%**
	(Tonnes CO_2 per annum)		
Cumulative savings for off-set payment	-	475.3	-
Cash in-lieu contribution (£)*	-	45,150	-
*carbon price is based on GLA recommended price of £95 per tonne of carbon dioxide			

Commercial Development Summary

The energy strategy has been developed by following the GLA energy hierarchy (Baseline, Be Lean, Be Clean, Be Green). In accordance with the GLA's Draft Energy Assessment Guidance, June 2022 document, the refurbished and new elements of the development have been assessed separately and results are presented below:

Carbon Reduction

The commercial development achieves a site-wide 56% improvement under Be Lean, with the refurbishment achieving 61% and the new extension (floors 7, 8 and 9) 7% improvement from Be Lean under the Part L 2021 of the Building Regulations, as shown in the following tables.

Table 3 Carbon Dioxide Emissions after each stage of the Energy Hierarchy

Part L 2021 Building Regulations	Refurbishment Carbon Dioxide Emissions (Tonnes CO_2 per annum)		New ExtensionCarbon Dioxide Emissions (Tonnes CO_2 per annum	
	Regulated	Non Regulated	Regulated	Non Regulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	32.1	5.8	3.3	4.9
After energy demand reduction (Be Lean)	12.6	5.8	3.1	4.9
After heat network / CHP (Be Clean)	12.6	5.8	3.1	4.9
After renewable energy (Be Breen)	12	5.8	2.0	4.9

Table 4 Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for the refurbishment.

Part L 2021 Building Regulations	Refurbishment		New Extension	
	Regulated carbon dioxide savings			
	(Tonnes CO_2 per annum)	(%)	(Tonnes CO_2 per annum)	(%)
Be Lean: savings from energy demand reduction	19.5	61%	0.2	7%
Be Clean: savings from heat network	0.0	0%	0.0	0%
Be Green: savings from renewable energy	0.6	2%	1.0	32%
Total Cumulative Savings	**12.0**	**62%**	**1.3**	**39%**

It is very challenging to achieve the 15% target for the new extension under the new 2021 Building Regulations since the 'actual' building is compared against the 'notional' building that uses highly efficient fabric and system specifications. The proposed values are performing much better than the Part L 2021 limiting values and 'notional' building values, and demonstrate a U-value improvement of 22%, as shown in the following table.

It is worth mentioning that the new extension achieves 36% improvement under the old Part L 2013 of the Building Regulations. This shows that the development has been designed using extensive passive design measures and the high difference between the old and the new building regulations targets.

Table 5 Fabric performance improvement from the Part L limiting values and notional building values

Element/ Characteristic (W/m²K)	Limiting Part L2 2021	Notional Building 2021	Proposed Scheme	% Improvement
Roof/ terrace (W/m²K)	0.18	0.15	0.12	20%
External wall (W/m²K)	0.26	0.18	0.15	17%
External window (including frame) (W/m²K)	1.60	1.40	1.00	29%
Opaque Panels (W/m²K)	1.60	1.40	1.40	
Average U-value				
Average U-value (W/m²K)		0.5	0.39	22%
Glazing Specifications				
Solar transmittance (G-value) (%)	0.40	0.29	0.27	7%
Visible Light Transmittance (VLT) (%)	0.60	0.60	0.50	17%
Air Leakage				
Air Permeability @ 50 Pascals (m^3/hrm^2)	8.0	3.0	3.0	
Window to Wall Ratio (WWR)				
Ext. Wall Area (m2)		1.5m high × full facade width OR 40% of exposed facade area	855.5	
Ext. Opening Area (m2)			348.6	
WWR (%)			41%	

Carbon Reduction – Site Wide

The area-weighted calculation for the refurbished and new extension elements indicates that the proposed development is achieving a **60%** improvement over the Building Regulations Part L 2021 Target Emission Rate. Therefore, the development exceeds the GLA minimum on-site reduction of 35% target, complying with Policy SI 2 of the London Plan.

Table 6 Carbon Dioxide Emissions after each stage of the Energy Hierarchy for the development

Part L 2021 Building Regulations	Carbon Dioxide Emissions for non-domestic buildings (Tonnes CO_2 per annum)	
	Regulated	Non Regulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	35.4	10.7
After energy demand reduction (Be Lean)	15.7	10.7
After heat network / CHP (Be Clean)	15.7	10.7
After renewable energy (Be Green)	14.1	10.7

Table 7 Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for the development.

Part L 2021 Building Regulations	Regulated non-domestic carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Be Lean: savings from energy demand reduction	19.7	56%
Be Clean: savings from heat network	0.0	0%
Be Green: savings from renewable energy	1.7	5%
Total Cumulative Savings	21.3	**60%**
	(Tonnes CO_2 per annum)	
Cumulative savings for off-set payment	422	-
Cash in-lieu contribution (£)*	40,101	-
*carbon price is based on GLA recommended price of £95 per tonne of carbon dioxide		

Based on The London Plan's carbon off-set price of £95 per tonne, the required contribution to off-set carbon is **£40,102** over a 30-year period. This will be met through cash in lie contribution to the London Borough of Southwark Council's Emissions Fund secured by legal agreement.

Residential Development Summary

Carbon Reduction

The residential development achieves a site-wide 14% improvement under Be Lean, therefore, complies with the GLA 10% improvement requirement on Building Regulations from energy efficiency measures alone.

The site-wide overall calculation for the residential development indicates that the proposed development achieves a **76%** improvement over the Building Regulations Part L 2021 Target Emission Rate. Therefore, the development exceeds the 35% target complying with Policy SI 2 of the London Plan.

Table 8 Carbon Dioxide Emissions after each stage of the Energy Hierarchy for the development

Part L 2021 Building Regulations	Carbon Dioxide Emissions for domestic buildings (Tonnes CO_2 per annum)	
	Regulated	Non Regulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	7.5	3.4
After energy demand reduction (Be Lean)	6.4	3.4
After heat network / CHP (Be Clean)	6.4	3.4
After renewable energy (Be Green)	1.8	3.4

Table 9 Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for the development

Part L 2021 Building Regulations	Regulated domestic carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Be Lean: savings from energy demand reduction	1.1	14
Be Clean: savings from heat network	00	0
Be Green: savings from renewable energy	4.6	62
Total Cumulative Savings	5.7	**76**
Annual savings from off-set payment	1.8	-
	(Tonnes CO_2 per annum)	
Cumulative savings for off-set payment	53	
Cash in-lieu contribution (£)*	5,049	
*carbon price is based on GLA recommended price of £95 per tonne of carbon dioxide		

Based on The London Plan's carbon off-set price of £95 per tonne, the required contribution to off-set carbon is **£5,049** over a 30-year period. This will be met through cash in lie contribution to the London Borough of Southwark Council's Emissions Fund secured by legal agreement.

Baseline

Before energy efficiency measures are investigated, it is necessary to establish the baseline energy consumption of the scheme, for comparison and evaluation of the proposed carbon reduction measures.

In accordance with the GLA's guidance, for all major refurbishments, developers are required to provide an estimate of the CO_2 savings from the refurbishment of the building. To provide this, the CO_2 emissions baseline performance of the un-refurbished condition of the existing building were estimated using Building Regulations approved compliance software.

The following 'regulated' energy uses are considered in the baseline energy analysis.

Commercial Development

Refurbishment

Fabric Characteristics

The Target Emission Rate (TER) for the refurbishment was calculated based on the building fabric parameters of the notional specification for existing buildings in accordance with the Appendix 3 of the GLA Energy Assessment Guidance on preparing energy assessments as part of planning applications (June 2022). This methodology has been developed to determine a consistent baseline across refurbishment planning applications.

Table 10 Existing Elements Fabric Performance for the Baseline Model

Element/ Characteristic	Baseline Values for Existing Elements (W/m²K)
Floor (W/m²K)	0.58
Roof/ terrace (W/m²K)	0.18
External wall (W/m²K)	0.55
External window (including frame) (W/m²K)	1.40
Opaque panels (W/m²K)	1.40
Glazing Specifications	
Solar transmittance (G-value) (%)	0.40
Visible Light Transmittance (VLT) (%)	0.70
Air Permeability @ 50 Pascal (m^3/hrm^2)	25.0

Fixed Building Services

The minimum assumed HVAC efficiencies of the refurbishment have been based upon the minimum energy efficiency standards for existing buildings as per the Government's Building Services Non-Domestic Compliance Guide.

Heating and cooling to the main building spaces is provided by a Fan Coil Unit (FCU) system using Air Source Heat Pumps. Circulation, storage, changing, showers, and WC areas are served through Electric Panel Heaters. Domestic hot water is produced by Air Source Heat Pumps for all toilets and basement showers. Mechanical ventilation with heat recovery is supplied to all offices, reception, toilets, and basement showers.

A summary of the fixed building services inputs used for the 'Baseline' scenario can be found in Appendix C.

The 'Baseline' BRUKL document's front page and technical data sheet can be found in Appendix B.

New Extension

According to the GLA's Energy Assessment Guidance, (April 2020) document, the new build elements of the extension should be assessed in line with the methodology for new build development and will be expected to comply with London Plan energy policy.

For the purposes of this energy assessment, the TER of the new extension was calculated based on the Part L2 notional building specifications and the minimum energy efficiency standards for new buildings as per the non-domestic compliance guide.

Reference should be made to section Appendix B for the Baseline BRUKL documents.

Table 11 Carbon Dioxide Emissions after Baseline stage for the refurbishment

Part L 2021 Building Regulations	Carbon Dioxide Emissions for non-domestic buildings (Tonnes CO_2 per annum)	
	Regulated	Non Regulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	35.1	10.8

For the new extension part of the development a TER of 3.44 kg/m²/yr has been identified as the baseline figure.

Residential Development

For the Residential part of the development the notional building TER of 15.18 $kgCO_2/m^2/yr$ has been identified as the baseline figure.

Reference should be made to section Appendix B for the Baseline BRUKL documents.

For the purposes of this energy assessment, the TER of the residential development was calculated based on the Part L1 notional building specifications and the minimum energy efficiency standards for new buildings as per the domestic compliance guide.

Table 12 Notional Dwelling Specification for the Baseline Model

Element/ Characteristic	Baseline Values (W/m²K)
Floor (W/m²K)	0.13
Roof/ terrace (W/m²K)	0.11
External wall (W/m²K)	0.18
External window (including frame) (W/m²K)	1.20
Opaque panels (W/m²K)	1.00
Glazing Specifications	
Solar transmittance (G-value) (%)	0.63
Visible Light Transmittance (VLT) (%)	0.80
Air Permeability @ 50 Pascal (m^3/hrm^2)	5.0

Be Lean - Demand Reduction

This section outlines how energy demand and consumption will be reduced through the implication of lean design measures to the proposed scheme.

Section 8.1 of the GLA Energy Assessment Guidance relates to the London Plan and requires non-domestic developments to achieve at least 35% improvement on energy efficiency.

Commercial Development

Passive Design Measures

Passive solar design involves adapting building massing, layout and glazing to best respond to the local climate and annual sun path, with the aim of reducing energy demands and improving occupant comfort through limiting solar gain.

Orientation and Site Layout

The orientation of the building is firmly fixed due to the size of the site, roads and adjacent buildings closely surrounding the site.

Lighting

The amount of glazing within external façades are optimised to get good levels of natural daylight throughout the occupied space. The proposed glazing has a light transmission value of 50%; thereby daylighting will be fully utilised.

Solar Shading

There are external shading fins on all the façades, along with recessed windows which will also provide some shading to the windows.

Internal blinds were excluded from all calculations.

All new glazing in the extension will be with a low solar transmission (g-value) but a high visible light transmission (VLT) to achieve effective daylighting of occupied spaces.

Fabric Characteristics

The building fabric U-values of the building have been significantly improved when compared against the 'Baseline stage'.

Table 13 Fabric Characteristics for Be Lean Proposed Scheme

Element/ Characteristic (W/m²K)	Limiting Part L2 2021	Proposed Scheme
Floor (W/m²K)	0.18	0.58
Roof/ terrace (W/m²K)	0.18	0.12
External wall (W/m²K)	0.26	0.15
External window (including frame) (W/m²K)	1.60	1.00
Opaque Panels (W/m²K)	1.60	1.40
Glazing Specifications		
Solar transmittance (G-value) (%)	0.40	0.27
Visible Light Transmittance (VLT) (%)	0.60	0.50
Air Permeability @ 50 Pascals (m^3/hrm^2)	8.0	3.0

Control of Solar Heat Gain

Solar control glazing will be used throughout the development to reduce the amount of heat gain to the space in summer. The solar transmittance G-Value being targeted is 0.27.

Active Design Measures -Ventilation

Occupied spaces with windows or other external openings could potentially be naturally ventilated, however, the proposal is to use mechanical ventilation in a mixed mode method, taking advantage of the following benefits that mechanical ventilation has over natural ventilation in certain instances, however switching to natural ventilation when conditions allow.

- Controlled air flow rate, limiting heat losses and gains required to be served by heating/cooling systems.
- Filtered air supply. Adequate ventilation can be provided in winter when there is typically reluctance to open windows due to draughts.
- The use of heat recovery between air streams to optimise efficiency.
- Reduced noise transfer into the spaces from external sources.

Therefore, the building is mechanically ventilated.

Fresh air is delivered via MVHR units which have a specific fan power of than 1.4 W/l/s.

Fixed Building Services

All equipment and plant will exceed the minimum requirements of the Approved Document Part L2 2021 of the Building Regulations for conventional space heating/ cooling systems, hot water systems and ventilation systems.

MVHR units are to be employed to provide fresh air with a heat recovery efficiency of at least 75%.

The heating and cooling systems shall be appropriately zoned, with local fast responding controls.

For the purposes of demonstrating CO_2 emission improvements in the 'Be Lean' stage of the energy hierarchy, the notional building system type and performance values specified in the Part L 2021 baseline were used as determined by the final proposed building specification. The TER for the Part L 2021 baseline would include heat pumps with notional performance, therefore, the 'Be Lean' model uses heat pumps with seasonal generator efficiency of 2.64 (SCOP) for heating and DHW, and 4.4 (SEER) for cooling. In this way CO_2 emission improvements from the proposed space heating and hot water demand reduction measures can be compared against the Part L 2021 baseline, for example through improvements in performance of building fabric, heat recovery or water efficient fittings.

A summary of the fixed building services inputs used for the 'Be Lean' scenario can be found in **Appendix C**.

Lighting

All lighting shall be PIR controlled except for plant. PIRs shall be ceiling mounted and have a minimum run period of 20 minutes.
Lighting in the reception area shall be controlled manually from the back office.
The following lighting efficacies have been allowed within the thermal model:

- Offices & reception – 110 lm/cW
- Circulation, toilets, stores – 110 lm/cW.

Unregulated Energy

Unregulated energy is those uses that fall outside the typical scope of building regulations. This can include energy used through cooking, computers, external lighting and other 'plug loads' which are typically under the control of the occupant. Addressing these loads, which often form a significant portion of a building's overall energy consumption, is key to reducing energy consumption. This will be achieved through the specification of energy efficient white goods, lifts as well as other appliances where possible.

Refer to the 'Be Seen' section of this report.

Energy Demand

The development's energy demand has been calculated and presented in the following table. The estimated annual regulated energy demand is expected to be **113MWh/year**.

Table 14 Site Wide Energy demand per Year

Total Energy Demand						
Energy demand following energy efficiency measures (MWh/year)	Heating	Hot Water	Lighting	Cooling	Auxiliary	Unregulated
New Extension	8.5	2.6	5.9	4.8	2.7	35.2
Refurbishment	20.3	21.6	24.9	12.3	8.9	143.0

This section outlines how energy demand and consumption will be reduced through the implication of lean design measures to the proposed scheme.

Section 8.1 of the GLA Energy Assessment Guidance relates to the London Plan and requires domestic developments to achieve at least 35% improvement on energy efficiency.

Residential Development

Passive Design Measures

Passive solar design involves adapting building massing, layout and glazing to best respond to the local climate and annual sun path, with the aim of reducing energy demands and improving occupant comfort through limiting solar gain.

Orientation and Site Layout

The orientation of the building is firmly fixed due to the size of the site, roads and adjacent buildings closely surrounding the site.

Lighting

The amount of glazing within the external façades are optimised to get good levels of natural daylight throughout the occupied space.

Solar Shading

Internal blinds were excluded from all calculations.

All new glazing in the extension will be with a low solar transmission (g-value of 0.50) to achieve effective daylighting of occupied spaces.

Fabric Characteristics

The building fabric U-values of the building have been significantly improved when compared against the 'Baseline stage'.

Table 15 Fabric Characteristics for Be Lean Proposed Scheme

Element/ Characteristic (W/m²K)	**Limiting Part L2 2021**	**Proposed Scheme**
Floor (W/m²K)	0.18	0.18
Roof/ terrace (W/m²K)	0.18	0.12
External wall (W/m²K)	0.26	0.15
External window (including frame) (W/m²K)	1.60	0.8
Pedestrian door (W/m²K)	1.60	1.00
Glazing Specifications		
Solar transmittance (G-value) (%)	0.40	0.5
Air Permeability @ 50 Pascals (m^3/hrm^2)	8.0	3.0

Control of Solar Heat Gain

Solar control glazing will be used throughout the development to reduce the amount of heat gain to the space in summer. The solar transmittance G-Value being targeted is 0.5.

Active Design Measures -Ventilation

Occupied spaces with windows or other external openings could be naturally ventilated, however, the proposal is to use mechanical ventilation in a mixed mode, taking advantage of the following benefits that mechanical ventilation has over natural ventilation in certain instances, however switching to natural ventilation when conditions allow.

- Controlled air flow rate, limiting heat losses and gains required to be served by heating/cooling systems.
- Filtered air supply. Adequate ventilation can be provided in winter when there is typically reluctance to open windows due to draughts.
- The use of heat recovery between air streams to optimise efficiency.
- Reduced noise transfer into the spaces from external sources.

Therefore, the building is mechanically ventilated.
Fresh air is delivered via MVHR units which have a specific fan power of than 0.74 W/l/s.

Fixed Building Services

All equipment and plant will exceed the minimum requirements of the Approved Document Part L1 2021 of the Building Regulations for conventional space heating/ cooling systems, hot water systems and ventilation systems.

MVHR units are to be employed to provide fresh air with a heat recovery efficiency of at least 91%.

The heating and cooling systems shall be appropriately zoned, with local fast responding controls.

A summary of the fixed building services inputs used for the 'Be Lean' scenario can be found in **Appendix C**.

Lighting

The following lighting efficacies within the thermal model are 100 lm/cw.

Unregulated Energy

Unregulated energy is energy use for those that fall outside the typical scope of building regulation, regulated energy e.g. heating, cooling, ventilation, interior lighting and hot water. Unregulated energy can include energy used through cooking, computers, external lighting and other 'plug loads' which are typically under the control of the occupant. Addressing these loads, which often form a significant portion of a building's overall energy consumption, is key to reducing energy consumption. This will be achieved through the specification of energy efficient white goods, lifts as well as other appliances where possible.

Refer to the 'Be Seen' section of this report.

Energy Demand

The development's energy demand has been calculated and presented in the following table. The estimated annual regulated energy demand is expected to be **41.8MWh/year**.

Table 16 Site Wide Energy demand per Year

Total Energy Demand						
Energy demand following energy efficiency measures (MWh/year)	Heating	Hot Water	Lighting	Cooling	Auxiliary	Unregulated
	12.6	11.8	11.1	2.8	3.5	63.3

Be Lean Results

The 'Be Lean' measures alone provide a **56%** carbon saving when compared against a baseline L2A 2021 compliant building for the Commercial development and a **14%** carbon saving when compared against a baseline L2A 2021 compliant building for the Residential element.

Table 17 Carbon Dioxide Emissions after Be Lean stage for the development.

Part L 2021 Building Regulations	**Commercial Development**		**Residential Development**	
	Carbon Dioxide Emissions (Tonnes CO_2 per year)			
	Regulated	**Non Regulated**	**Regulated**	**Non Regulated**
Baseline	35.4	10.7	6.4	3.4
After energy demand reduction	15.7	10.7	7.5	3.4

Table 18 Regulated Carbon Dioxide savings from Be Lean stage for the development.

Part L 2021 Building Regulations	**Commercial Development**		**Residential Development**	
	Regulated carbon dioxide savings			
	(Tonnes CO_2 per year)	**%**	**(Tonnes CO_2 per year)**	**%**
Savings from energy demand reduction	19.7	56%	1.1	14

Reference should be made to section **Appendix B** for the Be Lean stage BRUKL document output.

Be Clean – Supply Energy Efficiently

The next step in the Energy Hierarchy is the 'Be Clean' strategy of supplying the required energy as efficiently as possible.

Potential approaches include connecting the scheme to existing low carbon or CHP-led district energy networks, or if no existing schemes exist, investigating whether such networks are planned in the area and designing systems with the flexibility to connect to these in the future.

With or without a district energy system, the feasibility of CHP (Combined Heat and Power). For larger developments, the use of a site wide communal heating system should be provided if considered viable.

District Energy Networks (DEN)

Investigations have been undertaken to determine if the development can connect into an existing or proposed distribution network. There are no existing or proposed district heating networks in close proximity to the development site.

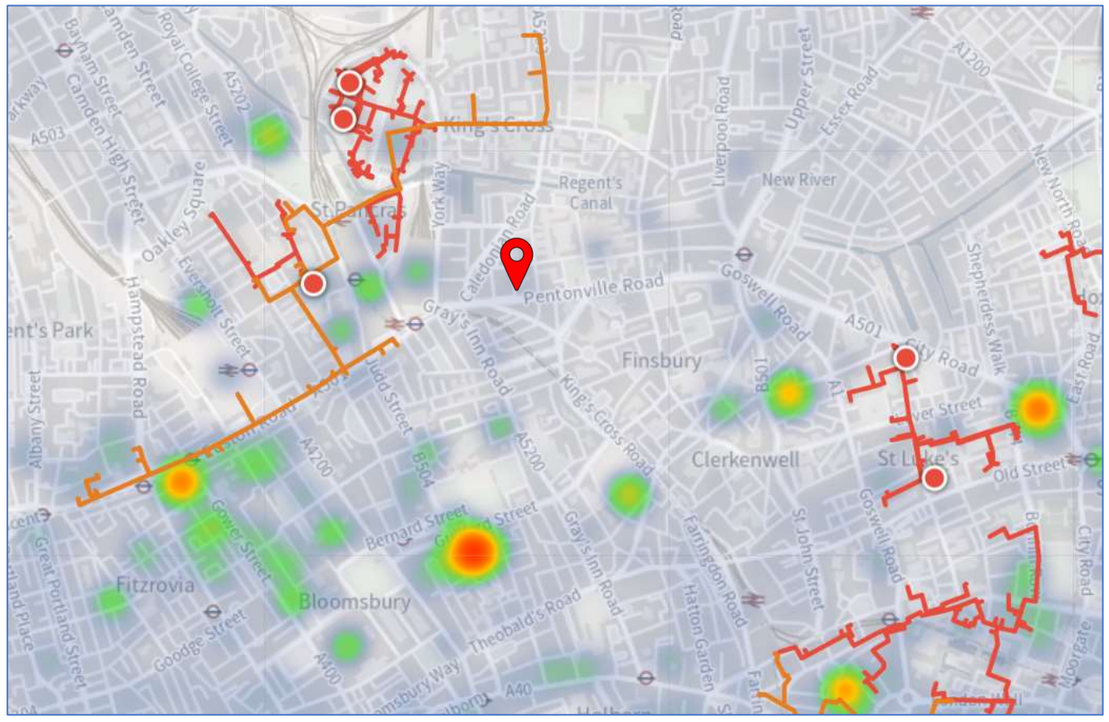


Figure 4 London Heat Map showing the heat density of the area surrounding 300 Gray's Inn Road.

London Heat Map showing the heat density of the area surrounding 300 Gray's Inn Road, red networks are 'installed', orange networks are 'proposed' routes.

Therefore, a VRF system using R32 is proposed for heating and cooling, this does not supporting a future DEN, but reduces carbon emissions from the development from day one. The building will be fed from dedicated plant within the basement. A district heating system, in our experience, requires a constant heat load within the development to allow for the stringent flow and return requirements imposed by the district heating network provider. Without a constant load such requirements cannot be met. This development is predominantly made up of commercial office spaces. This type of occupied building has intermittent heating demands that may not be suitable for such district heating systems.

The space heating is provided by an ASHP which is contributing to the on-site renewables (maximising the contribution through 'Be Green') required by the GLA, so is inherently an energy efficient system.

In 15-20 years when the heating system is due for replacement it would be appropriate to re-evaluate and install an alternative system at this point in time if there is a DEN available to connect to. This will be subject to a detailed feasibility study of the proposed district heating system when it becomes available. At this stage a zone within the basement plantroom will be provided to facilitate the district heating plant.

CHP

Combined Heat and Power engines are not viable for a development of this nature due to a low constant heat demand and there being no significant background heat demand during the summer. As such we do not propose to utilise CHP unless the use of this building changes.

Conclusion

Since there are no changes proposed, clean measures have not been adopted as part of proposals with this proposed scheme. The carbon emissions, at the end of 'be clean' stage, are identical to those at the end of the 'Be Lean' stage.

Be Green – Renewable Technology

The third and final stage of the energy hierarchy - 'Be Green' is to review the potential of a range of renewable energy systems to serve the energy requirements of the site and thereby offset CO_2 emissions.

Solar Water Heating

Solar thermal domestic hot water consumption is technically viable for this development. However, installing a solar thermal system to serve the toilets will not make a significant carbon saving as the domestic hot water demand is very low. This combined with the limited available space at roof level has resulted that this technology being excluded from the final design proposals.

Wind Power

It is recognised that wind generators are often associated with unacceptable visual and noise implications. Wind technology as a renewable energy source is not considered appropriate for this site as the wind turbines would not be visually appropriate for this development, this technology has been excluded from the final design proposals.

Photovoltaics

Photovoltaic collectors are now part of the Notional building, and they should be included in the proposed scheme to achieve compliance with building regulations. The installation of PVs has been confirmed for both the commercial and Residential Developments; 66.5m² for the Commercial Development and 54.78m² for the Residential Development.

Air Source Heat Pump (ASHP)-Heating

To enable the development to be net zero carbon, heat pumps will be used throughout for the provision of heating, cooling and hot water. These heat pump systems will enable significant emissions savings over a conventional gas boiler heating system, particularly when factoring in the decarbonisation of the electrical grid.

A summary of the fixed building services inputs used for the 'Be Lean' scenario can be found in **Appendix C**.

The Seasonal Coefficient of Performance provided by the ASHPs is shown below and in **Appendix E.**

Commercial Development

Table 19 ASHPs Seasonal Efficiency for Be Green development.

Heating Circuit - Office, Reception	
Fuel Source	Air Source Heat Pumps (ASHPs)
SCOP %	3.28
Cooling Circuit - Office, Reception	
Fuel Source	Air Source Heat Pumps (ASHPs)
SEER	4.81
DHW Circuit	
Fuel Source	Air Source Heat Pumps (ASHPs)
Efficiency %	3.28

Residential Development

Table 20 ASHPs Seasonal Efficiency for Be Green development.

Heating Circuit	
Fuel Source	Air Source Heat Pumps (ASHPs)
Make & Model	Bosch CS7001iAW
DHW Circuit	
Fuel Source	From main heating system

Be Green Results

With the inclusion of PVs, a carbon reduction of **5%** on regulated emissions has been calculated for the Commercial development and with the inclusion of ASHPs and PV on the residential development, a carbon reduction of **62%** on regulated emissions has been calculated.

Table 21 Carbon Dioxide Emissions after each stage of the Energy Hierarchy

Part L 2021 Building Regulations	**Commercial Development**		**Residential Development**	
	Carbon Dioxide Emissions (Tonnes CO_2 per year)			
	Regulated	**Non Regulated**	**Regulated**	**Non-Regulated**
Baseline: Part L 2021 of the Building Regulations Compliant Development	35.4	10.7	7.5	3.4
After energy demand reduction (Be Lean)	15.7	10.7	6.4	3.4
After heat network / CHP (Be Clean)	15.7	10.7	6.4	3.4
After renewable energy (Be Green)	14.1	10.7	1.8	3.4

Table 22 Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy

Part L 2021 Building Regulations	**Commercial Development**		**Residential Development**	
	Regulated carbon dioxide savings			
	(Tonnes CO_2 per year)	**(%)**	**(Tonnes CO_2 per year)**	**(%)**
Be Lean: savings from energy demand reduction	19.7	56	1.1	14
Be Clean: savings from heat network	0.0	0	0.0	0
Be Green: savings from renewable energy	1.7	5	4.6	62
Total Cumulative Savings	21.3	**60**	5.7	**76**

Table 23 Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for the entire development.

	Total regulated emissions (Tonnes CO_2/year)	**CO_2 savings (Tonnes CO_2/year)**	**Percentage savings (%)**
Part L 2021 baseline	42.9	-	-
Be Lean	22.1	20.8	48%
Be Clean	22.1	0.0	0%
Be Green	15.8	6.3	15%
Total Savings	-	27.1	**63%**

The total carbon offset will require a cash in-lieu contribution of **£45,150** based on GLA recommended price of £95 per tonne CO_2.

The 'Be Green' BERL document can be found in **Appendix B.**

Be Seen – Report Energy Performance

The following table presents the Energy Use Intensity (EUI) and heating demand of the development.

Table 24 EUI & space heating demand (predicted energy use)

Building type	EUI (kWh/m²/year) (excluding renewable energy)	Space heating demand (kWh/m²/year) (excluding renewable energy)	EUI value from Table 13 of the guidance (kWh/m²/year) (excluding renewable energy)	Space heating demand from Table 13of the guidance(kWh/m²/year) (excluding renewable energy)	Methodology used
Residential	26.94	7.48	35	15	SAP
New Office	16.35	7.98	55	15	Part L2 - approved DSM
Existing Office	20.63	6.09	55	15	

Sustainability & Climate Change

CC2 Adapting to climate change

The cooling hierarchy in London Plan Policy SI 4 Managing heat risk has been applied to the development:

- Minimising internal heat generation through energy efficient design. E.g. minimised heat distribution infrastructure within the buildings.
- Reducing the amount of heat entering the building in summer. E.g. use of carefully designed shading measures.
- Use of thermal mass and high ceilings to manage the heat within the building.
- Passive ventilation E.g. opening windows, passive stack.
- Mixed Mode Cooling – local mechanical ventilation/cooling where required. E.g. low energy mechanical ventilation, air conditioning.
- Full building mechanical ventilation and cooling system. E.g. mechanical cooling and central mechanical supply/extract ventilation.

Natural ventilation where feasible will be used on this development. Mechanical vent/cooling is required to prevent overheating and to provide adequate fresh air into the spaces in winter months when it is unlikely windows will be opened due to cold draughts.

ASHP technology is found to be suitable to provide cooling for the office and reception areas of this development.

Through a refrigeration cycle, external ambient air can be used as a heating or cooling medium. Air source heat pumps recover or reject heat from outside air and can deliver heating or cooling, or both to an occupied space.

Although electrically driven, in a heating only scenario, the energy savings achieved by this solution are classified as renewable once the electricity consumed by the units is considered. This has been recognised within the current London Plan.

Where cooling is required, an argument can be made that heating only heat pumps would need to be supplemented by an additional external comfort cooling plant, thereby maintaining the renewable heating energy generated by "heating only" air source heat pumps. This has a detrimental impact in terms of cost, and increased noise from an external plant, when compared to the opportunity for utilising a common system.

Therefore, an ASHP providing both heating and cooling via VRF is proposed for the development. In terms of energy calculations, the improvement achieved via ASHP cooling combined with VRF is calculated at this 'Be Lean' stage.

Overheating & Cooling assessment can be found in **Appendix D.**

BREEAM

BREEAM (Building Research Establishment Environmental Assessment Method) is a tool that enables us to assess the environmental sustainability of a development.

A BREEAM Excellent is required for all non-residential development of 500m^2 or more floorspace.

BREEAM assessment contains the following categories:

- Energy
- Water
- Materials
- Waste
- Management
- Transport
- Land use & Ecology
- Health and Wellbeing and
- Pollution.

Each category contains credits that can be obtained by implementing a sustainable design or construction measure and the development is then rated on a scale from PASS, to GOOD, VERY GOOD, EXCELLENT and ending with OUTSTANDING. 300 Gray's Inn Road has been assessed against the Bespoke BREEAM speculative Refurbishment criteria.

Camden's policy DP22 requires major developments to achieve an "Excellent" ratings as well as achieving the following percentages:

- Energy Section – 60% including a Low & Zero Carbon Feasibility Report
- Water Section – 60% targeting 1110 litres per person per day (including 5 litres for external water use)
- Materials Section – 40%.

It is expected that 300 Gray's Inn Road will meet the above specific targets which relate to the BREEAM assessment (Appendix F BREEAM Summary Scoring sheet). Further liaison with the design team will be required to ensure these are fully incorporated in the design and construction as the project progresses.

CC3 Water and flooding

Water consumption in the UK has risen by 70% over the last 30 years. Trying to meet the increasing demand by locating new sources of water supply is both expensive and damaging to the environment. Therefore, the design team have focused on reducing the demand for water and managing the existing resources.

The following water saving measures are being considered throughout:

- Dual Flush Cisterns on WC's - It is proposed that these are used throughout the development in order to minimise water consumption.
- Flow Restrictors to Taps - Flow restrictors reduce the volume of water discharging from the tap. Spray taps have a similar effect and are recommended to reduce both hot and cold-water consumption.

- Low Flow Showers - The average shower uses 15 litres of water a minute, however by restricting the output of any showers in the development to lower rate, a significant water saving can be achieved. Flow rates can be reduced to 6 litres/ minute without compromising on water pressure and hence will be considered as the design develops.

A BREEAM 'Excellent' is being targeted for the Commercial development with Wat 01 targeting 4 credits for a reduction in water consumption of 50% against the BRE Baseline and ensuring 110 litres per person per day (including 5 litres for external water use) is achieved for the Residential Developments. **Error! Reference source not found.** below details the BREEAM Credits available for percentage improvement over baseline building water consumption below details the BREEAM Wat 01 minimum percentage improvements for credits to be awarded.

Table 25 BREEAM Credits available for percentage improvement over baseline building water consumption

BREEAM RFO 2014 Wat 01 Water consumption	
% improvement	**No. of BREEAM credits**
12.5	1
25	2
40	3
50	4
55	5

In 2017, approximately 5.3 billion cubic meters of water were abstracted for public water supply, making up over half of all water abstracted in the UK. To reduce this figure, accurate information on usage is required for management of a building's consumption.
Water meters will be specified on the main supply and sub-metering in line with the BREEAM requirements.

To minimise the risks of major water leaks occurring, a water leak detection will be installed. The flowrate of the incoming water meter will be monitored by a leak detection system, which will highlight when there is a significant rise in water consumption, indicating a major leak within the building.

The leak detection system can be standalone or can be integrated within the Building Management System (BMS). It will feature programmable thresholds to suit the specific consumption of the building and an audible alarm if those thresholds are exceeded. It will also be designed to avoid false alarms by normal operation of large water consuming plant.

As well as a major leak detection system, minor leaks will be prevented through automatic flow control devices within each WV/facility. These will feature solenoid valves within the cold-water supply to each area, linked to the occupancy sensors within the space. This will minimise water leaks and wastage from sanitary fittings.

In addition, sufficient water metering will be provided within the development, covering both the incoming supply, and also monitoring water usage of high-consumption systems, and building areas in accordance with Wat 02. A water leak detection system will be provided, which will monitor leaks throughout the development, and synchronise with the BMS to ensure that leaks are identified and can be mitigated quickly. In addition, sanitary supply shut off devices, such as PIR linked to the lighting systems, will be included to only supply water to spaces (such as WCs, and hand basin taps) when it is required which will meet the requirement of Wat 03. All of these solutions support the low flow sanitaryware specification requirements, and water recycling approach.

The surface water drainage system has been designed in accordance with the requirements of Planning Practice Guidance (PPG) and the London Borough of Camden SuDs Policy. The following drainage hierarchy has therefore been considered:

The location of 300 Gray's Inn Road does not appear to be within a critical drainage area (CDA) or within a Local Flood Risk Zone (LFRZ) as per the flood risk maps and critical drainage areas and local flood risks zone map.

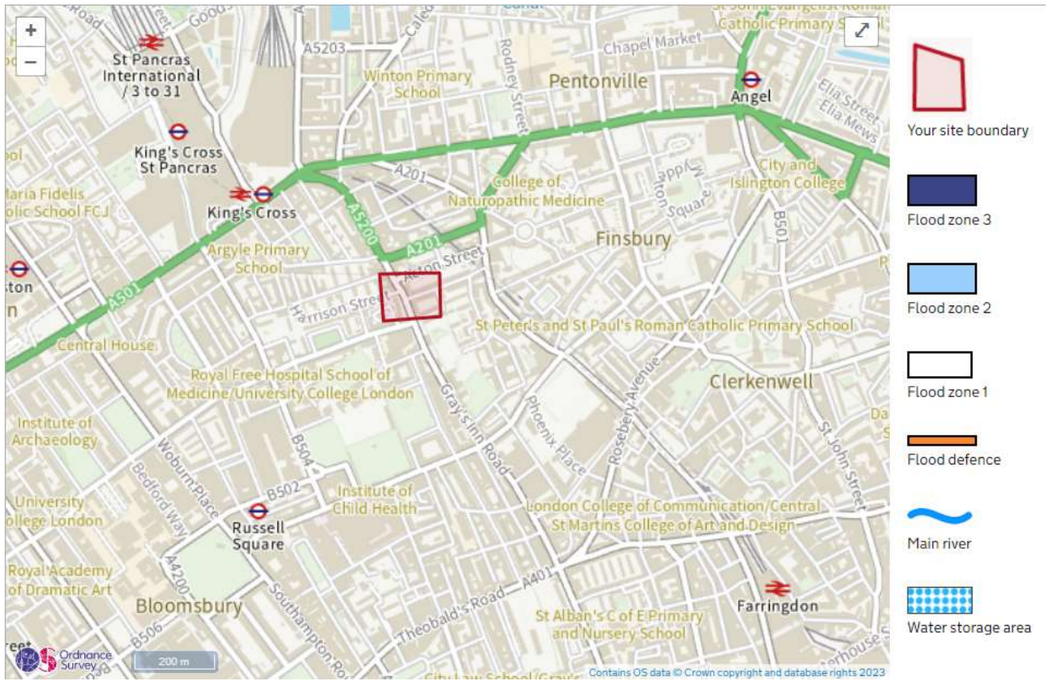


Figure 5 - Potential flood extent map to show the location of the Proposed Development within Flood Zone 1.

As the existing site is not at immediate risk of flooding, and the proposed changes will not increase the catchment area, no reduction in surface water runoff volume or discharge rate is proposed. It is proposed to upgrade the runoff rates of surface water run-off and volume to green field rates where possible.

As a major development where possible surface water drainage should be restricted to greenfield run off rates. Where this is not possible and with suitable justification the absolute minimum requirement is 50% of existing.

The drainage proposals consists of a surface network which utilises blue/green roofs, permeable paving and a below ground geo-cellular attenuation tank. Surface water runoff from the development will discharge to the attenuation tank where runoff will be pumped to a proposed manhole at high level within the external courtyard before discharging to the public combined sewer within Gray's Inn Road via a new connection. Blue/Green roofs have been included within the development to reduce both the total and peak surface water volume at source.

It is currently proposed to achieve a reduction in the surface water run-off rate to 2.3l/s in the following ways;

- Green/Blue Roofs on new plant roofs at tenth and fifth floors
- Permeable Paving for the lower ground hard landscaped areas
- Below Ground Attenuation for any residual attenuation volume.

Air Quality

C4 Air quality

Global concern for environmental pollution has risen in recent years, as concentrations of harmful pollutants in the atmosphere are increasing. Buildings have the potential to create major pollution both from their construction and operation, largely through pollution to the air (dust emissions, NOx emissions, ozone depletion and global warming) but also through pollution to watercourses and ground water. The proposed development will aim to minimise the above impacts, both at the design state and onsite. This will include low/No NOx heating systems (air source heat pump) and non-toxic building materials where feasible.

The pollutants of most concern in outdoor air are NO_2 and PM_{10} as these are the pollutants most likely to exceed statutory air quality criteria such as European Union limit values and UK AQS objectives. If ambient pollutant concentrations are above the criteria, then this is likely to be a constraint for building design. Careful consideration would then need to be given to the location of air intakes for any mechanical ventilation system.

300 Gray's Inn Road, London WC1X 8TS is located in Camden, the entire borough has been declared an Air Quality Management Area (AQMA) for exceedances of 1-hour and annual mean NO_2 concentrations and 24-hour.

A nitrogen dioxide (NO_2) monitoring survey was undertaken, further details can be found in the Air Quality Assessment, the results show that at both ground and first-floor locations concentrations were below the air quality objectives in 2022 and background concentrations for 2026 have estimated are well within the respective objectives.

Table 26 Air Quality Consultants Ltd Air Quality Assessment, Estimated annual mean background pollutant concentrations in 2022 and 2026 (µg/m³)

Year	NO_2 [a]	PM_{10} [a]	$PM_{2.5}$ [b]
2022	24.0	17.0	11.0
2026	22.5	16.4	10.6
Objective / GLA target	40	40	20/10 [c]

Emissions of construction dust have been assessed using the qualitative approach outlined in the IAQM guidance. It was concluded that in the absence of any adequate mitigation, there is a medium risk from the demolition, earthwork, construction and track out dust-generating activities an associated with the Proposed Development. However, with appropriate mitigation measures implemented, it is anticipated that the dust generation and harmful emissions from construction site activities will not be significant.

It is anticipated that heating and cooling for the development will be provided by non-fossil fuel combustion sources. Current designs include an emergency backup diesel generator, which will be installed for use for emergency energy supplies. The operation hours are anticipated to be less than 50 hours per year for testing and maintenance. A screening assessment has been undertaken to calculate the worst-case emissions of a typical candidate unit and no significant impacts were identified.

The AQA confirms that the proposed development is compliant with Policy SI 1 of the London Plan in the following ways:
- it will not cause exceedances of legal air quality limits;
- it will not create unacceptable risk of high levels of exposure to poor air quality;
- design solutions have been used to address air quality issues rather than post-design mitigation, including design measures to minimise exposure; and
- it will be air quality neutral.

The proposed development incorporates the following good design and best practice measures:
- scheme design such that the most sensitive uses (residential) are the furthest from sources of pollution (major roads such as Gray's Inn Road); the Residential Developments are located on Acton Street and have no ground-level residential occupation;
- 'car-free' development with provision of only one, on-street car parking space, which is a blue-badge space, to discourage the use of private vehicles to access the proposed development;
- provision of a detailed travel plan setting out measures to encourage sustainable means of transport (public, cycling and walking);
- provision of a Delivery, Servicing & Waste Management Plan to manage deliveries and set out the measures that will be adopted at the Site to mitigate the impact of servicing;
- provision of extensive cycle parking on-site for office and residential use;
- use of solar and ASHPs to avoid the need for on-site combustion; and,
- provision of the intakes for mechanical ventilation with heat recovery (MVHR) for the Residential Developments at the rear of the building away from Acton Street and Gray's Inn Road.

Waste

CC5 Waste

Caneparo Associates Transport Statement confirms,

- Servicing and delivery trips will be undertaken on-street on Acton Street, to be facilitated by the relocation of the nearby red-route loading bay to within circa 10m of the Site boundary. The Proposed Development will result in a minor increase in the demand for deliveries when compared with the existing situation.
- Waste collection will also be undertaken from the on-street loading bay on Acton Street, with waste for the office and residential uses stored within separate stores at ground floor level. Office waste bins will be transported to the waiting refuse vehicle on-street just before collection times.
- Dedicated waste storage will be provided for the office use to include 2 x 1,280L bins for general waste, 5 x 1,100L bins for mixed comingled recyclables, 4 x 240L wheelie bins for food waste and 1 x 1600L Eurobin for mixed electrical waste. In addition, a compactor will be provided as a space-saving measure.
- For the 7 Residential Developments, a shared bin store will be provided at ground floor for waste storage, including 6 x 660L Eurobins for general waste, 2 x mixed recyclables Eurobins, and 1 x 240L bin for food waste.

Figure 6 Caneparo Associates drawing showing waste facilities.

Community, Health and Wellbeing

C1 – Health and wellbeing

The development will create a high-quality internal space that considers the health and wellbeing of its occupants, exploring WELL Enabled for the commercial tenants.

C2 Community facilities

The developer is proposing to include additional floorspace for community use, accessible by foot and by sustainable modes of travel.

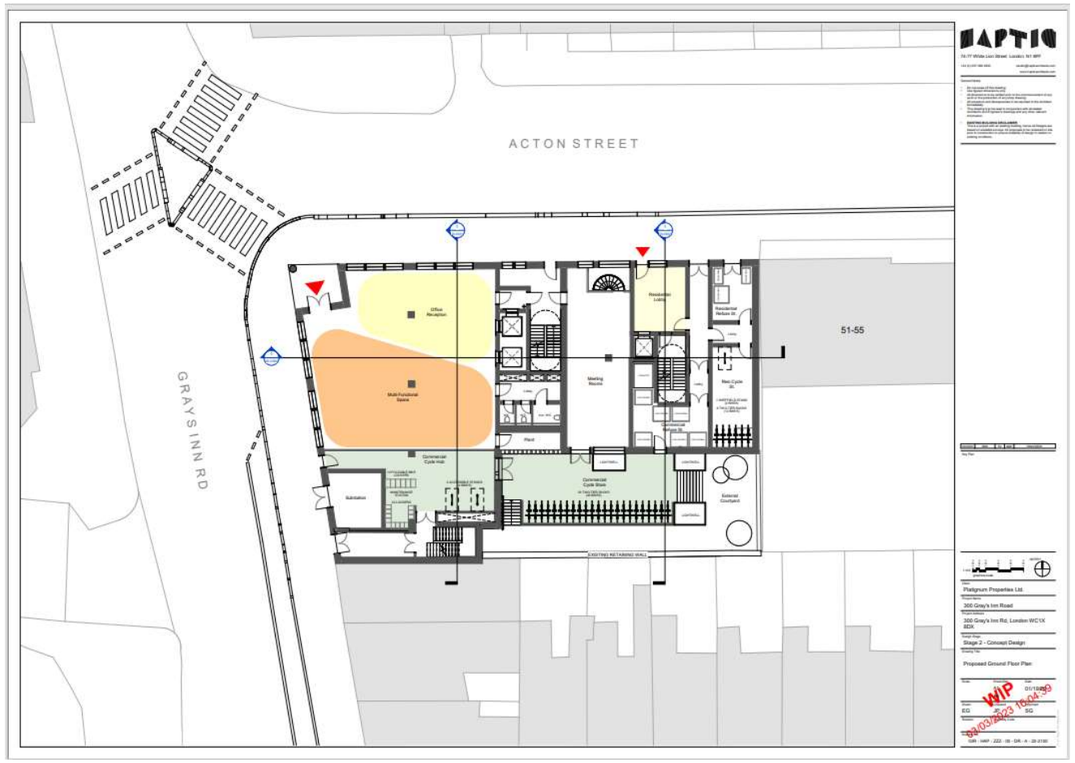


Figure 7 Haptic Architects, proposed Multi-functional space

C5 Safety and security

The development, will in accordance with the requirements of BREEAM Hea 06 Security, liaise with a Suitably Qualified Security Specialist (SQSS) and conduct a Security Needs Assessment (SNA) incorporating controls and measures which contribute to community safety and security, to promote pedestrian friendly spaces.

C6 Access for all

The development in line with the requirements of Hea 07 Safe and healthy surroundings will provide safe access around the site and outdoor space that enhances the wellbeing of building users. External site areas that form part of the assessed development will provide dedicated and safe cycle paths from the site entrance to any cycle storage, to outdoor space meeting the highest practicable standards of accessible and inclusive design so they can be used safely, easily and with dignity by all. Further details are available in the DAS.

Materials

D1 Design

The materials strategy for the scheme is being developed with environmental considerations. A life cycle approach (LCA) is being undertaken to inform the design team on the impacts of specific elements and material choices.

Options for the retention or partial retention of the existing building on site, have been significantly explored from the earliest stages of the programme development.

The decision for partial retention and re-build was chosen after these investigations considered a range of key design

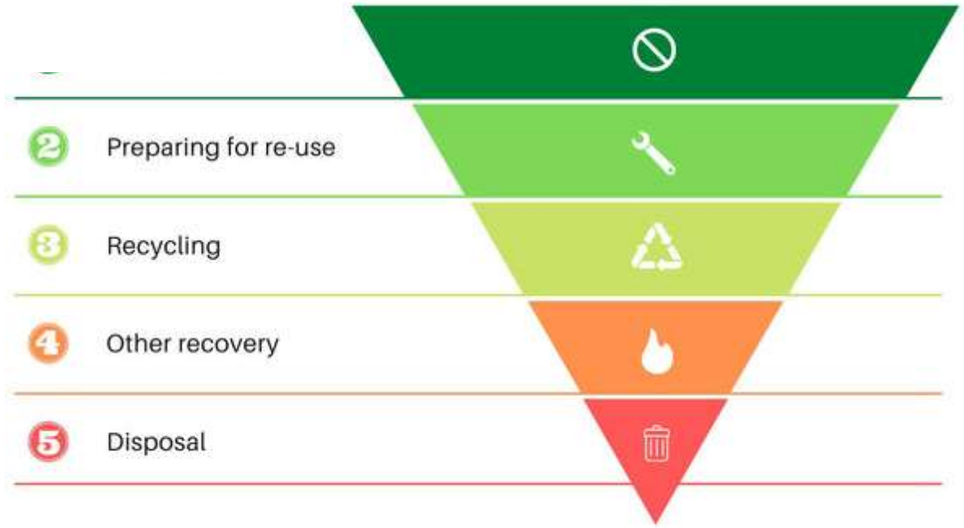


Figure 8 Waste Hierarchy

A pre-deconstruction and reuse audit of the existing building will be undertaken and in line with the waste hierarchy material will be identified for the purposes of reusing or repurposing as much of the material on or off site, with all remaining materials recycled.

The findings of the audit will be fed back into the design with the aim to refurbish where possible and 'design for longevity'. The aim is to limit waste disposal and divert it from landfill moving as many elements up the waste hierarchy as is viable, from traditional low value recycling and energy recovery to high grade reuse and repurposing.

Elements including inert materials (excluding soil), new and used metal materials, composite materials, new and used plasterboard, furniture, timber products, new and used mineral fibre ceiling panels and tiles, vinyl floor coverings, used carpet tiles, packaging materials, new and used insulation board and fixtures and fittings will be reused or directly recycled wherever possible.

The design will also look to use standardised components, offsite methods to improve waste efficiency and utilise modern methods of construction where appropriate thus optimising material use.

High recycled content materials which are responsibly sourced will be specified, taking into account the durability and reliance of the materials.

Accommodating for change of use, reconfigurations of layouts using demountable internal walls, and remodelling.as wall as enhancing and recommissioning or adapted for climate change will also be taken into consideration.

Participation in take back schemes and reduced packing as well as limiting single use plastics in construction will be encouraged.

Targets have been set and will be monitored throughout the construction process to achieve the sustainable objectives, as set out by the 300 Gray's Inn Road Design Team, as a minimum. This is to reduce the environmental impact through optimising the use of resources during all stages of the project.

It is important to set out the key factors influencing sustainable procurement early in the project design process, to ensure that specifications, and documentation can capture the requirements, and intent.

The development recognises the importance of using locally sourced materials, which it will aim to consider throughout the design. Preference will be given to locally sourced materials wherever practical. A Sustainable Procurement Plan (SPP) will be developed incorporate such measures as specify all timber to be responsibly sourced to FSC standards and requirements for products where possible, including ISO 14001 and BES.

Sourcing timber from responsibly managed and sustainable forests or plantations is the only truly renewable construction material in common use and the responsible management of forests for timber helps to lock in CO_2. By maximising the use of timber for structural or finishing purposes the embodied carbon impact of the development can be reduced.

In order to encourage the use of materials with a lower environmental impact over their lifecycle, the design will aim to avoid toxic materials, ozone depleting chemicals, volatile organic compounds, and other substances harmful to the environment, construction workers and building users.

In addition, materials in areas with high usage will be specified to be robust and durable, for longevity, to avoid the need to replace damaged surfaces.

Environmental Product Declarations (EPDs), third-party verified quantified assessment of a product or material's life cycle impacts, either from cradle-to-gate (raw extraction to delivery on site), or cradle-to-grave (raw extraction to demolition & disposal) and provide the data for embodied carbon in materials used.

During the procurement process, a preference for products, and materials with supporting EPD information will be requested direct from suppliers to inform the decision-making process when selecting materials for use on the project.

Effective monitoring and recording of site waste will also be a requirement of the project. A Resource Management Plan (RMP) will be prepared and implemented, as a minimum, the RMP will contain:.

1. Procedures to estimate, monitor, measures and report on hazardous and non-hazardous site waste and demolition waste, where relevant, arising from work carried out by the principal contractor and all subcontractors. Waste data obtained from licensed external waste contractors needs to be reliable and verifiable, i.e. using data from EA/SEPA/EA Wales/NIEA waste return forms or from a PAS402 compliant company.

2. Monthly reporting of all construction waste data throughout the project checked against what would be expected based on the stage of the project, invoices, etc., to validate completeness of waste reporting data.

3. Procedures to sort, reuse and recycle construction waste into defined waste groups, either on site or through a licensed external contractor.

4. Procedures to review and update the plan.

5. The name or job title of the individual responsible for implementing the above.

RMP Waste estimates, and calculations should be checked on completion against the final RMP documents with actual site waste to assess the effectiveness of target setting and demonstrate 'lessons learned'

In addition to sustainable waste practices, the site will be managed sustainably with respect to resource use and pollution control. The contractor will be responsible for undertaking a selection of the following actions:

- Monitor, report and set targets for CO_2 or energy arising from site activities;
- Monitor, report and set targets for CO_2 or energy arising from transport to and from site;
- Monitor, report and set targets for water consumption arising from site activities;
- Monitor construction waste on site; Less than 4.5m^3 per 100m^2 (GIA) of construction waste or 1.2 tonnes
- Sort and recycle construction waste; 85% by Volume (90% by Tonnage) of construction, and 90% by Volume (95% by Tonnage) demolition waste to be diverted from landfill
- Adopt best practice policies in respect of air (dust) pollution arising from the site;
- Adopt best practice policies in respect of water (ground and surface) pollution occurring on the site.

The site will be registered under the Considerate Constructors Scheme and the intention is to target a CCS score of 39 overall with at least 13 points in each of the 3 sections.

Local environmental impacts

A1 Managing the impact of development

Light Pollution

External lighting encompasses vehicle and pedestrian access lighting, security lighting, facility illumination and general feature lighting. The lighting will be designed on a site wide basis to meet the mandatory requirements and aesthetic considerations. The strategy is to provide a balance between adequate external lighting for safe and secure operation of the site without unnecessary illumination or power consumption.

The proposed development will aim to minimise the detrimental impact of glare and light spill on local amenity, biodiversity, highway and waterway users. Feature lighting, where required, will be focussed to the task/subject. Where necessary, luminaires will be further screened in cases where there may be an issue of proximity and light spill to the adjacent neighbouring residential areas, although the intention is to avoid this situation wherever possible from the outset. The external lighting design will take into consideration the relevant guidance from the British Standards and other recommended documents including the following Standards and Design Guides:

CIBSE Lighting Design Guides

- BS5489 Code of Practice for the Design of Road Lighting
- BS EN 13201-1&2 Road Lighting
- Institute of Lighting Professionals (ILP) The Reduction of Obtrusive Light, Guidance Note 01/21

Noise and Vibration

A4 Noise and vibration

The proposed development will aim to prevent adverse effects of noise and vibration and improve the noise environment in compliance with the council's noise thresholds.

auricl noise survey concluded that suitable internal noise levels should be achievable using standard constructions. The survey included an assessment of noise intrusion for the scenario when windows are open to control overheating concluding that open windows would be acoustically acceptable means of controlling overheating on the southern and eastern façades. However, the assessment concluded that open windows would not be acoustically acceptable means of controlling overheating on the northern and western façades.

Plant noise limits have also been proposed based on the results of the noise survey and the Camden Council standard requirements.

Biodiversity

A3 Biodiversity

Green Roofs provide a benefit of urban greening, also management of surface water runoff through 'mimicking nature' by utilising green surfaces, connection to nature in a dense urban environment and soil moisture storage capacities.

The provision of a Green Roofs is also understood to have positive health, and wellbeing benefits for building occupants. The appointed SQE allowing better consultation with the wider design team for more appropriate, and timely integration of ecological enhancements, enabling determination of recommendations that are suitable in the development context, and support overall aims.

BBUK Studio Limited have confirmed that there are no existing trees on the site, a new tree with ornamental planting mix is proposed together with an automatic irrigation system for all planting areas. .The introduction of new hard and soft landscape in the ground floor courtyard and the introduction of biodiverse green roofs con the building will contribute to the Proposed Developments Urban Greening Factor score of 0.31. Additionally, a green roofed bike stand is proposed with wildflower seeding.

Please refer to the Landscape statement for further details.

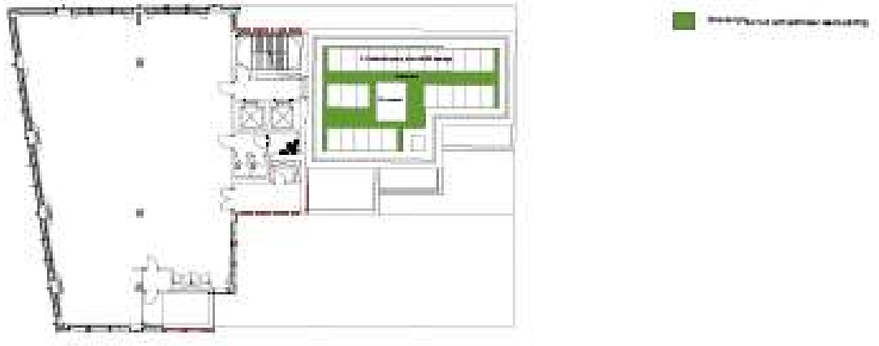


Figure 9 BBUK 6F Landscape Plan

Figure 10 BBUK RF landscaping plan

Figure 11 BBUK Ground Floor Plan landscaping

Figure 12 BBUK 9F landscaping plan

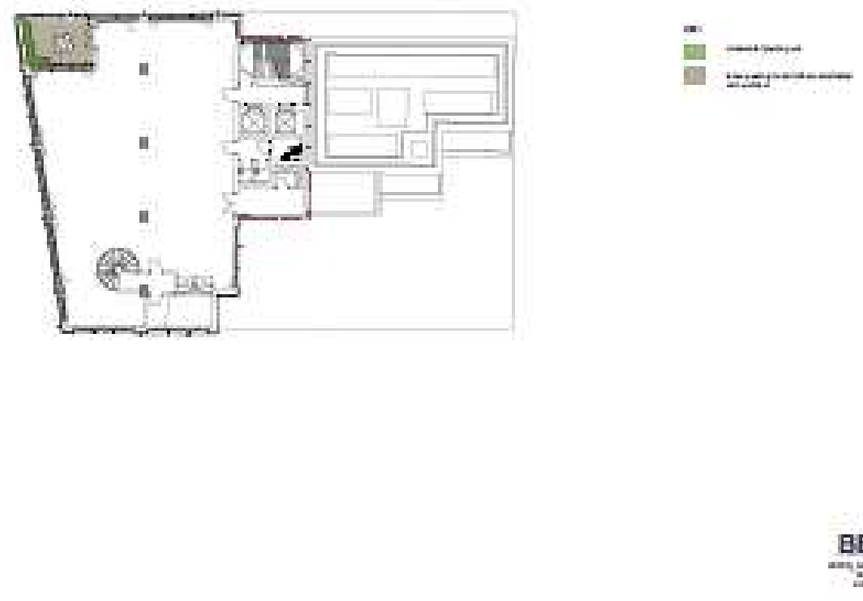


Figure 13 BBUK 8F landscaping plan

Transport

T1 Prioritising walking, cycling and public transport

Located within a 20minute walking distance to Kings Cross, Euston, Angel, and many more key areas of the city. The proposals promote Active Travel.

Inclusive design is fundamental to the proposed scheme. Level access will be provided throughout to both offices and residential areas with accessible stands located at ground floor within the cycle stores. Residential homes will be designed to meet Part M4(2) for accessible and adaptable dwellings.

Cycling will become a celebrated component of the building. A cycle entrance will be located on Acton Street , with cycle parking in excess of the London Plan (2021); totalling 76 cycle spaces for the commercial development, 24 spaces for the residential block, and an additional 14 short stay spaces on street. Changing facilities, maintenance station and lockers will also be provided.

Caneparo Associates Transport Statement confirms,

- The Site is located in an area of excellent accessibility by non-car modes of transport, being within convenient walking distance of a number of King's Cross St. Pancras, a major interchange in London along with several bus services; this is evidenced by the Site's PTAL rating of 6B.
- Cycle parking will be provided in excess of the London Plan (2021) and just below that of the Camden Planning Guidance: Transport document (2021). Additionally, the Site will contain showers (including an accessible shower), changing rooms and lockers. This means that the design of the Site will actively encourage cycling as a means of travel to/from work and provides a significant improvement when compared with the existing building. Indicative locations on Acton Street and Gray's Inn Road have been identified for the delivery of short-stay cycle parking.

Table 27 Cycle Provision

	Long Stay						Short Stay
Land Use	Two-Tier Stand Racks	Sheffield Stands	Accessible Stands	Vertical Stand	Foldable Bike Lockers	Total Provision	Sheffield Stands
Residential	*18*	*4*	*2*	*0*	*0*	*24*	*2*
Office	*36*	*6*	*4*	*22*	*8*	*76*	*12*
Total	*54*	*10*	*6*	*22*	*8*	*100*	*14*

A Travel Plan has been prepared that recognises the highly accessible location of the Site and identifies a range of measures and targets aimed at creating modal shift from public transport to active modes (walking and cycling).

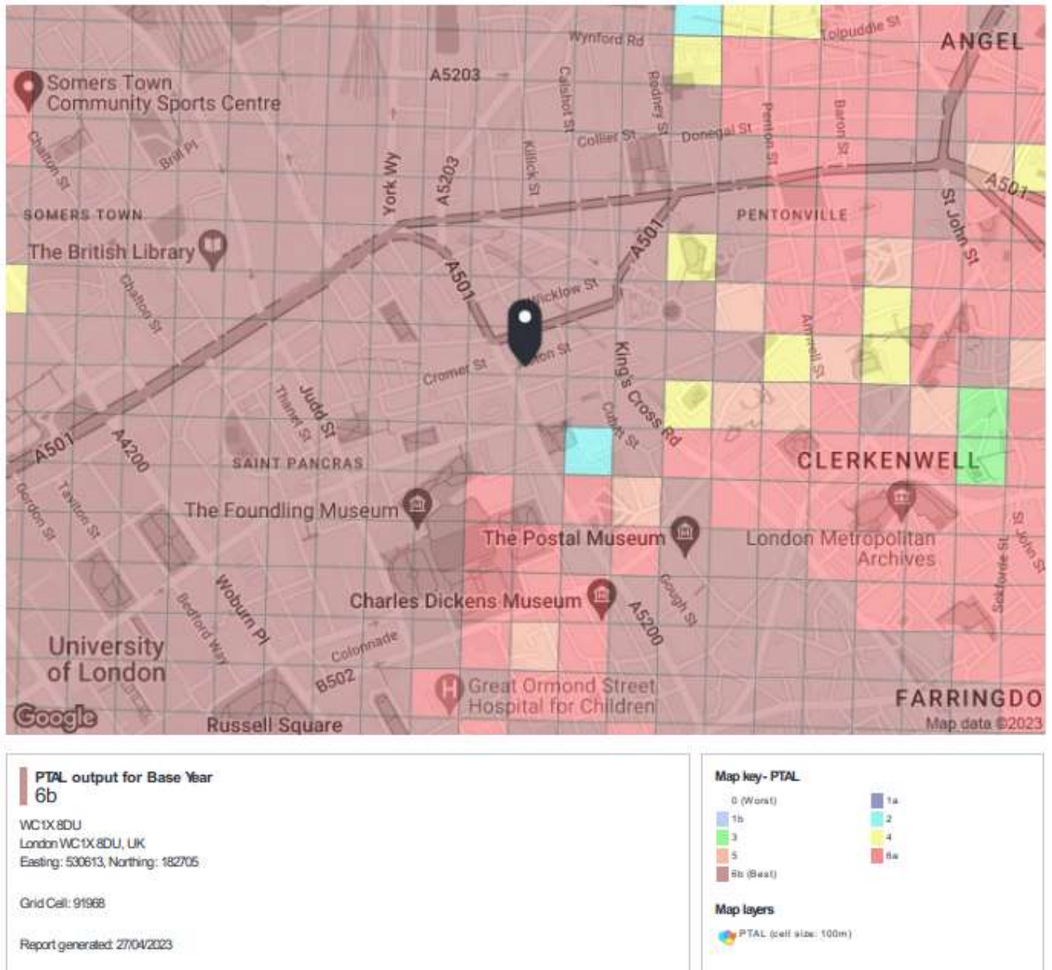


Figure 14 TfL PTAL calculation for 300 Gray's Inn Road

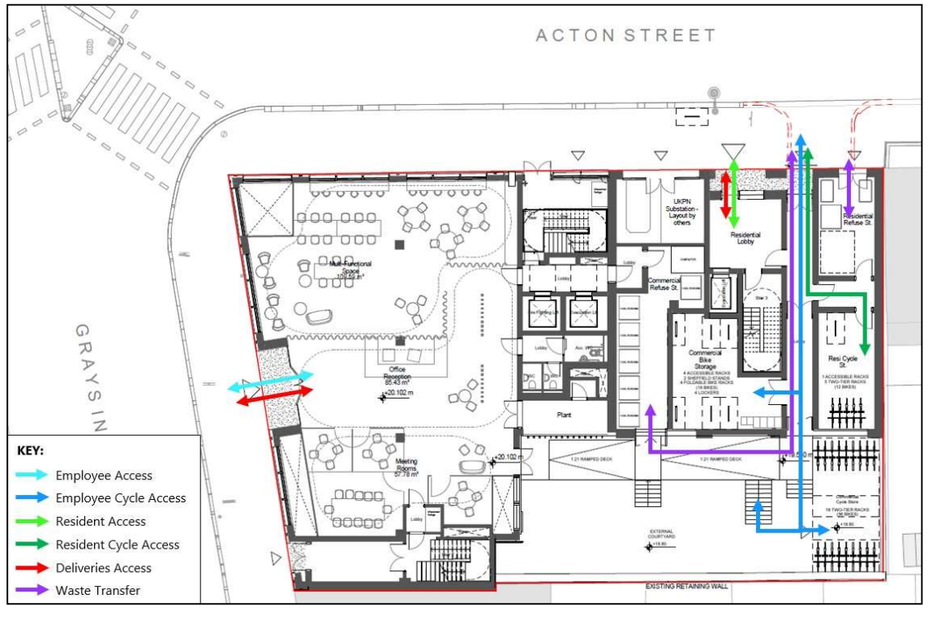


Figure 15 Caneparo Associates drawing showing cycle storage & access

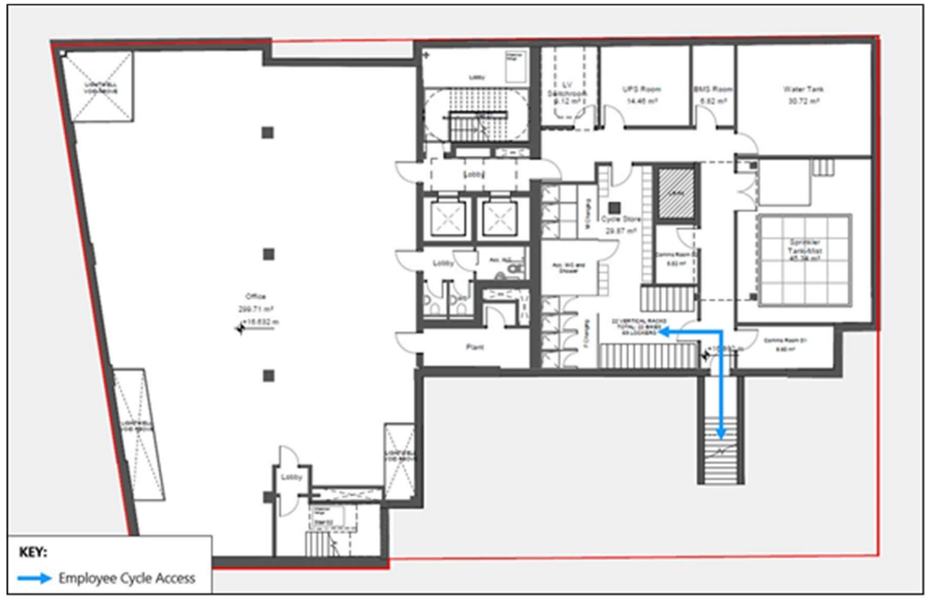


Figure 16 Caneparo Associates drawing showing cyclist facilities

T2 Parking and car-free development

- The proposed development will remove all existing on-site car parking with the existing crossover and rear courtyard removed, reflecting the Site's excellent accessibility by walking, cycling and public transport. Those requiring parking due to disability may utilise on-street disabled parking in the locality such as along Acton Street or access step-free public transport from King's Cross St. Pancras station or bus stops in the local area. An indicative location for an additional disabled bay is indicated on Acton Street.
- The multi-modal trip generation assessment undertaken demonstrates that the proposals will generate a small overall uplift in AM and PM peak hour trips by active and sustainable modes of transport, with a reduction in car trips made to the Site owing to the proposal's car-free nature. The assessment forecasts that the likely increase in trip generation will not result in a material impact upon public transport service capacity.

T4 Sustainable movement of goods and materials

- A draft Construction Management Plan (CMP) has been provided to set out the management procedures to be implemented on site with regard to demolition and construction logistics.

DM1 Delivery and monitoring

- Servicing and delivery trips will be undertaken on-street on Acton Street, to be facilitated by the relocation of the nearby red-route loading bay to within circa 10m of the Site boundary. The Proposed Development will result in a minor increase in the demand for deliveries when compared with the existing situation. See Figure 8 above.

The proposed development will not have a materially detrimental impact on the highway or local transport network, and is in accordance with relevant adopted national, strategic and local policy guidance.

Conclusion

This Sustainability Statement considers the various sustainability policy requirements and targets for the development, and describes the strategies proposed to deliver 300 Gray's Inn Road sustainably. Key strategies to achieve the various targets and requirements and deliver sustainable outcomes over the lifecycle of the project include:

- **Sustainable Energy**: An energy strategy has been developed and is detailed in the separate Energy Statement. It follows the GLA energy hierarchy; first applying lean measures such as consideration of highly efficient fabric and low air tightness of the building to reduce energy consumption, before then applying efficient systems, supplying low carbon heat through Air Source Heat Pumps (ASHP). Through the application of the energy hierarchy, 300 Gray's Inn Road achieves a carbon dioxide emissions reduction of 63%, below the Building Regulations 2021 Baseline Building and based on SAP 2010carbon factors.

- **Waste:** Waste sent to landfill will be minimised during the building's construction and operation through the development and implementation of a Resource Management Plan (RMP) and the provision of adequate dedicated storage space for recyclable waste. A strategy for waste reduction and promotion of recycling has been developed which follows a waste hierarchy to minimise waste and promote recycling during operation and construction. The segregation of different waste streams for recycling. Where possible circular economy principles will be used to either reduce, reuse and recycle considering future disassembly and adaptability.

- **Pollution:** A Construction Environmental Management Plan (CEMP) and Resource Management Plan (RMP) will be developed to manage noise and pollution impacts during construction. Night time light pollution will be minimised through best practice design.
  A noise impact assessment has been carried out and found that no negative noise impact will be present.

- **Materials:** A strategy has been developed to minimise demolition, maximise retention and reuse of the existing building; use materials with low embodied carbon & water; use responsibly sourced materials; optimise durability and lifespan; and design flexibility. 100% of timber and timber products will be sourced from accredited Forest Stewardship Council (FSC) or Programme for the Endorsement of Forestry Certification (PEFC) source. A project specific Life Cycle Carbon Assessment (LCA) will be carried out to inform the design and materials specifications

- **Biodiversity:** planting proposals aim to achieve urban greening factor target (UGF 0.31) through the transformation of the service yard into a landscaped amenity space for the office. Additionally terrace space on the 8th and 9th floor will be used for soft landscaping.

- **Transport:** The development promotes low carbon mobility with the provision of 76 commercial and 24 residential long stay cycle spaces and facilities with 14 short stay spaces on street and pedestrian access. The development will be car free.

- **Water consumption and flood risk:** A strategy has been developed to reduce water demand through water efficiency measures. Highly efficient water saving fixtures, fittings and appliances will be specified to achieve at least 50% water reduction, which is equivalent to 4 points under BREEAM water consumption credit. The rate of discharge of surface water will be limited to achieve the London Plan requirements and the target agreed with the Environment Agency for the whole masterplan. This will be achieved by incorporating SuDS techniques such as Blue/green roof systems and a below ground attenuation tank, etc.

- **Climate change:** The design includes measures that will help mitigation of and adaptation to climate change. Mitigation measures include energy efficiency through on-site low carbon heating plant; reducing embodied carbon; low energy LED lighting; and sustainable transport strategies. Measures to adapt to future climate change include SuDS implementation; best practice flood resilience measures; assessment of the risk of overheating in higher temperatures; use of green infrastructure to minimise and mitigate heating to the urban environment; resilient foundations.

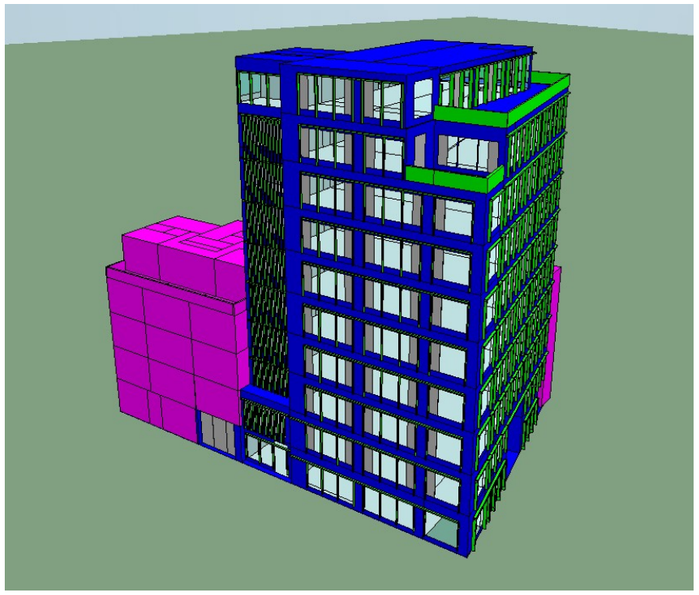
- **BREEAM**: A BREEAM Bespoke Refurbishment and Fit out (RFO) 2104 Shell and Core pre-assessments has been undertaken to demonstrate that the development is on track to achieve BREEAM "Excellent" rating as well as achieving the following percentages:
  - Energy Section – 60%
  - Water Section – 60%
  - Materials Section – 40.

- **Health and wellbeing:** Enhance and promote active and healthy lifestyles, ensuring the development follows principles and exploring WELL Enabled for the commercial tenants.

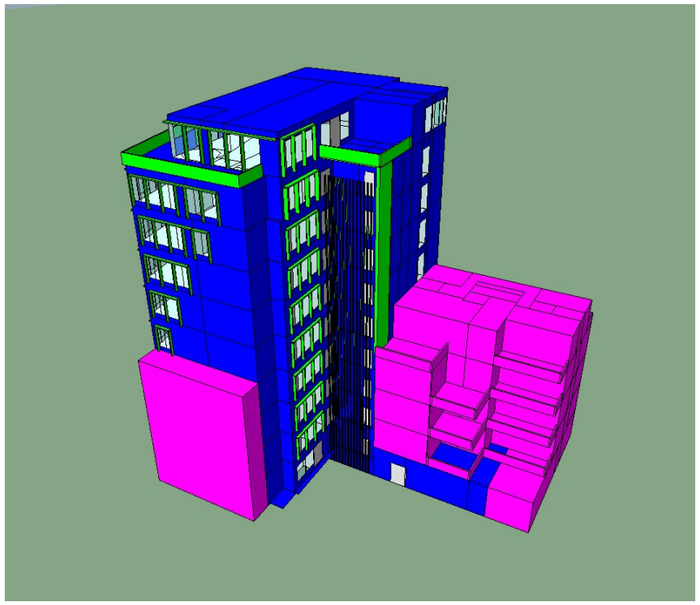
- **Social value:** Commitment to inclusivity, diversity and giving back to the community. In addition, the building contractor will be contractually required to comply with, and go significantly beyond, best practice principles under the Considerate Constructors Scheme (CCS).

Appendix A – 3D Views of Energy Model

North-West



South-East



Appendix B – BRUKL Reports

Baseline

Commercial Existing

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

300 Grays Inn Road - Baseline As designed

Date: Mon May 15 15:18:15 2023

Administrative information

Building Details

Address: Address 1, City, Postcode

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.20

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.20

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

Foundation area [m²]: 384.03

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

The building does not comply with England Building Regulations Part L 2021

Target CO_2 emission rate (TER), $kgCO_2/m^2$annum	3.64	
Building CO_2 emission rate (BER), $kgCO_2/m^2$annum	9.57	
Target primary energy rate (TPER), kWh_{PE}/m^2annum	39.52	
Building primary energy rate (BPER), kWh_{PE}/m^2annum	101.72	
Do the building's emission and primary energy rates exceed the targets?	BER > TER	BPER > TPER

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

Fabric element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.55	0.55	1S00000B:Surf[2]
Floors	0.18	0.58	0.58	1S00000B:Surf[0]
Pitched roofs	0.16	-	-	No pitched roofs in building
Flat roofs	0.18	0.18	0.18	1S00000B:Surf[1]
Windows** and roof windows	1.6	1.4	1.4	0100002B:Surf[0]
Rooflights***	2.2	-	-	No roof lights in building
Personnel doors^	1.6	1.4	1.4	0100002B:Surf[1]
Vehicle access & similar large doors	1.3	-	-	No vehicle access doors in building
High usage entrance doors	3	-	-	No high usage entrance doors in building

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [W/(m²K)] $U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [W/(m²K)]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m²K)]
* Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.
** Display windows and similar glazing are excluded from the U-value check. *** Values for rooflights refer to the horizontal position.
^ For fire doors, limiting U-value is 1.8 W/m²K
NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air permeability	Limiting standard	This building
$m^3/(h.m^2)$ at 50 Pa	8	25

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m²]	3354.8	3354.8
External area [m²]	3041.4	3041.4
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	25	3
Average conductance [W/K]	2219.14	1450.24
Average U-value [W/m^2K]	0.73	0.48
Alpha value* [%]	25.01	10

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

Building Use

% Area	Building Type
	Retail/Financial and Professional Services
	Restaurants and Cafes/Drinking Establishments/Takeaways
100	**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	31.26	3.52
Cooling	3.32	2.94
Auxiliary	3.82	5.81
Lighting	20.89	9.32
Hot water	7.04	6.3
Equipment*	42.63	42.63
TOTAL**	**66.32**	**27.9**

* 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	1.15
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*0*	*1.15*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	204.09	75.69
Primary energy [kWh_{PE}/m^2]	101.72	39.52
Total emissions [kg/m^2]	9.57	3.64

Be Lean
Commercial Existing

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

300 Greys Inn Road - Be Lean - Existing As designed

Date: Mon May 15 15:34:56 2023

Administrative information

Building Details

Address: Address 1, City, Postcode

Certification tool

Calculation engine: Apache
Calculation engine version: 7.0.20
Interface to calculation engine: IES Virtual Environment
Interface to calculation engine version: 7.0.20
BRUKL compliance module version: v6.1.e.1

Certifier details

Name: Name
Telephone number: Phone
Address: Street Address, City, Postcode

Foundation area [m²]: 384.03

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

The building does not comply with England Building Regulations Part L 2021

Target CO_2 emission rate (TER), $kgCO_2/m^2annum$	3.64	
Building CO_2 emission rate (BER), $kgCO_2/m^2annum$	3.77	
Target primary energy rate (TPER), kWh_{PE}/m^2annum	39.5	
Building primary energy rate (BPER), kWh_{PE}/m^2annum	40.81	
Do the building's emission and primary energy rates exceed the targets?	BER > TER	BPER > TPER

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

Fabric element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.15	0.15	1S00000B:Surf[2]
Floors	0.18	0.58	0.58	1S00000B:Surf[0]
Pitched roofs	0.16	-	-	No pitched roofs in building
Flat roofs	0.18	0.12	0.12	1S00000B:Surf[1]
Windows** and roof windows	1.6	1	1	0100002B:Surf[0]
Rooflights***	2.2	-	-	No roof lights in building
Personnel doors^	1.6	1.2	1.2	0100002B:Surf[1]
Vehicle access & similar large doors	1.3	-	-	No vehicle access doors in building
High usage entrance doors	3	-	-	No high usage entrance doors in building

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [W/(m²K)] $U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [W/(m²K)]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m²K)]
* Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.
** Display windows and similar glazing are excluded from the U-value check. *** Values for rooflights refer to the horizontal position.
^ For fire doors, limiting U-value is 1.8 W/m²K
NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m²]	3354.8	3354.8
External area [m²]	3041.4	3041.4
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	3	3
Average conductance [W/K]	1334.49	1450.24
Average U-value [W/m²K]	0.44	0.48
Alpha value* [%]	25.2	10

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

Building Use

% Area	Building Type
	Retail/Financial and Professional Services
	Restaurants and Cafes/Drinking Establishments/Takeaways
100	**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/m²]

	Actual	Notional
Heating	6.59	3.52
Cooling	4.01	2.94
Auxiliary	2.65	5.81
Lighting	7.41	9.32
Hot water	6.9	6.3
Equipment*	42.63	42.63
TOTAL**	27.56	27.9

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

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	1.16
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*0*	*1.16*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	81.84	75.69
Primary energy [kWh_{PE}/m^2]	40.81	39.5
Total emissions [kg/m²]	3.77	3.64

Commercial New

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

300 Greys Inn Road - Be Lean - New As designed

Date: Mon May 15 15:24:18 2023

Administrative information

Building Details

Address: Address 1, City, Postcode

Certification tool

Calculation engine: Apache
Calculation engine version: 7.0.20
Interface to calculation engine: IES Virtual Environment
Interface to calculation engine version: 7.0.20
BRUKL compliance module version: v6.1.e.1

Certifier details

Name: Name
Telephone number: Phone
Address: Street Address, City, Postcode

Foundation area [m²]: 324.85

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

The building does not comply with England Building Regulations Part L 2021

Target CO_2 emission rate (TER), $kgCO_2/m^2$annum	3.39	
Building CO_2 emission rate (BER), $kgCO_2/m^2$annum	3.63	
Target primary energy rate (TPER), kWh_{PE}/m^2annum	36.18	
Building primary energy rate (BPER), kWh_{PE}/m^2annum	39.09	
Do the building's emission and primary energy rates exceed the targets?	BER > TER	BPER > TPER

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

Fabric element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.15	0.15	07000001:Surf[0]
Floors	0.18	-	-	UNKNOWN
Pitched roofs	0.16	-	-	No pitched roofs in building
Flat roofs	0.18	0.12	0.12	08000008:Surf[0]
Windows** and roof windows	1.6	1	1	07000001:Surf[1]
Rooflights***	2.2	1	1	09000005:Surf[12]
Personnel doors^	1.6	1.2	1.2	08000003:Surf[5]
Vehicle access & similar large doors	1.3	-	-	No vehicle access doors in building
High usage entrance doors	3	-	-	No high usage entrance doors in building

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [W/(m²K)] $U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [W/(m²K)]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m²K)]
* Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.
** Display windows and similar glazing are excluded from the U-value check. *** Values for rooflights refer to the horizontal position.
^ For fire doors, limiting U-value is 1.8 W/m²K
NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m²]	974.5	974.5
External area [m²]	1255.9	1255.9
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	3	3
Average conductance [W/K]	485.04	626.8
Average U-value [W/m²K]	0.39	0.5
Alpha value* [%]	26.16	10

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

Building Use

% Area	Building Type
	Retail/Financial and Professional Services
	Restaurants and Cafes/Drinking Establishments/Takeaways
100	**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/m²]

	Actual	Notional
Heating	9.46	7.2
Cooling	5.39	3.41
Auxiliary	2.81	6.59
Lighting	6.02	8.55
Hot water	2.63	2.26
Equipment*	36.15	36.15
TOTAL**	26.31	28.02

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

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	3.68
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*0*	*3.68*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	111.49	110.9
Primary energy [kWh_{PE}/m^2]	39.09	36.18
Total emissions [kg/m²]	3.63	3.39

Be Lean
Residential

Block Compliance Report - DER				
Block Reference: GDM01139 300 Grey's Inn Road	Block Name:			
Property-Assessment Reference	Floor area (m^2)	DER ($kgCO_2/m^2$)	TER ($kgCO_2/m^2$)	% DER/TER
0001 AC - As Designed 2B4P Be Lean	77.31	15.81	16.47	4.01 %
0003 - As Designed 2B4P Be Lean	77.31	13.55	14.30	5.24 %
0005 - As Designed 2B4P Be Lean	77.31	14.04	14.85	5.45 %
0002 - As Designed 1B2P Be Lean	56.89	15.37	17.55	12.42 %
0004 - As Designed 1B2P Be Lean	56.89	14.40	15.21	5.33 %
0006 - As Designed 1B2P Be Lean	56.89	14.81	15.61	5.12 %
0007 - As Designed 3B5P Be Lean	90.49	14.16	15.92	11.06 %
Totals:	493.09	102.14	109.91	
Average DER = 14.55 $kgCO_2/m^2$	% DER/TER	PASS		
Average TER = 15.65 $kgCO_2/m^2$	7.08 %			

Block Compliance Report - DFEE				
Block Reference: GDM01139 300 Grey's Inn Road	Block Name:			
Property-Assessment Reference	Floor area (m^2)	DFEE ($kWh/m^2/yr$)	TFEE ($kWh/m^2/yr$)	% DFEE/TFEE
0001 AC - As Designed 2B4P Be Lean	77.31	42.17	49.89	15.47 %
0003 - As Designed 2B4P Be Lean	77.31	30.49	40.15	24.07 %
0005 - As Designed 2B4P Be Lean	77.31	32.98	42.57	22.52 %
0002 - As Designed 1B2P Be Lean	56.89	36.21	47.47	23.72 %
0004 - As Designed 1B2P Be Lean	56.89	27.62	36.89	25.14 %
0006 - As Designed 1B2P Be Lean	56.89	29.40	38.68	23.99 %
0007 - As Designed 3B5P Be Lean	90.49	40.81	50.90	19.83 %
Totals:	493.09	239.68	306.54	

Average DFEE = 34.81 $kgCO_2/m^2$	% DFEE/TFEE	PASS
Average TFEE = 44.33 $kgCO_2/m^2$	21.47 %	

Be Green
Commercial Existing

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

300 Greys Inn Road - Be Green - Existing As designed

Date: Mon May 15 13:19:39 2023

Administrative information

Building Details

Address: Address 1, City, Postcode

Certifier details

Name: Name
Telephone number: Phone
Address: Street Address, City, Postcode

Certification tool

Calculation engine: Apache
Calculation engine version: 7.0.20
Interface to calculation engine: IES Virtual Environment
Interface to calculation engine version: 7.0.20
BRUKL compliance module version: v6.1.e.1

Foundation area [m²]: 384.03

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

Target CO_2 emission rate (TER), $kgCO_2/m^2$.annum	3.64	
Building CO_2 emission rate (BER), $kgCO_2/m^2$.annum	3.59	
Target primary energy rate (TPER), kWh_{PE}/m^2.annum	39.5	
Building primary energy rate (BPER), kWh_{PE}/m^2.annum	38.83	
Do the building's emission and primary energy rates exceed the targets?	BER =< TER	BPER =< TPER

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

Fabric element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.15	0.15	1S00000B:Surf[2]
Floors	0.18	0.58	0.58	1S00000B:Surf[0]
Pitched roofs	0.16	-	-	No pitched roofs in building
Flat roofs	0.18	0.12	0.12	1S00000B:Surf[1]
Windows** and roof windows	1.6	1	1	0100002B:Surf[0]
Rooflights***	2.2	-	-	No roof lights in building
Personnel doors^	1.6	1.2	1.2	0100002B:Surf[1]
Vehicle access & similar large doors	1.3	-	-	No vehicle access doors in building
High usage entrance doors	3	-	-	No high usage entrance doors in building

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [W/(m²K)] $U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [W/(m²K)]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m²K)]
* Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.
** Display windows and similar glazing are excluded from the U-value check. *** Values for rooflights refer to the horizontal position.
^ For fire doors, limiting U-value is 1.8 W/m²K
NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m²]	3354.8	3354.8
External area [m²]	3041.4	3041.4
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	3	3
Average conductance [W/K]	1334.49	1450.24
Average U-value [W/m²K]	0.44	0.48
Alpha value* [%]	25.2	10

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

Building Use

% Area	Building Type
	Retail/Financial and Professional Services
	Restaurants and Cafes/Drinking Establishments/Takeaways
100	**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/m²]

	Actual	Notional
Heating	6.05	3.52
Cooling	3.67	2.94
Auxiliary	2.65	5.81
Lighting	7.41	9.32
Hot water	6.44	6.3
Equipment*	42.63	42.63
TOTAL**	26.22	27.9

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

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	1.16
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*0*	*1.16*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	81.84	75.69
Primary energy [kWh_{PE}/m^2]	38.83	39.5
Total emissions [kg/m²]	3.59	3.64

Commercial New

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

300 Greys Inn Road - Be Green - New As designed

Date: Mon May 15 10:40:41 2023

Administrative information

Building Details

Address: Address 1, City, Postcode

Certifier details

Name: Name
Telephone number: Phone
Address: Street Address, City, Postcode

Certification tool

Calculation engine: Apache
Calculation engine version: 7.0.20
Interface to calculation engine: IES Virtual Environment
Interface to calculation engine version: 7.0.20
BRUKL compliance module version: v6.1.e.1

Foundation area [m²]: 324.85

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

Target CO_2 emission rate (TER), $kgCO_2/m^2annum$	3.39	
Building CO_2 emission rate (BER), $kgCO_2/m^2annum$	2.08	
Target primary energy rate (TPER), kWh_{PE}/m^2annum	36.18	
Building primary energy rate (BPER), kWh_{PE}/m^2annum	21.13	
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	$U_{b\text{-}Limit}$	$U_{b\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.15	0.15	07000001:Surf[0]
Floors	0.18	-	-	UNKNOWN
Pitched roofs	0.16	-	-	No pitched roofs in building
Flat roofs	0.18	0.12	0.12	08000008:Surf[0]
Windows** and roof windows	1.6	1	1	07000001:Surf[1]
Rooflights***	2.2	1	1	09000005:Surf[12]
Personnel doors^	1.6	1.2	1.2	08000003:Surf[5]
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

$U_{b\text{-}Limit}$ = Limiting area-weighted average U-values [W/(m²K)] $U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [W/(m²K)]
$U_{b\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m²K)]
* Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.
** Display windows and similar glazing are excluded from the U-value check. *** Values for rooflights refer to the horizontal position.
^ For fire doors, limiting U-value is 1.8 W/m²K
NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m²]	974.5	974.5
External area [m²]	1255.9	1255.9
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	3	3
Average conductance [W/K]	485.04	626.8
Average U-value [W/m²K]	0.39	0.5
Alpha value* [%]	26.16	10

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

Building Use

% Area	Building Type
	Retail/Financial and Professional Services
	Restaurants and Cafes/Drinking Establishments/Takeaways
100	**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/m²]

	Actual	Notional
Heating	8.75	7.2
Cooling	4.93	3.41
Auxiliary	2.81	6.59
Lighting	6.02	8.55
Hot water	2.63	2.26
Equipment*	36.15	36.15
TOTAL**	**25.14**	**28.02**

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

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	11.11	3.68
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*11.11*	*3.68*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	111.49	110.9
Primary energy [kWh_{PE}/m^2]	21.13	36.18
Total emissions [kg/m²]	2.08	3.39

Be Green
Residential

Block Compliance Report - DER

Block Reference: GDM01139 300 Grey's Inn Road	Block Name:			
Property-Assessment Reference	Floor area (m^2)	DER ($kgCO_2/m^2$)	TER ($kgCO_2/m^2$)	% DER/TER
0001 AC - As Designed 2B4P Be Green	77.31	3.56	16.04	77.81 %
0003 - As Designed 2B4P Be Green	77.31	3.39	13.87	75.56 %
0005 - As Designed 2B4P Be Green	77.31	3.55	14.41	75.36 %
0002 - As Designed 1B2P Be Green	56.89	4.18	16.96	75.35 %
0004 - As Designed 1B2P Be Green	56.89	3.58	14.64	75.55 %
0006 - As Designed 1B2P Be Green	56.89	3.13	15.03	79.17 %
0007 - As Designed 3B5P Be Green	90.49	3.76	15.54	75.80 %
Totals:	493.09	25.15	106.49	
Average DER = 3.59 $kgCO_2/m^2$	% DER/TER	PASS		
Average TER = 15.18 $kgCO_2/m^2$	76.33 %			

Block Compliance Report - DFEE

Block Reference: GDM01139 300 Grey's Inn Road	Block Name:			
Property-Assessment Reference	Floor area (m^2)	DFEE ($kWh/m^2/yr$)	TFEE ($kWh/m^2/yr$)	% DFEE/TFEE
0001 AC - As Designed 2B4P Be Green	77.31	42.17	49.89	15.47 %
0003 - As Designed 2B4P Be Green	77.31	30.49	40.15	24.07 %
0005 - As Designed 2B4P Be Green	77.31	32.98	42.57	22.52 %
0002 - As Designed 1B2P Be Green	56.89	39.61	47.47	16.55 %
0004 - As Designed 1B2P Be Green	56.89	27.62	36.89	25.14 %
0006 - As Designed 1B2P Be Green	56.89	29.40	38.68	23.99 %
0007 - As Designed 3B5P Be Green	90.49	40.81	50.90	19.83 %
Totals:	493.09	243.08	306.54	
Average DFEE = 35.20 $kgCO_2/m^2$	% DFEE/TFEE	PASS		
Average TFEE = 44.33 $kgCO_2/m^2$	20.59 %			

Appendix C – Services Input

Commercial

System Detail	Be Lean	Be Green/ Proposed
Office		
Ventilation Type	MVHR - Supply and Extract	MVHR - Supply and Extract
Heat Recovery	Plate Heat Exchanger	Plate Heat Exchanger
HVAC Type	VRF	VRF
Exchanger Efficiency	0.75	0.75
Supply & Extract SFP W/l/s	1.4	1.4
Demand Control Ventilation?	Yes	Yes
Toilets		
Ventilation Type	Extract only	Extract only
HVAC Type	Electric Panel Heater	Electric Panel Heater
Flow Rate l/s/m² or ACH	10 ACH	10 ACH
Extract Fan SFP W/l/s	0.4	0.4
Fan Type	Remote from zone	Remote from zone
Stairwell and corridors		
Ventilation Type	MVHR - supply and extract	MVHR - supply and extract
Heat Recovery	Plate Heat Exchanger	Plate Heat Exchanger
HVAC Type	local electric heaters	local electric heaters
Exchanger Efficiency	0.75	0.75
Supply & Extract SFP W/l/s	1.4	1.4
Demand Control Ventilation?	No	No
Showers		
Ventilation Type	MVHR - Supply and Extract	MVHR - Supply and Extract
Heat Recovery	Plate Heat Exchanger	Plate Heat Exchanger
HVAC Type	VRF	VRF
Exchanger Efficiency	0.75	0.75
Supply & Extract SFP W/l/s	1.4	1.4
Demand Control Ventilation?	No	No
Heating Circuit		
Fuel Source	Heat Pump	Heat Pump
Heat Pump?	Yes	Yes
SCOP	2.64	3.28
Cooling Circuit		
Fuel Source	Grid Supplied Electricity	Grid Supplied Electricity
Cooling Source Type	Heat Pump	Heat Pump
EER	4.44	4.81
SEER	4.44	4.81
DHW Circuit - shower		
Fuel Source	central calorifier	central calorifier
Efficiency %	2.64	3.28
Storage Volume (Litres)	570	570
Standing Loss	0.0067	0.0067
DHW Circuit		
Fuel Source	local electric	local electric
Efficiency %	100%	100%
Storage Volume (Litres)	15	15
Storage Loss (kWh/Annum)	0.045	0.045
Lighting		
Auto Presence Detection	Auto on Off	Auto on Off
Daylight control	PIR + Daylight dimming	PIR + Daylight dimming
Luminaire Lumens/ Circuit Watt	110 lm/cw 80 lm/cw = display	110 lm/cw 80 lm/cw = display
Parasitic power (W/m²)	0.1	0.1
Other		
Pump speed	Variable speed via multiple pressure sensors	Variable speed via multiple pressure sensors
HVAC systems metering	Yes	Yes
HVAC systems 'out of range' warning	Yes	Yes
Lighting systems metering	Yes	Yes
Lighting systems 'out of range' warning	Yes	Yes
Power factor correction	>0.95	>0.95
Renewables - PV		
Azimuth	-	50% east 50% west
Inclination	-	10
Surface Area m²	-	1.02 x 1.63 =1.66m², 40 panels x 1.66 m²= 66.5m²
Efficiency %	-	20.50%
Installed Capacity		14.8kWp

Residential

System Detail	Be Green
Ventilation	
Ventilation Type	Local MVHR units
Heating Circuit - Apartment	
Fuel Source	Grid Supplied Electricity
Heat Pump?	Yes
Model	Bosch CS7001iAW 17 ORE-T
DHW Circuit - Toilet	
Fuel Source	Electricity
Heat Pump?	No
Efficiency %	As per main heating
Lighting	
Auto Presence Detection	Manual
Daylight control	No Dimming in Apartments
Luminaire Lumens/ Circuit Watt	Apartment = 100 lm/cw
Renewable	
PVs	370W x 33panels = 12.21kWp

Appendix D – Overheating & Cooling

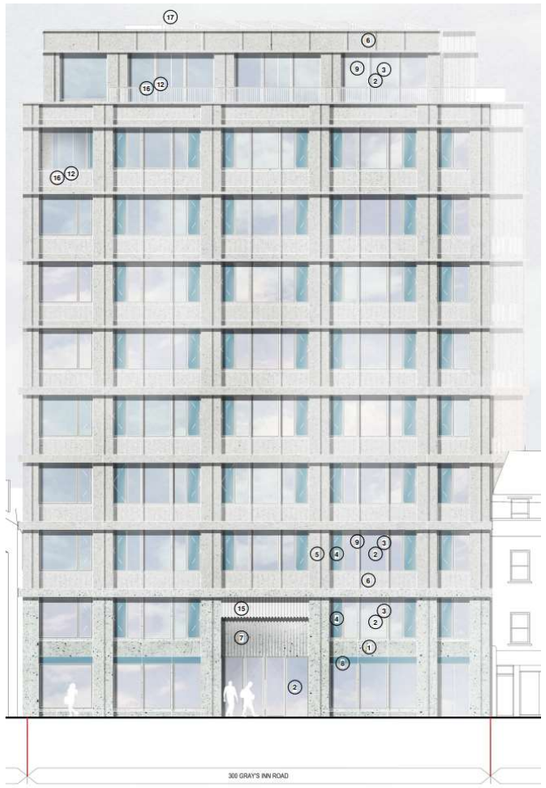
The proposed commercial development has been designed to minimise its use of energy intensive cooling systems through passive and energy efficient measures. To reduce the need for cooling and reduce the risk of overheating, the following measures have been taken in accordance with Camden's local plan policy 8.42 and in line with London Plan Policy SI 4.

- Minimising internal heat generation - Plug-loads and occupant densities associated with office activities cannot be altered beyond the client's brief. Therefore, the only area that can be targeted is the lighting. Low energy, high efficacy, Light Emitting Diode (LED) lighting will be used through-out the development to minimize internal heat gains.
- Reducing the amount of heat entering the building - The development facades have undergone design review to control the amount of solar gain entering internal spaces. The façade elements have been specified with a low solar transmission g-value of 0.27 and use of carefully designed shading measures. There are external shading fins on all the façades, along with recessed windows which will also provide some shading to the windows.
- Use of thermal mass and high ceilings to manage the heat within the building.
- Passive ventilation - Opening windows and passive stack.
- Mixed Mode Cooling - local mechanical ventilation/cooling where required. The building uses low energy mechanical ventilation systems and air conditioning.
- Mechanical ventilation and active cooling systems - To deliver the high-performance internal environment required by the client, a mechanical ventilation and cooling strategy has been recommended. All equipment and plant will exceed the minimum requirements of the Approved Document Part L2 2021 of the Building Regulations for conventional space heating/ cooling systems, hot water systems and ventilation systems. MVHR units are to be employed to provide fresh air with a heat recovery efficiency of at least 75%. The heating and cooling systems shall be appropriately zoned, with local fast responding controls.

Natural ventilation where feasible will be used on this development. Mechanical ventilation/cooling is required to prevent overheating (see following section) and to provide adequate fresh air into the spaces in winter months when it is unlikely windows will be opened due to cold draughts. ASHP technology is found to be suitable to provide cooling for the office and reception areas of this development. Through a refrigeration cycle, external ambient air can be used as a heating or cooling medium. Air source heat pumps recover or reject heat from outside air and can deliver heating or cooling, or both to an occupied space.

Although electrically driven, in a heating only scenario, the energy savings achieved by this solution are classified as renewable once the electricity consumed by the units is considered. This has been recognised within the current London Plan. Where cooling is required, an argument can be made that heating only heat pumps would need to be supplemented by an additional external comfort cooling plant, thereby maintaining the renewable heating energy generated by "heating only" air source heat pumps. This has a detrimental impact in terms of cost, and increased noise from an external plant, when compared to the opportunity for utilising a common system. Therefore, an ASHP providing both heating and cooling via VRF is proposed for the development. In terms of energy calculations, the improvement achieved via ASHP cooling combined with VRF is calculated at this 'Be Lean' stage.

Commercial Development



KEY:
1. Stone/Precast with Larger Grain Aggegrate
2. Glazing
3. Light Metal Window Frame with Internal Timber Reveal
4. Openable Metal Panel, with Perforation
5. Concrete with Smaller Grain Aggregate
6. Ribbed Concrete Panel with Smaller Grain Aggregate
7. Ribbed Concrete Panel with Larger Grain Aggregate
8. Metal Panel
9. Vertical Concrete with Smaller Grain Aggregate Fins
10. Buff Brick Flemish Bond
11. Buff Brick Soldier Bond
12. Metal Ballustrade
13. Metal Bike Enclosure with Perforated Screen
14. Air Source Heat Pump
15. Translucent Fluted Lantern
16. Landscape - refer to Landscape Architect Design
17. Photovoltaics - refer to MEP information
18. Louvres
19. Metal Screening to Balcony
20. Door - Glazed
21. Door - Metal
22. Door - Louvered
23. Dry Riser Outlet

Figure 17 Proposed Façade of the commercial development showing openable windows and external fins

Figure 18 Façade of the commercial development

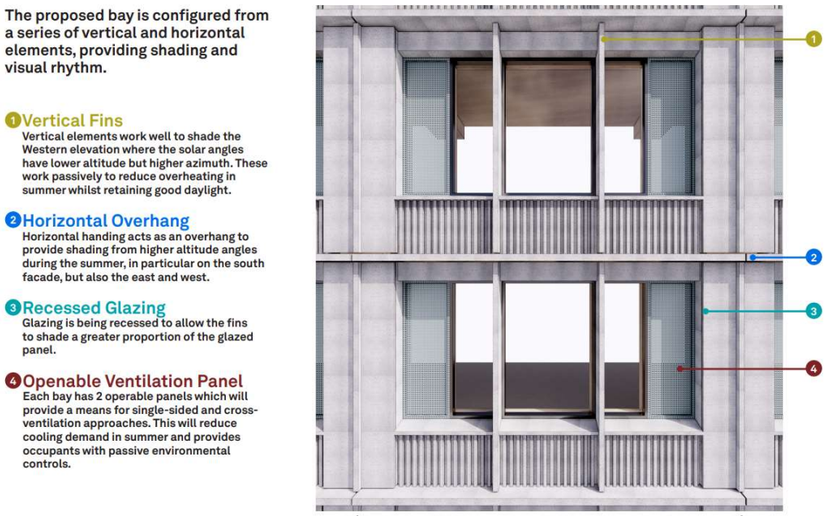


Figure 19 Elevation showing the proposed overheating mitigation measures for the commercial development

Active Cooling

The Part L assessment also provides a quantification of the energy demand likely to be expected of the cooling system. This is compared to the notional building benchmark demand to demonstrate compliance. The table below shows that the 'Actual' cooling demand for the development is 61.1 MJ/m^2, compared to 65.7 MJ/m^2 for the 'Notional' building. Therefore, the proposed design meets the cooling reduction requirements of Policy SI 4 of the London Plan.

Table 28 Non-Residential Space cooling demand

	Area weighted non-residential cooling demand (MJ/m^2)	Total area weighted non-residential cooling demand (MJ/year)
Actual	61.9	268,042.9
Notional	66.4	287,412.8

Overheating Risk Analysis

In line with GLA's planning requirements, all developments are required to undertake an analysis of overheating risk. The following sections present various methods for quantifying this risk.

As this is a non-domestic development, CIBSE guide TM52, entitled 'The Limits of Thermal Comfort: Avoiding Overheating in European Buildings', has been used as a guidance on the limits of thermal comfort. The development has been modelled and analysed using dynamic simulation modelling (DSM).

The following assumptions have been used for the overheating assessment:

- Approved software IES VE 2022 has been used in accordance with CIBSE 'AM11: Building Energy and Environmental Modelling'.
- The building is located in central London and is oriented 340.66° clockwise from due North.
- The simulation was run using the London Weather Centre DSY1 2020 high emissions 50% scenario weather file.
- The internal gains and occupancy lighting and equipment profiles are presented in Tables 9 and 10, respectively.
- The overheating modelling used the same fabric details as given in the Fabric Characteristics section of this report.
- No internal blinds were included in the modelling.
- Internal surfaces are expected to be lined and therefore thermal mass is assumed to be very low.

Internal Conditions

Table 29 - Internal Gains for the open plan office areas

Zone	Lighting Gain (W/m²)	Occupancy Gain		Equipment Gain (W/m²)
		Density (m²/person)	Sensible / Latent (W)	
Open Plan Office	8	8	75 / 55	25

Table 30 Occupancy, lighting, and equipment profiles for the open plan office areas

Profile Type	Profile
Occupancy, Lighting and Equipment	07:00-19:00 (100%)

Summer Overheating Criteria and Assumptions

An overheating assessment was carried out for the office areas using the CIBSE TM52 methodology. CIBSE TM52 (2013) sets three criteria by which a building can be classed as overheating.

- The first criterion sets a limit of 3% for the number of occupied hours that the operative temperature can exceed θ max during a typical non-heating season (i.e. 1 May to 30 September).
- The second criterion deals with the severity of overheating within any one day, which is given in terms of temperature rise and duration and sets a daily limit for acceptability.
- The third criterion sets an absolute maximum acceptable temperature for a room.

Proposed Design Openable Areas and Window Types

The simulation was based on an openable window angle of 30°. These areas applied to openable areas based off the architect drawings across the north and west façade while there is no cooling operating. Security of the windows and protection from falling and entrapment should be also taken into consideration when designing the ventilation openings.

Weather Files and Opening Profile

The CIBSE TM52 guidance requires that developments refer to the latest CIBSE Design Summer Year (DSY) weather files. Developments are required to pass the DSY1 file most appropriate for the site location for the 2020s, high emissions, 50th percentile scenario. The appropriate nearest available weather file location is the London City Weather file.

A summary of the different DSY weather files is presented below:

- DSY1 (Design Summer Year) for the 2020s, high emissions, 50% percentile scenario. This is categorised as a 'moderately warm summer'.
- DSY2 – a year with a very intense single warm spell.
- DSY3 – a year with a prolonged period of sustained warmth.

For the compliance weather file DSY1 2020, the window openings are assumed to be manually operated by occupants in response to internal temperatures. The window profile used for the assessment operates when internal dry bulb temperature is higher than 22°C. The ground floor reception and office areas are excluded from this assessment, as there are not enough window openings to provide sufficient natural ventilation and the window openable areas will be limited due to security reasons.

Night Cooling and Internal Blinds

Night-time cooling applied to all office areas between 19:00 in the afternoon and 7:00 in the morning.

Internal venetian blinds applied to all office areas during the summer months with the following specifications:

- External blinds to operate only during summer between April and September.
- They are covering the whole window surface.
- They will operate only when the incident irradiance variable is higher than 3,000 W/m².
- The blinds assumed to have the following specifications:
  - shading coefficient of 0.61
  - short-wave radiant fraction of 0.3.

Openable areas and Opening Types

The following figures show the openable areas and window types assumed in the proposed design model and the option with more openable window areas to mitigate the risk of overheating.

The overheating analysis was carried out based on the window sizes and openable areas as indicated in the architectural elevations. The middle-glazed windows on the west and north elevations are fixed, and all the south facade windows are also fixed without being able to provide cross ventilation to the office spaces.

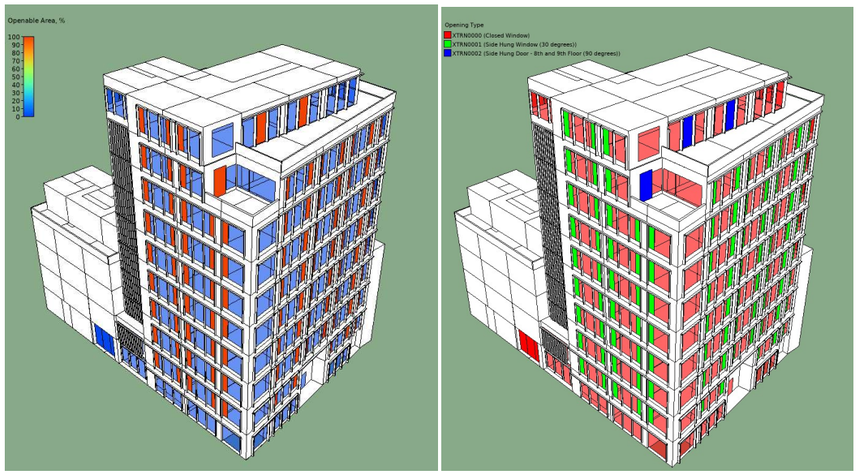


Figure 20 Openable areas and Opening Types for the proposed design of the commercial development

For the office areas to operate passively, more windows will need to be openable on all façades, as showing in the following figures.

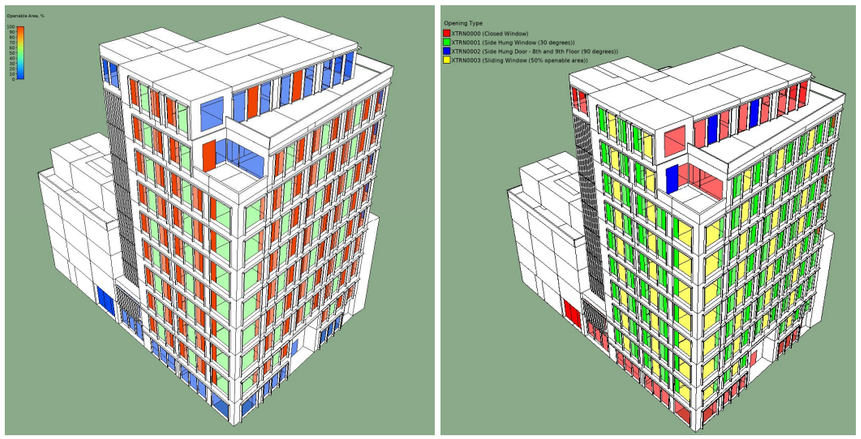


Figure 21 Openable areas and Opening Types for the option with more openable areas

Overheating Results

Summer Overheating Temperature exceeds 25°C

The following tables summarise the % of hours that the air temperature is within the range when occupied for each floor. The % hours in range in the offices should not exceed 25°C for more than 3% of occupied hours. The dynamic weather file used for this assessment was the 'London_LWC_DSY1_2020High50.epw'.

Table 31 Proposed design – DSY 1 2020 overheating assessment results for the commercial development

Floor	Overheating Threshold - % occupied hours above 25°	Air Temperature (°C) - % Hours in range (when occupied) - October to April	Air Temperature (°C) - % Hours in range (when occupied) - May to September
		>25°	>25°
GF	3	90.013	100.000
1	3	0.089	47.722
2	3	0.000	33.567
3	3	0.000	33.478
4	3	0.000	33.433
5	3	0.000	33.767
6	3	0.000	33.933
7	3	0.000	33.767
8	3	0.000	32.875
9	3	0.000	29.814

Mitigation measures have been examined to reduce cooling demand without the use of active cooling. The options examined include:

- Option 1 - the use of night-time purge ventilation
- Option 2 - the use of internal blinds
- Option 3 - increasing the openable window areas.

Table 32 Mitigation Measures Option 1 – Night Cooling

Floor	Overheating Threshold - % occupied hours above 25°	Air Temperature (°C) - % Hours in range (when occupied) - October to April	Air Temperature (°C) - % Hours in range (when occupied) - May to September
		>25°	>25°
GF	3	88.988	100.000
1	3	0.033	15.944
2	3	0.000	14.211
3	3	0.000	14.244
4	3	0.000	14.156
5	3	0.000	14.122
6	3	0.000	14.089
7	3	0.000	14.011
8	3	0.000	13.825
9	3	0.000	11.700

Table 33 Option 2 – Night Cooling and Internal Blinds

Floor	Overheating Threshold - % occupied hours above 25°	Air Temperature (°C) - % Hours in range (when occupied) - October to April	Air Temperature (°C) - % Hours in range (when occupied) - May to September
		>25°	>25°
GF	3	88.738	100.000
1	3	0.033	15.533
2	3	0.000	13.867
3	3	0.000	13.856
4	3	0.000	13.744
5	3	0.000	13.733
6	3	0.000	13.689
7	3	0.000	13.600
8	3	0.000	13.425
9	3	0.000	11.314

Table 34 Option 3 – Night Cooling, Internal Blinds and More Openable Areas

Floor	Overheating Threshold - % occupied hours above 25°	Air Temperature (°C) - % Hours in range (when occupied) – October to April	Air Temperature (°C) - % Hours in range (when occupied) – May to September
		>25°	>25°
GF	3	89.700	100.000
1	3	0.000	13.289
2	3	0.000	12.333
3	3	0.000	12.333
4	3	0.000	12.289
5	3	0.000	12.278
6	3	0.000	12.233
7	3	0.000	12.156
8	3	0.000	12.000
9	3	0.000	11.071

Summer Overheating TM52 results

The commercial development was assessed under the TM52 overheating criteria and the results for the new extension floors 7, 8 and 9 are presented in the following tables.

The results demonstrate that most of the spaces fail to pass the TM52 criteria for the proposed design. A few of the 8th and 9th floor spaces pass when night time applied, and all 9th floor spaces pass when blinds and more openable areas applied.

Room Name	Occupied days (%)	Criteria 1 (%Hrs Top-Tmax>=1K)	Criteria 2 (Max. Daily Deg.Hrs)	Criteria 3 (Max. DeltaT)	Criteria failing	Option 1 - Criteria 1 (%Hrs Top-Tmax>=1K)	Option 1 - Criteria 2 (Max. Daily Deg.Hrs)	Option 1 - Criteria 3 (Max. DeltaT)	Option 1 - Criteria failing	Option 2 - Criteria 1 (%Hrs Top-Tmax>=1K)	Option 2 - Criteria 2 (Max. Daily Deg.Hrs)	Option 2 - Criteria 3 (Max. DeltaT)	Option 2 - Criteria failing	Option 3 - Criteria 1 (%Hrs Top-Tmax>=1K)	Option 3 - Criteria 2 (Max. Daily Deg.Hrs)	Option 3 - Criteria 3 (Max. DeltaT)	Option 3 - Criteria failing
		Proposed Design				Option 1 – Night Cooling				Option 2 – Night Cooling, Internal Blinds				Option 3 – Night Cooling, Internal Blinds and More Openable Areas			
07-Office 01	71.2	7.1	40	6	1 & 2 & 3	3.1	26	4	1 & 2	4.4	33	5	1 & 2 & 3	3.1	26	4	1 & 2
07-Office 02	71.2	8.1	47	7	1 & 2 & 3	4.4	33	5	1 & 2 & 3	6	38	6	1 & 2 & 3	4.4	33	5	1 & 2 & 3
07-Office 03	71.2	8	43	6	1 & 2 & 3	3.6	32	5	1 & 2 & 3	5.3	33	5	1 & 2 & 3	3.4	31	5	1 & 2 & 3
07-Office 04	71.2	8	45	6	1 & 2 & 3	4.6	33	5	1 & 2 & 3	6	37	6	1 & 2 & 3	4.1	32	5	1 & 2 & 3
07-Office 05	71.2	8.9	48	6	1 & 2 & 3	4.7	33	5	1 & 2 & 3	6.6	37	5	1 & 2 & 3	4.1	32	5	1 & 2 & 3
07-Office 06	71.2	9.3	49	6	1 & 2 & 3	5	35	5	1 & 2 & 3	7	40	6	1 & 2 & 3	4.1	32	5	1 & 2 & 3
07-Office 07	71.2	7.5	41	6	1 & 2 & 3	3.3	28	4	1 & 2	4.4	29	5	1 & 2 & 3	2.4	25	4	2
07-Office 08	71.2	8.8	46	6	1 & 2 & 3	3.8	31	5	1 & 2 & 3	5.5	37	5	1 & 2 & 3	3.3	28	4	1 & 2
07-Office 09	71.2	8.5	46	6	1 & 2 & 3	4.1	33	5	1 & 2 & 3	5.5	35	5	1 & 2 & 3	3.4	29	5	1 & 2 & 3
08-Office 01	71.2	6.3	37	6	1 & 2 & 3	3.1	27	4	1 & 2	4.1	28	5	1 & 2 & 3	2.3	25	4	2
08-Office 02	71.2	4.8	36	5	1 & 2 & 3	3.2	28	5	1 & 2 & 3	4.1	33	5	1 & 2 & 3	3.1	27	5	1 & 2 & 3
08-Office 03	71.2	5.1	36	5	1 & 2 & 3	3	25	4	2	3.9	30	5	1 & 2 & 3	2.9	25	4	2
08-Office 04	71.2	7.8	45	6	1 & 2 & 3	4.4	33	5	1 & 2 & 3	5.4	34	5	1 & 2 & 3	3.7	32	5	1 & 2 & 3
08-Office 05	71.2	8	44	6	1 & 2 & 3	4	32	5	1 & 2 & 3	5	34	5	1 & 2 & 3	3.4	29	5	1 & 2 & 3
08-Office 06	71.2	7.3	41	6	1 & 2 & 3	3.4	30	5	1 & 2 & 3	5	33	5	1 & 2 & 3	3.4	29	5	1 & 2 & 3
08-Office 07	71.2	7.4	39	5	1 & 2 & 3	3.5	28	4	1 & 2	4.7	34	5	1 & 2 & 3	3	27	4	2
08-Office 08	71.2	8.6	46	6	1 & 2 & 3	4.4	33	5	1 & 2 & 3	5.7	36	5	1 & 2 & 3	3.6	30	5	1 & 2 & 3
09-Office 01	71.2	3.8	32	5	1 & 2 & 3	3	25	4	2	2.9	25	4	2	2.4	25	4	2
09-Office 02	71.2	3.1	28	4	1 & 2	2.3	25	4	2	2.1	25	4	2	2	24	4	2
09-Office 03	71.2	3.8	31	5	1 & 2 & 3	3.2	27	4	1 & 2	2.8	25	4	2	2.4	25	4	2
09-Office 04	71.2	4	33	5	1 & 2 & 3	3.4	28	4	1 & 2	2.9	27	4	2	2.7	25	4	2
09-Office 05	71.2	3.6	31	5	1 & 2 & 3	2.9	28	4	2	2.4	28	4	2	2.2	26	4	2
09-Office 06	71.2	2.6	27	4	2	2.2	24	4	2	2.1	24	4	2	2.1	24	4	2
09-Office 07	71.2	2.9	28	4	2	2.3	25	4	2	2.1	24	4	2	2	24	4	2

Overheating Results Conclusion

The results show that between October and April all floors pass the overheating criteria. Ground floor fails as there are no openings on this floor, however, increasing the number of openings is unviable due to security reasons. Furthermore, there are minimal openings on the south and east elevation due to fire needs adjacent to core and being on a party wall. Therefore, these windows are also not able to be opened.

However, all spaces fail to pass the overheating criteria during summer months between May to September for the proposed design. Mitigation measures have been examined to reduce cooling demand without the use of active cooling such as the use of night-time purge ventilation, the use of internal blinds, and increasing the openable window areas. The overheating analysis shows that even with the incorporation of the mitigation measures the commercial development still fails to pass the overheating criteria during the summer months.

Therefore, throughout the year, all occupied spaces will be supplemented with cooling that the natural ventilation cannot achieve. The results of the overheating analysis show that the building will be predominantly mechanically ventilated and cooled; however, openable windows will also be provided to offer additional cooling and fresh air if needed.

Residential Development

In line with Camden's 2017 Local Plan Policy CC2 Adapting to climate change, the Council requires development to be resilient to climate change.

All development should adopt appropriate climate change adaptation measures such as:

a. measures to reduce the impact of urban and dwelling overheating, including application of the cooling hierarchy.
b. ensuring development schemes demonstrate how adaptation measures and sustainable development principles have been incorporated into the design and proposed implementation.

The proposed residential development has been designed to minimise its use of energy intensive cooling systems through passive and energy efficient measures. To reduce the need for cooling and reduce the risk of overheating, the following measures have been taken in accordance with Camden's local plan policy 8.42 and in line with London Plan Policy SI 4.

- Minimising internal heat generation - Plug-loads and occupant densities associated with office activities cannot be altered beyond the client's brief. Therefore, the only area that can be targeted is the lighting. Low energy, high efficacy, Light Emitting Diode (LED) lighting will be used through-out the development to minimize internal heat gains.
- Reducing the amount of heat entering the building - The development facades have undergone design review to control the amount of solar gain entering internal spaces. The façade elements have been specified with a low solar transmission G-value of 0.50 and use carefully designed shading measures. There are external shading fins on all the façades, along with recessed windows which will also provide some shading to the windows.
- Use of thermal mass and high ceilings to manage the heat within the building.
- Passive ventilation - Opening windows and passive stack.
- Mixed Mode Cooling - local mechanical ventilation/cooling where required. The building uses low energy mechanical ventilation systems and air conditioning.
- Mechanical ventilation and active cooling systems - To deliver the high-performance internal environment required by the client, a mechanical ventilation and cooling strategy has been recommended. All equipment and plant will exceed the minimum requirements of the Approved Document Part L1 2021 of the Building Regulations for conventional space heating/ cooling systems, hot water systems and ventilation systems. MVHR units are to be employed to provide fresh air with a heat recovery efficiency of at least 91%. The heating and cooling systems shall be appropriately zoned, with local fast responding controls.

The following sections present various methods for quantifying this risk.

As this is a domestic development, Approved Document Part O: Overheating (ADO) of the Buildings Regulations and CIBSE guide TM59, entitled 'Dynamic Overheating Assessment for Dwellings and Residential Institutions, have been used as guidance on the limits of thermal comfort.

300 Gray's Inn is located in central London, in the London Borough of Camden. The address is 300 Gray's Inn Rd, London WC1X 8DX and according to Table C1 of Part O of the Building Regulations this is an area of high risk for overheating.

The proposed ventilation strategy is natural ventilation via openable windows where external conditions allow e.g. noise and pollution levels are appropriate.

Figure 22 Residential development south façade showing the recessed windows

Assumptions

- No internal blinds were included in the modelling.
- Ventilation was run completely naturally.

Methodology

1- Software used

Approved software IES VE 2022 has been used to create the model, assign thermal templates and construction profiles in accordance with CIBSE TM59. TM59 Report tool was used to generate the overheating results.

2- Guidance used

CIBSE TM59, Approved Document Part F and O and LETI Standards documents.
Thermal templates for internal gains including occupancy, equipment and lighting were assigned based on TM59 Report as shown on the following table.

Table 35 Internal Gains for the habitable main rooms.

Zone	Lighting Gain (W/m²)	Occupancy Gain		Equipment Gain
		Density (person)	Sensible / Latent (W)	
1B2P-Living/Kitchen/Dining. (LKD)	2	1	75/55	450 W
2B4P- LKD		2		
3B5P- LKD		3		
Double Bedroom		2		80 W
Single Bedroom		1		
Bathroom	-	-	-	1.75 W/m²
Circulation in flats	2	-	-	-

Opening Strategy and Equivalent area of windows

The equivalent areas for each type of window are shown in the following table. The following figures which are screen shots from IESVE, show opening type and other details in all assessed rooms.

Table 36 Type and other details of the windows in the habitable main rooms.

Window	Type	Length m	Height m	Opening angle °	Equivalent Area m²	Room Name
W1-A	L/K/D Balcony Door	1.3	2.6	90	3.467	01-02-1B2P-Kitchen+Dining
W1-B	L/K/D Balcony Door	1.2	2.6	90	3.195	01-02-03-2B4P-K/D/L
W1-C	L/K/D Balcony Door	1.3	2.6	90	3.467	04-3B5P-K/D/L
W2	Closed	1.2	2.6	-	-	-
W3	Side hung	1.75	2.6	30	2.633	01-02-03-1B2P-Double Bedroom
W4-A	Sliding door	1.2	2.6	-	3.260	01-02-03-2B4P-Double Bedroom 1
W4-B	Sliding door	1.2	2.6	-	3.289	01-02-03-1B2P-Living Room
W5-A	Bottom hung	1.2	2.6	30	3.048	01-02-03-2B4P-K/D/L
W5-B	Bottom hung	1.1	2.6	30	2.788	04-3B5P-K/D/L
W5-C	Bottom hung	1.2	2.6	90	3.033	04-3B5P-Double Bedroom 2
W5-D	Bottom hung	1.2	2.6	90	3.033	01-02-1B2P-Kitchen+Dining
W6-A	Balcony Door	1.2	2.25	90	2.806	04-3B5P-Single Bedroom
W6-B	Balcony Door	1.1	2.6	90	2.788	01-02-03-2B4P-Double Bedroom 2
W6-C	Balcony Door	1.0	2.25	90	2.283	04-3B5P-Double Bedroom 1
W6-D	Balcony Door	1.1	2.25	90	2.527	04-Corridor
W7	Bottom hung	1.2	2.6	30	3.048	01-02-03-2B4P-K/D/L

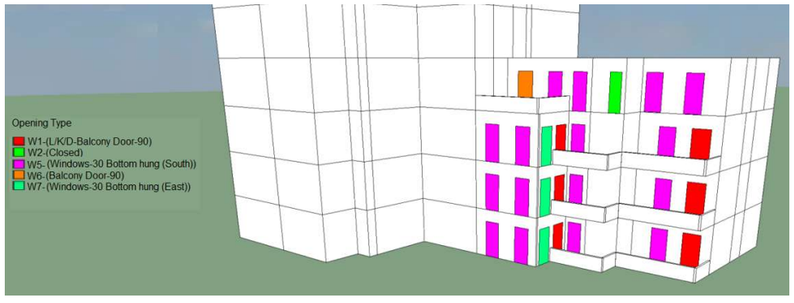


Figure 23. South facing opening type

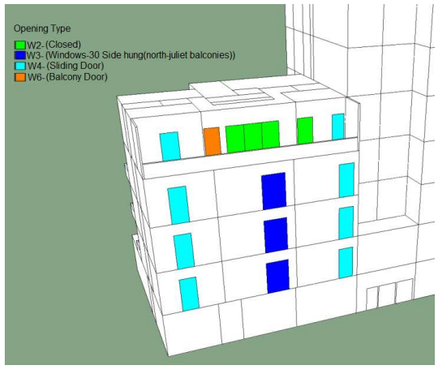


Figure 24 North facing opening type

Guidance

Overheating Compliance Calculations

The latest Building Regulations include a requirement for overheating within dwellings, this is a mandatory requirement on certain new buildings which follows the UK TM59 overheating methodology. The criteria are listed as following:

- CIBSE TM59 Criteria.
- Part O Criteria.

Naturally Ventilated Homes

For homes with natural ventilation (for example, with high levels of openable windows), CIBSE TM59 sets two criteria for compliance:

Criterion a: Hours of Exceedance (applying to living rooms, kitchens and bedrooms)

- During the non-heating season (1 May to 30 September), the temperature within living rooms, kitchens and bedrooms must not exceed the threshold comfort temperature, Tmax, by 1K or greater for more than 3 per cent of the occupied hours.

Criterion b: Night hours above 26°C (applying to bedrooms only). Should a dwelling fail either criterion then the risk of overheating is regarded as being unacceptable.

To ensure comfort while asleep, the operative temperature in bedrooms from 10 pm to 7 am must not exceed 26°C for more than 1 per cent of annual hours.

Part O Criteria

Based on the approved document of overheating mitigation, these limits should be applied when following the guidance in CIBSE's TM59. for creating windows profile in IES.

a. When a room is occupied during the day (8am to 11pm), openings should be modelled to do all of the following:
   i. Start to open when the internal temperature exceeds 22°C.
   ii. Be fully open when the internal temperature exceeds 26°C.
   iii. Start to close when the internal temperature falls below 26°C.
   iv. Be fully closed when the internal temperature falls below 22°C.
b. At night (11pm to 8am), openings should be modelled as fully open if both of the following apply:
   i. The opening is on the first floor or above and not easily accessible.
   ii. The internal temperature exceeds 23°C at 11pm.
c. When a ground floor or easily accessible room is unoccupied, both of the following apply:
   i. In the day, windows, patio doors and balcony doors should be modelled as open, if this can be done securely, following the guidance in paragraph 3.7 below.
   ii. At night, windows, patio doors and balcony doors should be modelled as closed.
d. An entrance door should be included, which should be shut all the time.

In addition, for new residential building the building's overheating mitigation strategy for use by occupants takes account of all of the following.

a. Noise at night.
b. Pollution.
c. Security.
d. Protection from falling.
e. Protection from entrapment.

In locations where external noise may be an issue, the overheating mitigation strategy should take account of the likelihood that windows will be closed during sleeping hours (11pm to 7am).

Windows are likely to be closed during sleeping hours if noise within bedrooms exceeds the following limits.

f. 40dB $L_{Aeq,T}$, averaged over 8 hours (between 11pm and 7am).
g. 55dB L_{AFmax}, more than 10 times a night (between 11pm and 7am).

Table 37 Rear/south façades for the proposed residential elements

Parameter	External	Internal	ADO Limit	Less than ADO Limit
Night-time $L_{Aeq\ (8\ hour)}$ (dB)	44	**31**	40	✓
Night-time L_{AFmax} (10th highest)	61	**48**	55	✓

Table 38 Front/North façades for the proposed residential elements

Parameter	External	Internal	ADO Limit	Less than ADO Limit
Night-time $L_{Aeq\ (8\ hour)}$ (dB)	60	**47**	40	**X**
Night-time L_{AFmax} (10th highest)	76	**63**	55	**X**

In-situ noise measurements (Auricl Noise Assessment) show that the ADO limits are not predicted to be exceeded for the residential façade facing into the site / south, therefore open windows would be acoustically feasible in this façade. There are no dwellings on the Ground floor or easily accessible bedroom windows and window opening areas have also been limited to prevent occupants falling and the Juliet balconies and terrace railing have been designed to prevent body parts becoming trapped.

However, the ADO limit is predicted to be exceeded for the residential façade facing north, therefore open windows would **not** be acoustically feasible in this façade.

In addition, openable windows in locations near to significant local pollution sources should be designed to minimise the intake of external air pollutants in accordance with Part F of the Building Regulations and either avoid or restrict openings that may be vulnerable to intrusion.

When determining the free area available for ventilation during sleeping hours, only the proportion of openings that can be opened securely should be considered to provide useful ventilation. This particularly applies in the following locations, where openings may be vulnerable to intrusion by a casual or opportunistic burglar. Openings which are intended to be open for long periods to reduce overheating risk could also pose a higher risk of falls from height. Louvered shutters, window railings and ventilation grilles should not allow body parts to become trapped.

Weather Files

Part O does not reference any information on weather and therefore the TM59 guidance should be followed. TM59 gives guidance on the expected weather data which should be considered when considering occupant comfort for residential dwellings. This includes a requirement to pass the overheating criteria when the most appropriate locations DSY1 2020s high emissions, 50% percentile scenario weather data is used. For this, the below weather file was used.

- 'London_LWC_DSY1_2020High50.epw', - DSY1 – A moderately warm summer.

It also states consideration of DSY2 and 3 as well as future years (2050s and 2080s) should be considered to further test designs of particular concern. Stating a pass for these weather files is not mandatory. Design summer years are available for today's standard analysis (2016 weather files) however they are also available from another batch of DSY weather files referenced as Future weather files. These future weather files include files for the same 14 location sites but cover different variables including, DSY types (1-3), emission scenarios, percentile, as well as three different time periods:

- 'London_LWC_DSY2_2020High50.epw' - DSY2 – A summer with a short intense spell.
- 'London_LWC_DSY3_2020High50.epw' - DSY3 – A summer with a longer less intense warm spell.
- London_LWC_2050s (2041 – 2070) and
- London_lwc_2080s (2071 – 2100).

Results

The assessment results included in this paragraph are taken from TM59 analysis tool results in IES. All rooms passed the strategy applied with, 'London_LWC_DSY1_2020High50.epw' weather file. However, none of the spaces pass using the intense warm spell DSY2 and prolonged period of sustained warmth DSY3 weather files, 'London_LWC_DSY2_2020High50.epw' and 'London_LWC_DSY3_2020High50.epw', respectively.

For the future weather files 2050 and 2080, all spaces fail to comply, and the strategy applied needs to be enhanced in all rooms in order to make rooms passing.

Table 39 DSY 1 2020 overheating assessment results.

Room Name	Occupied hours	Criteria a		Criteria b			Status
		No. hours ΔT ≥ 1°K	% Occupied hours ΔT ≥ 1°K	No. hours > 26°C 22:00-24:00	No. hours > 26°C 0:00-07:00	Total hours > 26°C	
01-1B2P-Double Bedroom	3,672	34	0.9	13	8	21	Pass
01-1B2P-Living Room	1,989	27	1.4	NA	NA	NA	Pass
01-1B2P-Kitchen+Dinig	1,989	27	1.4	NA	NA	NA	Pass
01-2B4P-Double Bedroom 2	3,672	31	0.8	12	5	17	Pass
01-2B4P-Double Bedroom 1	3,672	30	0.8	12	7	19	Pass
01-2B4P-K/D/L	1,989	40	2	NA	NA	NA	Pass
02-1B2P-Double Bedroom	3,672	33	0.9	12	8	20	Pass
02-1B2P-Living Room	1,989	27	1.4	NA	NA	NA	Pass
02-1B2P-Kitchen+Dinig	1,989	28	1.4	NA	NA	NA	Pass
02-2B4P-Double Bedroom 2	3,672	30	0.8	12	5	17	Pass
02-2B4P-Double Bedroom 1	3,672	31	0.8	12	5	17	Pass
02-2B4P-K/D/L	1,989	40	2	NA	NA	NA	Pass
03-1B2P-Double Bedroom	3,672	30	0.8	12	8	20	Pass
03-1B2P-Kitchen+Dinig	1,989	28	1.4	NA	NA	NA	Pass
03-2B4P-Double Bedroom 2	3672	33	0.9	12	5	17	Pass
03-2B4P-Double Bedroom 1	3672	26	0.7	12	6	18	Pass
03-2B4P-K/D/L	1989	39	2	NA	NA	NA	Pass
04-3B5P-Double Bedroom	3672	33	0.9	12	6	18	Pass
04-3B5P-K/D/L	1989	45	2.3	NA	NA	NA	Pass
04-3B5P-Single Bedroom	3672	27	0.7	12	6	18	Pass
04-3B5P-Double Bedroom	3672	45	1.2	12	5	17	Pass

Table 40 DSY 2 2020 overheating assessment results.

Room Name	Occupied hours	Criteria a		Criteria b			Status
		No. hours ΔT ≥ 1°K	% Occupied hours ΔT ≥ 1°K	No. hours > 26°C 22:00-24:00	No. hours > 26°C 0:00-07:00	Total hours > 26°C	
01-1B2P-Double Bedroom	3,672	82	2.2	24	24	48	Fail
01-1B2P-Living Room	1,989	70	3.5	NA	NA	NA	Fail
01-1B2P-Kitchen+Dinig	1,989	69	3.5	NA	NA	NA	Fail
01-2B4P-Double Bedroom 2	3,672	77	2.1	21	20	41	Fail
01-2B4P-Double Bedroom 1	3,672	74	2	23	24	47	Fail
01-2B4P-K/D/L	1,989	94	4.7	NA	NA	NA	Fail
02-1B2P-Double Bedroom	3,672	82	2.2	24	24	48	Fail
02-1B2P-Living Room	1,989	71	3.6	NA	NA	NA	Fail
02-1B2P-Kitchen+Dinig	1,989	71	3.6	NA	NA	NA	Fail
02-2B4P-Double Bedroom 2	3,672	75	2	20	20	40	Fail
02-2B4P-Double Bedroom 1	3,672	75	2	23	21	44	Fail
02-2B4P-K/D/L	1,989	93	4.7	NA	NA	NA	Fail
03-1B2P-Double Bedroom	3,672	76	2.1	23	25	48	Fail
03-1B2P-Kitchen+Dinig	1,989	71	3.6	NA	NA	NA	Fail
03-2B4P-Double Bedroom 2	3,672	83	2.3	21	24	45	Fail
03-2B4P-Double Bedroom 1	3,672	67	1.8	20	24	44	Fail
03-2B4P-K/D/L	1,989	88	4.4	NA	NA	NA	Fail
04-3B5P-Double Bedroom	3,672	82	2.2	23	25	48	Fail
04-3B5P-K/D/L	1,989	100	5	NA	NA	NA	Fail
04-3B5P-Single Bedroom	3,672	73	2	20	23	43	Fail
04-3B5P-Double Bedroom	3,672	100	2.7	20	20	40	Fail

Table 41 DSY 3 2020 overheating assessment results.

Room Name	Occupied hours	Criteria a		Criteria b			Status
		No. hours ΔT ≥ 1°K	% Occupied hours ΔT ≥ 1°K	No. hours > 26°C 22:00-24:00	No. hours > 26°C 0:00-07:00	Total hours > 26°C	
01-1B2P-Double Bedroom	3,672	109	3	28	21	49	Fail
01-1B2P-Living Room	1,989	87	4.4	NA	NA	NA	Fail
01-1B2P-Kitchen+Dinig	1,989	87	4.4	NA	NA	NA	Fail
01-2B4P-Double Bedroom 2	3,672	101	2.8	24	16	40	Fail
01-2B4P-Double Bedroom 1	3,672	94	2.6	25	17	42	Fail
01-2B4P-K/D/L	1,989	118	5.9	NA	NA	NA	Fail
02-1B2P-Double Bedroom	3,672	105	2.9	28	21	49	Fail
02-1B2P-Living Room	1,989	87	4.4	NA	NA	NA	Fail
02-1B2P-Kitchen+Dinig	1,989	91	4.6	NA	NA	NA	Fail
02-2B4P-Double Bedroom 2	3,672	100	2.7	24	16	40	Fail
02-2B4P-Double Bedroom 1	3,672	94	2.6	24	17	41	Fail
02-2B4P-K/D/L	1,989	118	5.9	NA	NA	NA	Fail
03-1B2P-Double Bedroom	3,672	96	2.6	27	21	48	Fail
03-1B2P-Kitchen+Dinig	1,989	92	4.6	NA	NA	NA	Fail
03-2B4P-Double Bedroom 2	3,672	111	3	24	17	41	Fail
03-2B4P-Double Bedroom 1	3,672	89	2.4	24	18	42	Fail
03-2B4P-K/D/L	1,989	116	5.8	NA	NA	NA	Fail
04-3B5P-Double Bedroom	3,672	108	2.9	24	18	42	Fail
04-3B5P-K/D/L	1,989	125	6.3	NA	NA	NA	Fail
04-3B5P-Single Bedroom	3,672	93	2.5	24	17	41	Fail
04-3B5P-Double Bedroom	3,672	129	3.5	24	17	41	Fail

Table 42 DSY 1 2050 overheating assessment results.

Room Name	Occupied hours	Criteria a		Criteria b			Status
		No. hours ΔT ≥ 1°K	% Occupied hours ΔT ≥ 1°K	No. hours > 26°C 22:00-24:00	No. hours > 26°C 0:00-07:00	Total hours > 26°C	
01-1B2P-Double Bedroom	3,672	99	2.7	44	27	71	Fail
01-1B2P-Living Room	1,989	77	3.9	NA	NA	NA	Fail
01-1B2P-Kitchen+Dinig	1,989	72	3.6	NA	NA	NA	Fail
01-2B4P-Double Bedroom 2	3,672	81	2.2	36	23	59	Fail
01-2B4P-Double Bedroom 1	3,672	81	2.2	38	26	64	Fail
01-2B4P-K/D/L	1,989	112	5.6	NA	NA	NA	Fail
02-1B2P-Double Bedroom	3,672	96	2.6	41	27	68	Fail
02-1B2P-Living Room	1,989	77	3.9	NA	NA	NA	Fail
02-1B2P-Kitchen+Dinig	1,989	73	3.7	NA	NA	NA	Fail
02-2B4P-Double Bedroom 2	3,672	78	2.1	35	23	58	Fail
02-2B4P-Double Bedroom 1	3,672	83	2.3	36	26	62	Fail
02-2B4P-K/D/L	1,989	110	5.5	NA	NA	NA	Fail
03-1B2P-Double Bedroom	3,672	81	2.2	38	27	65	Fail
03-1B2P-Kitchen+Dinig	1,989	75	3.8	NA	NA	NA	Fail
03-2B4P-Double Bedroom 2	3,672	89	2.4	37	26	63	Fail
03-2B4P-Double Bedroom 1	3,672	72	2	34	26	60	Fail
03-2B4P-K/D/L	1,989	106	5.3	NA	NA	NA	Fail
04-3B5P-Double Bedroom	3,672	94	2.6	37	27	64	Fail
04-3B5P-K/D/L	1,989	119	6	NA	NA	NA	Fail
04-3B5P-Single Bedroom	3,672	74	2	34	25	59	Fail
04-3B5P-Double Bedroom	3,672	117	3.2	31	20	51	Fail

Table 43 DSY 1 2080 overheating assessment results.

Room Name	Occupied hours	Criteria a		Criteria b			Status
		No. hours ΔT ≥ 1°K	% Occupied hours ΔT ≥ 1°K	No. hours > 26°C 22:00-24:00	No. hours > 26°C 0:00-07:00	Total hours > 26°C	
01-1B2P-Double Bedroom	3,672	250	6.8	86	69	155	Fail
01-1B2P-Living Room	1,989	211	10.6	NA	NA	NA	Fail
01-1B2P-Kitchen+Dinig	1,989	201	10.1	NA	NA	NA	Fail
01-2B4P-Double Bedroom 2	3,672	242	6.6	77	56	133	Fail
01-2B4P-Double Bedroom 1	3,672	230	6.3	82	63	145	Fail
01-2B4P-K/D/L	1,989	295	14.8	NA	NA	NA	Fail
02-1B2P-Double Bedroom	3,672	247	6.7	86	68	154	Fail
02-1B2P-Living Room	1,989	213	10.7	NA	NA	NA	Fail
02-1B2P-Kitchen+Dinig	1,989	207	10.4	NA	NA	NA	Fail
02-2B4P-Double Bedroom 2	3,672	234	6.4	77	55	132	Fail
02-2B4P-Double Bedroom 1	3,672	226	6.2	80	59	139	Fail
02-2B4P-K/D/L	1,989	291	14.6	NA	NA	NA	Fail
03-1B2P-Double Bedroom	3,672	222	6	84	68	152	Fail
03-1B2P-Kitchen+Dinig	1,989	214	10.8	NA	NA	NA	Fail
03-2B4P-Double Bedroom 2	3,672	257	7	79	59	138	Fail
03-2B4P-Double Bedroom 1	3,672	203	5.5	78	59	137	Fail
03-2B4P-K/D/L	1,989	279	14	NA	NA	NA	Fail
04-3B5P-Double Bedroom	3,672	253	6.9	81	64	145	Fail
04-3B5P-K/D/L	1,989	342	17.2	NA	NA	NA	Fail
04-3B5P-Single Bedroom	3,672	214	5.8	78	58	136	Fail
04-3B5P-Double Bedroom	3,672	360	9.8	86	72	158	Fail

Conclusion

With the strategy applied, 100% of the habitable rooms passed the assessment during the current climate scenario with DSY1 weather file, none of the spaces passed the assessment with harsher climate scenario, DSY2 and DSY3. Also, none of the rooms passed the assessment during the future climate scenario, 2050s and 2080s even with moderately summer temperature DSY1 weather file.

Compliance with the weather files DSY 2 and DSY 3 and future weather files is not mandatory, however, extra measures need to be applied in harsher summer and future climate scenarios to mitigate the overheating risks. Update the design by making the fixed windows openable, if there is no noise or pollution risk, might help with decreasing the interior temperature in the failed rooms. The occupants should also be able to mitigate overheating through use of local fans and shutting internal blinds during the particularly long or particularly intense hot periods.

The design should follow the cooling hierarchy that includes:

- Passive ventilation: larger windows that do not let in too much direct sun or adding coating to the glazing that absorb excess solar gains, adding shading such as blinds, roller shutters with ventilation louvres.
- Mechanical ventilation; MVHR (Mechanical Ventilation with Heat Recovery); and
- Active cooling; heat pump or air conditioning.

Total number of assessed rooms	Number of rooms passed					Number of rooms failed				
	2020			2050	2080	2020			2050	2080
	DSY1	DSY2	DSY3	DSY1	DSY1	DSY1	DSY2	DSY3	DSY1	DSY1
21	21	0	0	0	0	0	21	21	21	21

Appendix E – ASHP Efficiencies

Commercial

The 300 Gray's Inn office areas will be provided with a new heat recovery type VRF (variable refrigerant flow) air conditioning systems in order to maintain the comfort conditions stated under the overheating section.

Details of the Seasonal Coefficient of Performance (SCOP) and/or Seasonal Energy Efficiency ratio (SEER) for the selected model, and how these have been calculated are shown below. This is to be reviewed at the next Stage 3 once detailed calculations are completed.

R32 HVRF Heat Recovery - Standard Efficiency

Seasonal Efficiency	Best Possible		Standard		Part L	
	SEER (C)	SCOP	SEER (C)	SCOP	SEER (C)	SCOP
PURY-M200YNW-A1	6.23	3.65	5.53	3.50	10.71	5.64
PURY-M250YNW-A1	5.90	3.59	5.28	3.50	9.60	5.32
PURY-M300YNW-A1 – 2 x main HBC	6.38	3.54	5.47	3.50	9.80	6.28
PURY-M300YNW-A1 – 1 x main HBC	5.61	3.32	4.81	3.28	8.35	5.97
PURY-M350YNW-A1 – 2 x main HBC	6.69	3.56	5.79	3.50	10.28	6.24
PURY-M350YNW-A1 – 1 x main HBC	5.88	3.29	5.10	3.23	8.39	7.77
PURY-M400YNW-A1	6.12	3.55	4.90	3.50	9.42	6.27
PURY-M450YNW-A1	6.56	3.54	5.17	3.50	10.09	6.23
PURY-M500YNW-A1	5.87	3.59	4.81	3.50	9.03	6.21

CITY MULTI

How efficient is a product?

HVAC products will vary performance over the changing seasons and application conditions. Peak heating or cooling output is required for less than 10% of the year.

Seasonal Efficiency takes in to account the energy efficiency of the system at varying temperatures and partial loads over the course of a year.

Therefore it is widely accepted that seasonal energy efficiency is the most appropriate and accurate efficiency figure to use when assessing how a heating or cooling system will perform when installed in a building.

Seasonal efficiency numbers are defined as:

SEER Seasonal Energy Efficiency Ratio for Cooling

SCOP Seasonal Coefficient of Performance for Heating

Using a plants SEER or SCOP has been widely adopted in the UK HVAC industry to build energy models, run cost calculations and ensure products meet the MEPS of their ErP Lot.

Setting the Standard - MEPS

One of the most significant aspects of the ErP is that it requires measurement of the efficiencies to be carried out by manufacturers to agreed national and European standards.

As part of the Brexit transition, Part L is likely to be updated to incorporate the Lot 21/6 EN14825 methodology.

These standards are set out in the Official Journal of the European Union (OJEU), and they provide a 'presumption of conformity with the Regulations.' The MEPS required for products are widely agreed to be very demanding.

For air conditioning outdoor units, they must meet the MEPS for seasonal energy efficiency listed below:

	Minimum efficiency: 1/1/2018		Minimum efficiency: 1/1/2021	
	Cooling	Heating	Cooling	Heating
Air-to-air air conditioners, driven by an electric motor, except rooftop air conditioners	181% (4.60)	133% (3.40)	189% (4.80)	137% (3.50)

Information from Official Journal of the European Union, EU 2016/2281, Annex II Tables 3 and 4.

Cooling capacity and Global Warming Potential (GWP) of the refrigerant are also taken into account when setting these minimum targets. It is important to note that the requirements of the ErP are very specific, and compliance with the directive may or may not apply to a product depending on how it is used in a project.

There are detailed guidelines to accompany Regulation 2016/2281 that offer more in-depth advice on how the energy efficiency measures should be applied to a type of product.

Residential

WORCESTER BOSCH

7001iAW and AWE wall-hung indoor unit Technical information

Suitable for renovation projects (building dependent) and new build, our 7001iAW outdoor unit monobloc design houses all refrigeration circuit components, including the inverter and circuit boards, keeping maintenance low.

Features and benefits

- A+++ at 35°C flow temperature
- Our outdoor unit is Quiet Mark certified, to comply with even the strictest noise regulations
- Heating mode from -20°C to 35°C (outside temperature)
- Cooling mode from 15°C to 45°C (outside temperature)
- Inverter-driven compressor
- Integrated drain tray and coastal protection as standard
- Built-in back up electric booster for heating and hot water
- Up to a 7 year guarantee* on our outdoor unit and indoor unit

Product name (outdoor unit)	7001iAW 5kW	7001iAW 7kW	7001iAW 9kW	7001iAW 13kW	7001iAW 17kW
Part number (outdoor unit)	8 738 210 255	8 738 210 256	8 738 210 257	7 738 602 089	7 738 601 999
Product name (indoor unit)	AWE 5-9kW	AWE 5-9kW	AWE 5-9kW	AWE 13-17kW	AWE 13-17kW
Part number (indoor unit)	7 738 602 107	7 738 602 107	7 738 602 107	7 738 602 108	7 738 602 108
ErP Data					
Regulation year	2019	2019	2019	2019	2019
Regulation code	811/2013	811/2013	811/2013	811/2013	811/2013
Energy efficiency class (35°C)	A+++	A+++	A+++	A+++	A+++
Energy efficiency class (55°C)	A+++	A+++	A+++	A+++	A+++
Heating power at A2/W35*	5.32	6.26	8.95	13.07	14.37
Coefficient of performance (COP) at +7/W35*	4.69	5.31	5.02	4.68	4.87
Sound pressure level at a distance of 1m dB(A)	39	39	40	47	45
Sound power levels outdoors dB(A)**	47	47	48	55	53
Maximum temperature of flow (heat pump only)	62°C	62°C	62°C	62°C	62°C

*Performance data in accordance with EN 14511.
**Sound level in accordance with EN 12102.

Accessories

50 litre buffer tank	Acoustic hood	Green Storage WB Range Heat Pump cylinder
		

Controls

CR10H Room controller


*Terms and conditions apply. For full terms and conditions please visit worcester-bosch.co.uk/heat-pump-tc

Technical Specifications

Product	7001iAW 5kW	7001iAW 7kW	7001iAW 9kW	7001iAW 13kW	7001iAW 17kW
Heating power at A-7/W35*	4.7	5.93	6.21	11.5	13.02
Seasonal space heating energy efficiency ηS% (35°C)	183%	203%	194%	179%	191%
Seasonal space heating energy efficiency ηS% (55°C)	131%	144%	145%	126%	142%
Seasonal space heating energy efficiency ηS% (55°C) with supplied temperature controller	133%	146%	147%	128%	144%
Seasonal coefficient of performance (SCOP) (35°C)	4.65	5.16	4.93	4.54	4.85
Seasonal coefficient of performance (SCOP) (55°C)	3.34	3.67	3.70	3.24	3.61
Seasonal coefficient of performance (SCOP) (55°C) with supplied temperature controller	3.40	3.73	3.75	3.29	3.66
Fuse rating for supplying the heat pump directly via the building connection** (outdoor unit)	10	16	16	25	13
Seasonal water heating energy efficiency ηwh% (average climate)	N/A	N/A	N/A	N/A	N/A
Dimensions (WxHxD mm) - outdoor unit	930x1380x440	930x1380x440	930x1380x440	1122x1695x545	1122x1695x545
Weight (kg) - outdoor unit (without walls and top cover)	89	89	96	154	165
Weight (kg) - outdoor unit (with walls and top cover)	106	107	114	182	193
Dimensions (WxHxD mm) - indoor unit	495x700x386	495x700x386	495x700x386	495x700x386	495x700x386
Weight (kg) - indoor unit	32	32	32	32	32
Expansion vessel (heating) - capacity (l)	8	8	8	8	8
Working outdoor temperature range (heating)	-20/35°C	-20/35°C	-20/35°C	-20/35°C	-20/35°C
Compressor type	Twin rotary compressor	Twin rotary compressor	Twin rotary compressor	Twin rotary compressor	Twin rotary compressor
Power supply - outdoor unit	230V 1N AC 50Hz	230V 1N AC 50Hz	230V 1N AC 50Hz	230V 1N AC 50Hz	400V 3N AC 50Hz
Electric booster heater (standard)	Yes	Yes	Yes	Yes	Yes
Pump type PCO	Grundfos UPM2K 25-75 PWM	Grundfos UPM2K 25-75 PWM	Grundfos UPM2K 25-75 PWM	Grundfos UPM GEO 25-85 PWM	Grundfos UPM GEO 25-85 PWM
Clearances of outdoor unit (front/side/back mm)	2000/2000/400*	2000/2000/400*	2000/2000/400*	2000/2000/400*	2000/2000/400*
Clearances of outdoor unit - with acoustic hood (front/side/back mm)	2000/2000/700*	2000/2000/700*	2000/2000/700*	2000/2000/700*	2000/2000/700*
Ingress protection rating - indoor unit	IPX1	IPX1	IPX1	IPX1	IPX1
Ingress protection rating - outdoor unit	IPX4	IPX4	IPX4	IPX4	IPX4
Temperature controller (weather compensation supplied)	Yes	Yes	Yes	Yes	Yes
Refrigerant type	R410A	R410A	R410A	R410A	R410A
Refrigerant charge (kg)	1.7	1.75	2.35	3.3	4.0

*Performance data in accordance with EN 14511.
**Fuse class gL/C.
*Clearance can be reduced on one side. This may lead to a higher noise level.

Zoom

To find out more visit worcester-bosch.co.uk/heatpumps

2 of 2

Issue C

BOSCH

Compress 7000i AW
CS7001iAW 17 OR-T
7738601998

To the extent applicable to the product, the following data are based on the requirements of Regulations (EU) 811/2013 and (EU) 813/2013.

Productdata	Symbol	Unit	7738601998
Energy Efficiency Class			A++
Energy efficiency class (low temperature application)			A+++
Rated heat output (average climate conditions)	Prated	kW	10
Rated heat output (low temperature application, average climate conditions)	Prated	kW	12
Seasonal space heating energy efficiency (average climate conditions)	η_S	%	142
Seasonal space heating energy efficiency (low temperature application, average climate conditions)	η_S	%	191
Annual energy consumption (average climate conditions)	Q_{HE}	kWh	5716
Annual energy consumption (low temperature application, average climate conditions)	Q_{HE}	kWh	5113
Annual energy consumption	Q_{HE}	GJ	-
Sound power level, indoors	L_{WA}	dB	41
Special precautions to be taken during assembly, installation or maintenance (if applicable): see product accompanying documents			
Rated heat output (colder climate conditions)	Prated	kW	9
Rated heat output (low temperature application, colder climate conditions)	Prated	kW	10
Rated heat output (warmer climate conditions)	Prated	kW	13
Rated heat output (low temperature application, warmer climate conditions)	Prated	kW	14
Seasonal space heating energy efficiency (colder climate conditions)	η_S	%	123
Seasonal space heating energy efficiency (low temperature application, colder climate conditions)	η_S	%	161
Seasonal space heating energy efficiency (warmer climate conditions)	η_S	%	171
Seasonal space heating energy efficiency (low temperature application, warmer climate conditions)	η_S	%	244
Annual energy consumption (colder climate conditions)	Q_{HE}	kWh	7114
Annual energy consumption (colder climate)	Q_{HE}	GJ	-
Annual energy consumption (warmer climate conditions)	Q_{HE}	kWh	3833
Annual energy consumption (low temperature application, colder climate conditions)	Q_{HE}	kWh	5997
Annual energy consumption (warmer climate)	Q_{HE}	GJ	-
Annual energy consumption (low temperature application, warmer climate conditions)	Q_{HE}	kWh	3097
Sound power level, outdoors	L_{WA}	dB	53
Air-to-water heat pump			Yes
Water-to-water heat pump			No
Brine-to-water heat pump			No
Low temperature heat pump			No
Equipped with a supplementary heater?			Yes
Heat pump combination heater			No
Declared capacity for heating for part load at indoor temperature 20 °C and outdoor temperature Tj			
Tj = - 7 °C (average climate conditions)	Pdh	kW	9,5
Tj = + 2 °C (average climate conditions)	Pdh	kW	5,6
Tj = + 7 °C (average climate conditions)	Pdh	kW	5,1
Tj = + 12 °C (average climate conditions)	Pdh	kW	6,0
Tj = bivalent temperature (average climate conditions)	Pdh	kW	10,1
Tj = operation limit temperature	Pdh	kW	7,5
For air-to-water heat pumps: Tj = - 15 °C (if TOL < - 20 °C)	Pdh	kW	7,1
Bivalent temperature (average climate conditions)	T_{biv}	°C	-10
Cycling interval capacity for heating (average climate conditions)	Pcych	kW	-
Degradation coefficient			-

Data at the time of printing. Latest version available on the Internet.

Bosch Thermotechnik GmbH - Junkersstrasse 20-24 - D-73249 Wernau 6721842463 (2021/09)

BOSCH

Compress 7000i AW
CS7001iAW 17 OR-T
7738601998

Productdata	Symbol	Unit	7738601998
Degradation co-efficient (average climate conditions)	Cdh		1,0
Declared coefficient of performance or primary energy ratio for part load at indoor temperature 20 °C and outdoor temperature Tj /			
Tj = - 7 °C (average climate conditions)	COPd		2,25
Tj = - 7 °C (average climate conditions)	PERd	%	-
Tj = + 2 °C (average climate conditions)	COPd		3,64
Tj = + 2 °C (average climate conditions)	PERd	%	-
Tj = + 7 °C (average climate conditions)	COPd		4,49
Tj = + 7 °C (average climate conditions)	PERd	%	-
Tj = + 12 °C (average climate conditions)	COPd		5,79
Tj = + 12 °C (average climate conditions)	PERd	%	-
Tj = bivalent temperature (average climate conditions)	COPd		1,90
Tj = bivalent temperature	PERd	%	-
Tj = operation limit temperature	COPd		1,65
Tj = operation limit temperature	PERd	%	-
For air-to-water heat pumps: Tj = - 15 °C (if TOL < - 20 °C)	COPd		1,96
For air-to-water heat pumps: Tj = - 15 °C (if TOL < - 20 °C)	PERd	%	-
For air-to-water heat pumps: Operation limit temperature	TOL	°C	-18
Cycling interval efficiency (average climate conditions)	COPcyc		-
Cycling interval efficiency	PERcyc	%	-
Heating water operating limit temperature	WTOL	°C	60
Power consumption in modes other than active mode			
Off mode	P_{OFF}	kW	0,024
Thermostat-off mode	P_{TO}	kW	0,017
In standby mode	P_{SB}	kW	0,024
Crankcase heater mode	P_{CK}	kW	0,011
Supplementary heater			
Rated heat output supplementary heater	Psup	kW	0,0
Type of energy input			Electric
Other items			
Capacity control			variable
Emissions of nitrogen oxides (only gas- or oil fired)	NO_x	mg/kWh	-
For air-to-water heat pumps: Rated air flow rate, outdoors		m^3/h	5600
For brine-to-water heat pumps: Rated brine flow rate, outdoor heat exchanger		m^3/h	-

Further important information for installation, maintenance as well as recycling and/or disposal are provided within the installation and operating manuals. Read and follow the installation and operating manuals.

Zoom

Bosch Thermotechnik GmbH - ... 2 of 2 6721842463 (2021/09)

Appendix F – BREEAM

BREEAM PRE-ASSESSMENT CHECKLIST

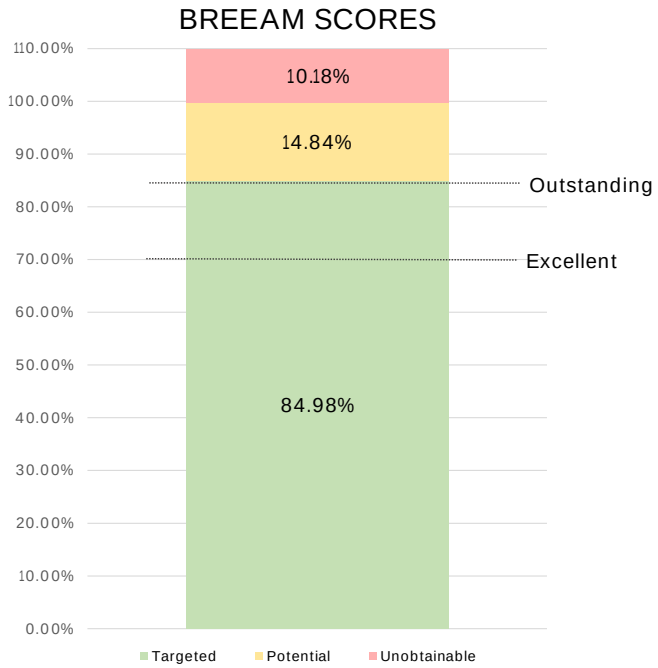
300 Gray's Inn Road

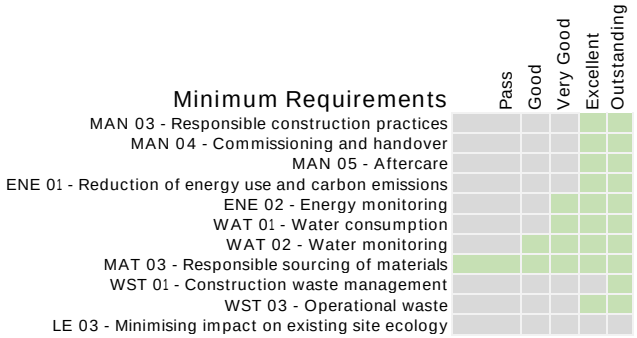
22/05/2023

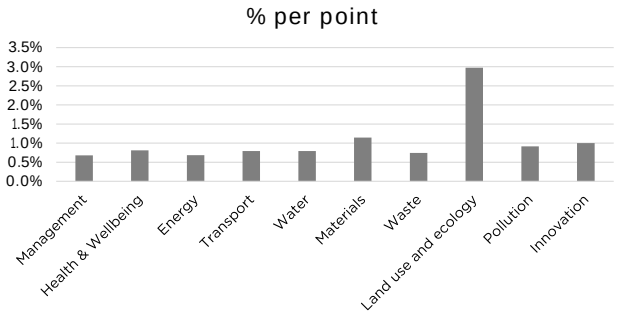
ASSESSMENT STATUS

DESKTOP PRE-ASSESSMENT	PRE-ASSESSMENT	DESIGN STAGE ASSESSMENT	CONSTRUCTION STAGE ASSESSMENT
Desktop Pre-assessment completed by BREEAM Assessor based on available information and assessor's experience.	Workshop Pre-assessment undertaken with Design team. Bespoke Assessment		

SUMMARY OF RESULTS







KEY ASSUMPTIONS

Site details

Site Name	300 Gray's Inn Road
Local planning authority	London Borough of Camden

Assessment

BREEAM Scheme	BREEAM UK BESPOKE
BREEAM Version	BESPOKE
Project type	Major Refurbishment
Boundary	Shell and Core

BREEAM PRE-ASSESSMENT CHECKLIST

300 Gray's Inn Road

BREEAM BESPOKE

Key

Av = Available

Targeted

Potential

Unobtainable

Minimum Requirements

		A MANAGEMENT - Requirements	C	T	P	U	Comments	Resp.
MAN 01 - Project Brief and Design	1	**One credit-Stakeholder consultation (project delivery)** 1. Project delivery stakeholders meet no later than RIBA Stage 2 to identify and define their roles, responsibilities and contributions for each of the key phases of project delivery. 2. Defining the roles and responsibilities for each key phase of the project, including (but not limited to): end user requirements, occupiers budget and technical expertise in maintaining any proposed systems, maintainability and adaptability requirements for training and aftercare support. 3. Demonstrate how the outcomes of the consultation process have influenced or changed the Initial Project Brief, including if appropriate, the Project Execution Plan, Communication Strategy, and the Concept Design. A clear sustainability brief is developed prior to Concept Design which sets out: a. Client requirements e.g. internal environmental conditions required b. Sustainability objectives and targets including target BREEAM rating, business objectives etc. c. Timescales and budget d. List of consultees and professional appointments that may be required e.g. Suitably Qualified Acoustician etc. e. Constraints for the project e.g. technical, legal, physical, environmental.		1			Design team to demonstrate how consultation has influenced the Initial Project Brief and Concept Design. **Stage 2 action:** Docs required: Stage 2 Project Execution Plan - to be developed by colliers (design responsibility matrix has been issued) - confirmed 16.03.23 Stage 2 kick off meeting minutes Supporting letter	COLLIERS
	1	**One credit-Stakeholder consultation (third party)** Undertake consultation in line with the established by BREEAM (which sets stakeholders and consultation topics). Consultation must be undertaken by Concept Design, feedback must be incorporated into the proposal and consultation feedback must be given to and received by, all relevant parties no later than detailed Design (RIBA Stage 4).		1			**Stage 2 action:** Undertake Community Consultation LCA are appointed via Gerald Eve to contact key stakeholders and hold a public exhibition. T&E to check LCA will be meeting relevant BREEAM criteria. Exchanges with Camden council already held with transport consultant Risk: BREEAM requires consultation to be undertaken in Stage 2.	COLLIERS
	1	**One credit-Sustainability Champion (design)** 1. A Sustainability Champion (BREEAM AP) is appointed no later than RIBA Stage 1. 2. BREEAM Rating Target is set by the Sustainability champion and agreed by client and design team no later than RIBA Stage 2. 3. The targeted BREEAM rating is achieved.		1			T&E to undertake the role at Concept Design stage. STAGE 1 & 2 CREDIT	TWIN&EARTH
	1	**One credit-Sustainability Champion (monitoring)** 1. The credit above is achieved. 2. The Sustainability Champion is appointed to monitor and report progress throughout the project. As a minimum must attend key project/design team meetings during the Concept Design, Developed Design and Technical Design stages and reporting during, and prior to, completion of each stage.		1			T&E to undertake the role from Concept Design stage. STAGE 2 CREDIT	TWIN&EARTH
MAN 02 - Life cycle cost and service life planning	2	**Two credits-Elemental life cycle cost (LCC)** 1. An elemental life cycle cost (LCC) analysis has been carried out, at RIBA Stage 2 together with any design option appraisals in line with 'Standardised method of life cycle costing for construction procurement' PD 156865:2008. 2. The LCC analysis shows options for basic structure and envelope also covering multiple cash flow scenarios e.g. 20, 30, 50+ years; It must also include a fabric and servicing strategy for the project outlining services component and fit-out options (if applicable) over a 15-year period.		2			Cost option appraisal to be undertaken and report issued prior to Stage 2 completion ACTION: Exigere to confirm appointment for LCC with Colliers STAGE 2 CREDIT	EXIGERE
	1	**One credit-Component level LCC Plan** 1. A component level LCC plan has been developed by the end of RIBA Stage 4 in line with PD 156865:2008 and includes: Envelope, Services, Finishes and External spaces. 2. Demonstrate, how the LCC plan has influenced building and systems design/specification to minimise life cycle costs and maximise critical value. - Part 1 assessments, including components within scope of works. - Envelope, e.g. cladding, windows, and/or roofing - Part 2 & 3 assessments including newly specified local and core services. - Newly specified local and/or core service equipment, e.g. boiler, air-conditioning, air handling unit, and/or controls etc. - Parts 1 – 4, where finishes are within scope of works. - Finishes, e.g. walls, partitions, floors and/or ceilings etc. - Where external spaces are within scope of works. - External spaces, e.g. alternative hard landscaping, boundary protection		1			Credit Component level LCC to be undertaken during RIBA Stage 4 and the recommendations implemented. ACTION: Exigere to confirm appointment for LCC with Colliers **STAGE 4 CREDIT**	EXIGERE
	1	**One credit-Capital Cost Reporting** 1. Report the capital cost for the building in pounds per square metre (£k/ m2), via the BREEAM Assessment Scoring and Reporting tool, Assessment Issue Scoring tab, Management section. Data will be treated as confidential and will only be used anonymously. Data for Design Stage compliance can be based on predicted capital cost, including contingencies.		1			It has been assumed that capital cost will be reported in line with the credit requirements Exigere confirmed credit achievable.	EXIGERE
MAN 03 - Responsible Construction Practices		**Pre-requisite** All timber and timber based products used on the project is 'Legally harvested and traded timber'.		Y			It has been assumed that all site timber will be legally harvested. Contractor responsibility	CONTRACTOR
	1	**One credit-Environmental management** 1. The principal contractor operates an environmental management system (EMS) covering their main operations (ISO 14001/EMAS) or equivalent standard; or have a structure that is in compliance with BS 8555:2003 and has reached phase four of the implementation stage, 'implementation and operation of the environmental management system', and has completed phase audits one to four, as defined in BS 8555. 2. The principal contractor implements best practice on-site in accordance with Pollution Prevention Guidelines, Working at construction and demolition-sites: PPG61.		1			It has been assumed that the Contractor will be required to comply with the credit requirements.	CONTRACTOR
	1	**One credit-Sustainability Champion** 1. A Sustainability Champion (like the contractor's environmental manager) to monitor environmental performance and ensure implementation of relevant measures during the Construction, Handover and Close Out stages 2. Will ideally be site based or will visit the site regularly to carry out spot checks (and record evidence including photos), with the relevant authority to do so and require action to be taken to address shortcomings in compliance, which should be reported at relevant project team meetings. 3. The BREEAM target rating forms a requirement of the principal contractor's contract and the rating is achieve at PC.		1			It has been assumed that the Contractor will be required to comply with the credit requirements.	CONTRACTOR
	2	**Two credits-Considerate construction** 1. One credit: a CCS score between 25 and 34 with at least 5 points achieved per section. 2. Two credits: a CCS score between 35 and 39 with at least 7 points achieved per section. **1 credit minimum requirement for Excellent rating.** **2 credits minimum requirement for Outstanding rating.**		2			It has been assumed that the Contractor will be required to comply with the credit requirements.	CONTRACTOR
		EXEMPLARY CRITERIA - Considerate construction A CCS score of 40 or more with at least 7 points achieved per section is achieved.		1			It has been assumed that the Contractor will be required to comply with the credit requirements.	CONTRACTOR
	2	**Two credits-Monitoring of refurbishment or fit-out-site impacts** 1. One credit: monitoring of water and energy consumption. 2. Two credits: monitoring of transport of construction materials to site and waste from site. Specific requirements apply depending on the parts being assessed. Contractor to liaise with BREEAM assessor.		2			It has been assumed that the Contractor will be required to comply with the credit requirements.	CONTRACTOR

MAN 04 - Commissioning and handover	1	**One credit-Commissioning and testing schedule and responsibilities** 1. Commissioning schedule covering commissioning and re-commissioning of building services and control systems and testing. 2. The schedule will identify the appropriate standards such as current Building Regulations, BSRIA and CIBSE guidelines. Specific requirements apply to BMS commissioning. 3. An appropriate project team member(s) is appointed to monitor and programme pre-commissioning, commissioning, testing and, where necessary, re-commissioning activities on behalf of the client. 4. The principal contractor accounts for the commissioning and testing programme, responsibilities and criteria within their budget and main programme of works.		1			It has been assumed that the Contractor will be required to comply with the credit requirements.	CONTRACTOR
MAN 04 - Commissioning and handover	1	**One credit-Commissioning Building Services** 1. The above credit is achieved. 2. A specialist commissioning manager is appointed for complex building systems during the design stage (by either the client or the principal contractor) with responsibility for: - Undertaking design reviews and giving advice on suitability for ease of commissioning. - Providing commissioning management input to construction programming and during installation stages. - Management of commissioning, performance testing and handover/post-handover stages.		1			It has been assumed that the Contractor will be required to comply with the credit requirements. Commissioning to be appointed through contractor during design stage.	CONTRACTOR
MAN 04 - Commissioning and handover	1	**One credit-Testing and inspection building fabric** **1** Where the fabric of the building is being upgraded, a thermographic survey as well as an airtightness test and inspection is undertaken by a Suitably Qualified Professional in accordance with the appropriate standard. 2. Any defects identified are rectified prior to building handover and close out.		1			It has been assumed that the Contractor will be required to comply with the credit requirements. Air and acoustic testing to be appointed.	CONTRACTOR
MAN 04 - Commissioning and handover	1	**One credit-Handover** 1. A Building User Guide (BUG) is developed **This is a minimum requirement for Excellent and Outstanding ratings.** 2. A training schedule is prepared for building occupiers/premises managers, timed appropriately around handover and proposed occupation plans, which includes the following content as a minimum: - The building's design intent - The available aftercare provision and aftercare team main contact(s), including any scheduled seasonal commissioning and post occupancy evaluation - Introduction to, and demonstration of, installed systems and key features, particularly building management systems, controls and their interfaces - Introduction to the Building User Guide and other relevant building documentation, e.g. design data, technical guides, maintenance strategy, operations and maintenance (O&M) manual, commissioning records, log book etc. - Maintenance requirements, including any maintenance contracts and regimes in place.		1			It has been assumed that handover will be undertaken in line with the credit requirements. To be noted that a BUG is to be developed as part of the requirements for this credit.	CONTRACTOR
		A HEALTH & WELLBEING - Requirements	C	T	P	U	Comments	Resp.
HEA 01 - Visual Comfort	3	**REFURBISHMENT** **Three credits -Daylighting** Credits are awarded on a sliding scale as follows: Option 1 - 1 credit if 40% of the areas achieve a DF of 2% - 2 credits if 60% of the areas achieve a DF of 2% - 3 credits if 80% of the areas achieve a DF of 2% AND The areas achieve a uniformity ratio of at least 0.3 or a minimum point daylight factor of at least 0.3 times the relevant average daylight factor below. For spaces with glazed roofs, such as atria, a 0.7 figure should be taken instead of 0.3. OR At least 80% of the room has a view of sky from desk or table top height (0.85m in multi-residential buildings, 0.7m in other buildings) and the depth criteria is met. Option 2 - 1 credit if 40% if the occupied spaces achieve average daylight illuminance of at least 300 lux for 2000 hours per year or more and a minimum illuminance at the worst lit point of at least 90 lux for 2000 hours per year or more. - 2 credits if 60% of the areas achieve a DF of 2% - 3 credits if 80% **Two credits -Daylighting** Daylighting provision, averaged over all relevant spaces, has improved after refurbishment or fit-out by 30% or more and there is a minimum glazing to floor area ratio of either: 5% glass to floor area ratio for side windows; OR 2.5% glass to floor area ratio for roof lights; **One credit -Daylighting** When it achieves 15% improvement.			3		Credits assumed achievable. Point 2 to assess credit requirements - and provide feedback (Andy to provide). 16.03.23	POINT2
		NEW BUILD - Extension(s) **Two credits -Daylighting** **ROUTE 1** When 80% of the occupied areas achieve an Average Daylight Factor (ADF) ≥2% AND one of the following: A uniformity ratio of at least 0.3 or a minimum point daylight factor of at least 0.3 times the above ADF. Glazed roofs, such as atria, must achieve a uniformity ratio of at least 0.7 or a minimum point daylight factor of at least 0.7 times the ADF. OR **ROUTE 2** When 80% of the other occupied areas achieve an average daylight illuminance of a least 300 lux for 2000 hours per year and a minimum daylight illuminance at worst lit point of at least 90 lux for 2000 hours per year. **One credit - Daylighting** As above, but for 60% of the occupied areas.						
		EXEMPLARY CRITERIA-Daylighting When daylighting levels in compliance with BREEAM exemplary performance criteria are achieved.			1		Assumed not targeted - subject to change upon daylight consultant feedback	POINT2
	2	**Two credits-View out** 1. 95% of the floor area in relevant building areas (areas with workstations/benches or where close work will be undertaken or visual aids will be used) is within 7m of a wall with an adequate view out. **One credit-View out** 1. Where 80% of the floor area achieved compliance with Criterion 1 above. 2. The window/opening is ≥ 20% of the surrounding wall area. Where the room depth >7m, compliance is only possible where the %window/opening ≥ values in table 1.0 of BS 8206. It must be noted that specific criteria applies to the type of view out depending on the building use. Additional criteria applies to Prison, Multi-residential and Healthcare buildings.			2		Credit assumed achievable. For 'shell & core' assessments all lettable space must be assessed (because desk locations are unknown). Haptic confirmed NIA in basements is meeting rooms so won't be considered in view-out assessment. Otherwise, all typical areas within 7m of external windows. 16.03.23 TBC if credit targeted following Point2 review.	POINT2

HEA 01 - Visual Comfort	1	**One credit-Internal and external lighting levels, zoning and control** **INTERNAL LIGHTING** - All fluorescent and compact fluorescent lamps are fitted with high frequency ballasts. - Illuminance levels in accordance with the SLL Code for Lighting 2012 and any other relevant industry standard. - Compliance with CIBSE LG7 for areas where computer screens are regularly used **EXTERNAL LIGHTING** Must be specified in accordance with BS 5489-1:2013 Lighting of roads and public amenity areas and BS EN 12464-2:2014 Light and lighting - Lighting of work places - Part 2: Outdoor work places. **ZONING AND OCCUPANT CONTROL** - Independent occupant control of areas including -but not limited to-: office zones of no more than four workplaces, workstations adjacent to windows/atria, presentation and audience areas in seminar and lecture rooms, zoning of seating areas, circulation space and lectern area in auditoria, servery and seating/dining areas in dining restaurant and café areas, bar and seating areas in bar areas.		1			To include in MEP spec	GDM
HEA 02 - Indoor air quality	1	**One credit-Indoor air quality (IAQ) plan** An indoor air quality plan has been produced which considers: removal of contaminant sources, dilution and control of contaminant sources, procedures for pre-occupancy flush out, protection of HVAC systems, procedures for protecting areas outside of the refurbishment zone that may be affected, third party testing and analysis and commitments for maintaining indoor air quality in-use.		1			A site-specific indoor air quality plan must be produced and implemented. Consultant appointed to IAQMP (Air quality consulting) - report to be issued to T&E	TBC
	1	**One credit-Ventilation** 1. Provide fresh air into the building in accordance with the criteria of the relevant standard for ventilation. 2. The building's air intakes and exhausts are over 10m apart and intakes are over 20m from sources of external pollution (unless relative position is designed in accordance with BS EN 13779:2007 Annex A2). 3. In naturally ventilated buildings/spaces: openable windows/ventilators are over 10m from sources of external pollution. 4. HVAC systems incorporate filtration as defined in BS EN 13779:2007 Annex A3. 5. Areas of the building subject to large and unpredictable or variable occupancy patterns (such as Auditoria, gyms, retail stores or malls, cinemas and waiting rooms) have carbon dioxide (CO_2) or air quality sensors specified which are linked to the mechanical ventilation system and provide demand-controlled ventilation to the space. **In naturally ventilated buildings/spaces:** sensors either have the ability to alert the building owner or manager when CO_2 levels exceed the recommended set point, or are linked to controls with the ability to adjust the quantity of fresh air, i.e. automatic opening windows/roof vents.			1		To be confirmed if achievable by GDM. ACTION: Marion (GDM) to check achievability - external NOx emissions known to be high 16.03.23	GDM
HEA 02 - Indoor air quality	1	**One credit-Adaptability - Potential for natural ventilation** Occupied spaces of the building are designed to be capable of providing fresh air entirely via a natural ventilation strategy. This is demonstrated when: - Room depths are designed in accordance with CIBSE AM10 (section 2.4) and the openable window area in each occupied space is equivalent to 5% of the gross internal floor area of that room/floor plate. OR - Cross ventilation is demonstrated via design tools recommended in CIBSE AM10. For fit-out projects (Part 3 assessments), local services are designed to provide fresh air via a natural ventilation strategy and are appropriately designed according to the room depth in accordance with CIBSE AM10. The natural ventilation strategy is capable of providing at least two levels of user-control on the supply of fresh air.			1		Credit kept as potential for now - credit requirements to be reviewed ACTION: Haptic to review and confirm if achievable	HAPTIC
HEA 04 - Thermal comfort	1	**One credit-Thermal modelling** 1. Thermal modelling is carried out using CIBSE AM11 compliant software. 2. The modelling demonstrates compliance with CIBSE Guide A summer and winter operative temperatures for A/C buildings or compliance with CIBSE Guide A winter temperature and compliance with CIBSE TM52 for summer temperatures. 3. 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. Note: Where undertaking a Part 4 assessment a competent person (e.g. chartered building services engineer) must assess the suitability of existing building services and controls to identify any changes that may be required as a result of fit-out works.		1			Credit confirmed achievable by GDM. 16.03.23	GDM
	1	**One credit-Adaptability - for a projected climate change scenario** 1. The above credit is achieved. 2.The thermal modelling demonstrates compliance with the requirements of the thermal comfort credit for a projected climate change environment. 3. Where criteria 2 is not met, the project team demonstrates how the building has been adapted, or designed to be easily adapted in future using passive design solutions in order to subsequently meet the requirements . 4. For air conditioned buildings, the PMV and PPD indices based on the above modelling are reported via the BREEAM assessment scoring and reporting tool.		1			Credit confirmed achievable by GDM. 16.03.23	GDM
	1	**One credit-Thermal zoning and controls** 1. The thermal comfort credit is achieved. 2. The thermal modelling analysis has informed the temperature control strategy for the building and its users. 3. The strategy for proposed heating/cooling system(s) has addressed the following: - Zones within the building and how the building services could efficiently and appropriately heat or cool these areas (for example different requirements for the central and perimeter areas). - Degree of occupant control (based on discussions with the end user or alternatively design guidance, case studies, feedback) considers: User knowledge of building services, Occupancy type, patterns and room functions, How the user is likely to operate or interact with the system(s), The user expectations and degree of individual control, How the proposed systems will interact with each other and how this may affect the thermal comfort of the building occupants and The need or otherwise for an accessible building user actuated manual override for any automatic systems.		1			Credit confirmed achievable by GDM. 16.03.23	GDM
HEA 05 - Acoustic performance	2	**One credit-Sound insulation and internal indoor ambient noise levels** The sound insulation between acoustically sensitive rooms and other occupied areas complies with the performance criteria given in BS 8233:2014. Pre-completion acoustic testing is carried out by a compliant test body in accordance with the acoustic testing and measurement procedures established by BREEAM. Indoor ambient noise levels comply with the design ranges given in BS 8233:2014. A programme of acoustic measurements is carried out by a compliant test body in accordance with the acoustic testing and measurement procedures established by BREEAM. **One credit-Reverberation** Achieve reverberation times compliant with Section 1 of BB93 - testing should be as follows: Reverberation times within teaching and study spaces: A programme of acoustic measurements is carried out by a compliant test body to achieve the required performance standards set out in table 6 in section 1 of BB93. Measurements should be carried out in accordance with the ANC Good Practice Guide, Acoustic testing of Schools. Open Plan teaching spaces: STI Measurements of the STI should be taken in at least one in ten typical student listening positions in the open plan spaces in accordance with the ANC Good Practice Guide, Acoustic testing of Schools. Corridors and stairwells: installation of a specification compliant with the BB93criteria demonstrates compliance. **Up to Three Credits - SQA** Meet performance and testing requirements as defined by an SQA.		2			Credit confirmed achievable by AURIC. 16.03.23	AURICL
HEA 06 - Safety & Security	1	**One credit-Security of site and building** 1. A Suitably Qualified Security Specialist (SQSS) conducts an evidence-based Security Needs Assessment (SNA) and develops a set of recommendations no later than RIBA Stage 2. 2. The recommendations are implemented.		1			KABSEC have provided a Security Needs Assessment. HAPTIC to include recommendations into the design. STAGE 2 CREDIT	SECURITY SPECIALIST

		A ENERGY - Requirements	C	T	P	U	Comments	Resp.
ENE 01 - Reduction of energy use and carbon emissions	14	**Energy Performance - Up to 15 credits** Credits achieved depending on the energy performance of the building. **Minimum requirements vary for different assessment types**		12.0			GDM will be undertaking the energy modelling. Target of 35% improvement over Part L so minimum 6 credits should be achieved. 16.03.23 Outstanding: 6 credits mandatory Excellent: 4 credits mandatory	GDM
		EXEMPLARY CRITERIA **Up to four credits - Zero regulated carbon** An equivalent percentage of the building's modelled 'regulated' operational energy consumption, is generated by carbon neutral on-site or near-site sources and used to meet energy demand from 'unregulated' building systems or processes. **Five credits - Carbon negative** The building is 'carbon negative' in terms of its total modelled operational energy consumption, including regulated and unregulated energy.				5	Credit assumed not achievable.	-
ENE 02 - Energy monitoring	2	**One credit-Sub-metering of major energy consuming systems** 1.Energy metering systems are installed that enable at least 90% of the estimated annual energy consumption of each fuel. 2. Buildings with a total useful floor area > 1,000m2 are metered using an appropriate energy monitoring and management system (BMS or equivalent). 3. The end energy consuming uses are identifiable to the building users (labelling or data outputs). **This credit is a minimum requirement for Very Good, Excellent and Outstanding rating for Parts 2, 3 and 4.** **One credit - Sub-metering of high energy load and tenancy areas** An accessible energy monitoring and management system or separate accessible energy sub-meters with pulsed or other open protocol communication outputs to enable future connection to an energy monitoring and management system are provided, covering a significant majority of the energy supply to tenanted areas or, in the case of single occupancy buildings, relevant function areas or departments within the building/unit.		2			To be included in MEP spec. 16.03.23	GDM
ENE 03 - Ext. lighting	1	**One credit-External lighting** The average initial luminous efficacy of the external light fittings is > 60 luminaire lumens per circuit Watt. All external light fittings are automatically controlled (timer or photocell).		1			To be included in MEP spec. 16.03.23	GDM
ENE 04 - Low carbon design	1	**One credit-Passive design analysis** 1. The thermal comfort credit has been achieved. 2. A passive design analysis is undertaken no later than RIBA Stage 2 or equivalent) 3. Total heating, cooling, mechanical ventilation and lighting load reductions result in at least 5% of overall building energy demand and/or CO2 emissions savings.		1			GDM have provided a compliant Passive Design Analysis. STAGE 2 CREDIT	GDM
	1	**One credit-Free Cooling** 1. The above credit has been achieved. 2. The passive design analysis reviews opportunities for the implementation of free cooling solutions. 3. Free cooling is provided. Free cooling includes: Night time cooling, Ground coupled air cooling, Displacement ventilation, Ground water cooling, Surface water cooling, Evaporative cooling, direct or indirect, Desiccant dehumidification and evaporative cooling using waste heat, Absorption cooling using waste heat and natural ventilation.				1	Not targeted as assumed mechanical cooling proposed.	TBC
	1	**One credit-Low Zero Carbon Technologies** 1. A feasibility study is carried out by an energy specialist no later than RIBA Stage 2. 2. LZC technologies are specified in line with the recommendations of the report and result on at least 5% of overall building energy demand and/or CO2 emissions savings.		1			GDM have provided a compliant LZC Study. STAGE 2 CREDIT	GDM
ENE 06 - Energy efficient transportation systems	1	**One credit-Energy consumption** For new lifts: 1. An analysis of the transportation demand and usage patterns for the building has been carried out to determine the optimum number and size of lifts, escalators and/or moving walks. 2. The energy consumption has been calculated in accordance with BS EN ISO 25745 for one of the following: At least two types of system, An arrangement of systems or A system strategy which is 'fit for purpose'. 3. Regenerative drives are specified where they save more energy than the additional standby energy used to support the drives (usually for high travel and high intensity use). 4. The transportation system with the lowest energy consumption is specified.		1			Credit confirmed achievable by GDM. 16.03.23	GDM
	2	**Two credits-Energy efficient features** 1. The first credit is achieved for new lifts - if applicable-. 2. For each newly specified lift, the following three energy efficient features are specified and for existing lifts, at least two of the following energy efficient features are specified: - Standby condition during off-peak periods - Energy efficient lift car lighting and display lighting (> 55 lamp lumens/circuit Watt) - Variable speed, variable-voltage, and variable-frequency (VVVF) controllers are specified. 3. Regenerative drives are specified is demonstrated to save energy. NOTE: other criteria apply to escalators which must be considered if specified.		2			Credit confirmed achievable by GDM. 16.03.23	GDM

		A TRANSPORT - Requirements	C	T	P	U	Comments	Resp.
TRA 01 - Public transport accessibility	3	**Up to three credits- Accessibility to public transport** Achieved depending on the Accessibility Index of the site.		3			PTAL Accessibility Index: 69.15 Full credits achieved based on building location.	TWIN&EARTH
TRA 02 - Proximity to amenities	1	**One credit-Proximity to amenities** At least two of the following amenities must be found within 500m of the building entrance: food outlet(required), access to cash (required), access to an outdoor open space, access to a recreation/leisure facility for fitness/sports.		1			Multiple food outlets and cash point access within 500m. One credit awarded.	TWIN&EARTH
TRA 03 - Cyclist facilities	1	**One credit-Cycle store** Provide 1 accessible cycle racks per 10 building staff.		1			Credit assumed achievable. Haptic confirmed provisions will meet requirements. ACTION: Canepero to check BREEAM calc. aligns with planning requirements.	HAPTIC
	1	**One credit-Cyclist facilities** At least two of the following types of compliant cyclist facilities are provided - Showers - 1 per 10 cycle racks - Changing facilities (Toilet/shower cubicles cannot be counted as changing facilities) - Lockers - 1 per cycle rack - Dedicated drying spaces .		1			Credit confirmed achievable by Haptic. 16.03.23	HAPTIC
TRA 05 - Travel plan	1	**One credit-Travel plan** Achieved when a BREEAM compliant site specific travel plan is developed and the recommendations are implemented.		1			Compliant Travel Plan and Transport Statement has been provided by Caneparo. RIBA STAGE 2	CANEPARO

		A WATER - Requirements	C	T	P	U	Comments	Resp.
WAT 01 - Water consumption	5	**Up to three credits-Water consumption** Achieved for reducing the water consumption on site via water efficient fittings and/or water recycling systems. The water consumption (L/person/day) is calculated based on the following 'domestic scale' water-consuming components: WCs, Urinals, Taps, Showers, Baths, Dishwashers (domestic and commercial sized) and Washing machines (domestic and commercial or industrial sized). Any greywater systems must be specified and installed in compliance with BS 8525-1:2010. **One credit minimum requirement for Very Good and Excellent ratings.** **Two credits minimum requirement for Outstanding rating.** **Note: Systems applicability depends on the scope of works of the project and needs to be discussed in detail with the assessor.**		4	1		4 credits: To be based on low flow sanitaryware 1 additional credit + Exemplary: Would require rainwater/greywater recycling for WC flushing Attenuation to be spec'd at roof level via blue roof and greywater harvesting -	HAPTIC TWIN&EARTH
		EXEMPLARY CRITERIA One credit when a 65% water reduction over the BREEAM base case is achieved.			1		ACTION: HAPTIC/Elliot Wood/GDM - To confirm if measures will meet BREEAM requirements.	
WAT 02 - Water monitoring	1	**One credit-Water monitoring** 1. A water meter on the mains water supply to each building is specified. **This is a minimum requirement for Good rating and above for Part 2 assessments.** 2. Water-consuming plant or building areas, consuming 10% or more of the building's total water demand, are either fitted with easily accessible sub-meters or have water monitoring equipment integral to the plant or area. 3. Each meter (main and sub) has a pulsed output and is connected to the BMS is present. If the refurbishment or fit-out zone is within a building that is leasehold, the pulsed/digital water meter(s) for the refurbishment or fit-out zone must be connected to the incoming water supply for water using equipment in tenanted areas.		1			To be included in MEP spec. 16.03.23	GDM
WAT 03 - Major leak detection	1	**One credit-Leak detection system** A system is installed which is able to detect any leak within the building as well as between the building and the site boundary and which is also: - Audible when activated - Activated when the flow of water passes through the water meter/data logger at a flow rate above a pre-set maximum for a pre-set period of time - Able to identify different flow and therefore leakage rates, e.g. continuous, high and/or low level, over set time periods - Programmable to suit the owner/occupiers' water consumption criteria - Where applicable, designed to avoid false alarms caused by normal operation of large water-consuming plant such as chillers.		1			N/A to part 1 and 2. Applicable to New Construction.	GDM
WAT 03 - Major leak detection	1	**One credit-Flow control device** A time controller, a programmed time controller, a volume controller, a presence detector and controller or a central control unit is installed to regulate the supply of water to each WC area/facility according to demand. Flow control devices also should be provided to shower blocks if present.		1			N/A to part 1 and 2. Applicable to New Construction.	GDM
WAT 04 - Water efficient equipment	1	**One credit-Water efficient equipment** 1. The design team has identified all unregulated water demands that could be realistically mitigated or reduced (typically irrigation and/or process water). 2. System(s) or processes have been identified to achieve a meaningful reduction of the unregulated water demand.		1			ACTION: BBUK to confirm achievability.	GDM BBUK

		A MATERIALS - Requirements	C	T	P	U	Comments	Resp.
MAT 01 - Life cycle impacts	6	**Up to six credits-Project lifecycle assessment study** A LCA study is undertaken via modelling. **Up to four credits-Elemental assessment of environmental performance information** Achieved for optimising the reuse of materials and specifying materials with the EPD for main materials including the following: - Part 1 includes elements of the fabric and structure - Part 2 and 3 includes elements used for core and local services - Part 4 includes interior fit-out elements - Hard landscaping and boundary protection are included where within scope of works		6			Credits assumed achievable. Up to 6 credits plus one credit for exemplary performance can be achieved depending on: % of materials retention - Materials specified with EPD - Whether a materials LCA will be developed.	HAPTIC
		EXEMPLARY CRITERIA-Life cycle impact One credit can be achieve following any of the two routes above for demonstrating that an exemplary performance number of points has been achieved.		1			ACTION: HAPTIC to carry out assessment -T&E to check meeting BREEAM requirements.	HAPTIC
MAT 03 - Responsible sourcing of materials		**Pre-requisite** All timber and timber based products used on the project is 'Legally harvested and traded timber' (see **This is a minimum requirement for achieving any BREEAM rating.**		Y			Pre-requisite achievable. Assumes that the Contractor will be required to comply with the credit requirements. Any timber based products specified by interior designer to be checked for FSC / PEFC certification prior to specification.	HAPTIC GDM ELLIOT WOOD
	1	**One credit - Sustainable procurement plan** The principal contractor sources materials for the project in accordance with a documented sustainable procurement plan covering: 1. Risks and opportunities are identified against a broad range of social, environmental and economic issues. BS 8902:2009 guidance. 2. Aims, objectives and targets to guide sustainable procurement activities. 3. The strategic assessment of sustainably sourced materials available locally and nationally. There should be a policy to procure materials locally where possible. 4. Procedures are in place to check and verify that the plan is being implemented/adhered to (KPI's).		1			Sustainable procurement plan to be included in contractors Ers.	HAPTIC GDM ELLIOT WOOD
	3	**Up to three credits-Responsible sourcing of materials (RSM)** Credits can be achieved by ensuring that materials are responsibly sourced (BES 6001 certification, EMS/ISO14001 certification etc.). Availability of responsible sourcing certification should be checked with the manufacturer prior to procurement.		2	1		Two credits assumed required as part of strategy for Outstanding. This will require careful specification of materials by all designers. To be reviewed at Stage 4.	HAPTIC GDM ELLIOT WOOD
		EXEMPLARY CRITERIA-Responsible sourcing of materials (RSM) When high levels of responsible sourcing (achievement of 70% of the available points) are achieved.				1	Assumed not achievable at this stage as credit requirements are onerous.	
MAT 04 - Insulation	1	**One credit - Embodied impact** Insulation specified for Building envelope and building services has an Insulation index no lower than 2.5. The Insulation Index is a parameter created by the BRE to measure Embodied Impact of materials which depends on the thermal properties of the insulation, the amount of insulation and the Green Guide rating of the product. Materials selected should have low thermal conductivity and a Green Guide rating of A or A+.		1			Credit to be confirmed at later stage - insulation will predominantly be rock/mineral wool based	HAPTIC GDM CONTRACTOR
MAT 05 - Designing for durability and resilience	1	**Protecting vulnerable parts of the building for damage** Measures to prevent damage to vulnerable parts of the internal and external building and landscaping elements are specified including: - Protection from the effects of high pedestrian traffic in main entrances, public areas and thoroughfares (corridors, lifts, stairs, doors etc.). - Protection against any internal vehicular/trolley movement within 1m of the internal building fabric in storage, delivery, corridor and kitchen areas. - Protection against, or prevention from, any potential vehicular collision where vehicular parking and manoeuvring occurs within 1m of the external building façade for all car parking areas and within 2m for all delivery areas.		1			Assumes that vulnerable parts of the building will be identified and suitably protected.	HAPTIC
		Protecting exposed parts of the building from material degradation Measures prevent from environmental factors and biological factors are implemented to prevent degradation from: Corrosion, dimensional change, fading/discolouration, rotting, leaching, blistering, melting, salt crystallisation and abrasion. Existing applicable building elements are surveyed, an assessment of the impact of material degradation has been undertaken and measures have been recommended and implemented.						
MAT 06 - Material efficiency	1	**One credit-Material efficiency** 1. Opportunities have been identified, and appropriate measures investigated and implemented, to optimise the use of materials in building design, procurement, construction, maintenance and end of life. Example measures are: reusing existing demolition/strip-out materials, procuring materials with higher levels of recycled content, off-site manufacture or use of pre-assembled service pods. 2. Review is carried out by the design/construction team in consultation with the relevant parties at: Preparation and Brief, Concept Design, Developed Design, Technical Design and Construction.		1			Credit assumed achievable based on CE statement being developed as part of planning submission. Requires that opportunities for reducing the amount of raw material used are reviewed at each RIBA Stage and that suitable strategies will be implemented. Works undertaken during Stage 1 to be discussed during the pre-assessment workshop in order to determine achievability. ACTION: Haptic to provide CE statement when available FROM RIBA STAGE 1	HAPTIC

		A WASTE - Requirements	C	T	P	U	Comments	Resp.
WST 01 - Construction waste management	1	**One credit - Pre-refurbishment Audit** 1. A pre-refurbishment audit is carried out at the Concept Design Stage (equivalent to RIBA stage 2) prior to strip-out or demolition works by a competent person (see Relevant Definitions) who is independent of the project. 2. Actual waste arising and waste management routes used should be compared with those forecast from the audit and barriers to achieving targets should be investigated. 3. The audit must be referenced in the resource management plan and cover: Identification and quantification of the key materials where present on the project, Potential applications and any related issues for the reuse and recycling of the key materials in accordance with the waste hierarchy, Identification of local reprocesses or recyclers, Identification of overall recycling rate for all key materials, Identification of reuse targets where appropriate and Identification of overall landfill diversion rate for all key materials.		1			Pre-demolition audit has been provided by ADW Developments. STAGE 2 CREDIT	COLLIERS
	2	**Two credits - Reuse and direct recycling of materials** Credits are achieved when waste materials are either directly re-used on-site or off-site or are sent back to the manufacturer for closed loop recycling. 1 credit is achieved when 50% of the materials achieve comply with the above and 2 credits when compliance is achieved for 75% of the materials.			2		Pre-demolition audit to be carried out - outcomes to be fed into design. Potential to achieve credits to be reviewed following pre-demo. ACTION: Pre-demo audit to be circulated once available.	TBC
WST 01 - Construction waste management	3	**Up to three credits - Construction resource efficiency** 1. A Resource Management Plan (RMP) has been developed covering the non-hazardous waste related to on-site construction and dedicated off-site manufacture or fabrication (including demolition and excavation waste) generated by the building's design and construction. 2. Where construction waste related to on-site construction and dedicated off-site manufacture/fabrication (excluding demolition and excavation waste) meets or is lower than the following: - One credit ≤1.3m3 or ≤3.5 tonnes - Two credits ≤4.5m3 or ≤1.2 tonnes - Three credits ≤2.1m3 or ≤0.4 tonnes 3. Where existing buildings on the site will be demolished a pre-demolition audit of any existing buildings, structures or hard surfaces is completed and referenced in the RMP. **1 credit minimum requirement for Outstanding rating.**		2		1	Assumes that a minimum of two credits will be achieved. To be included in contractors Ers.	CONTRACTOR
WST 01 - Construction waste management	1	**One credit - Diversion of resources from landfill** 1. The following percentages of non-hazardous construction (on-site and off-site manufacture/fabrication in a dedicated facility), demolition and excavation waste (where applicable) generated by the project have been diverted from landfill: - One credit: 85% by volume or 90% by weight of the construction waste and 90% by volume or 95% by weight of the demolition waste.		1			Assumes compliance with diversion from landfill targets.	CONTRACTOR
		EXEMPLARY CRITERIA When the above targets are increased as follows: - ≤1.4m3 or ≤0.3 tonnes -95% by volume or 97% by weight of the construction waste, 95% by volume or 97% by weight of the demolition waste.				1	Credit not achievable.	CONTRACTOR
WST 02 - Recycled aggregates	1	**One credit-Recycled aggregates** 1. At least 25% (by weight or volume) of the high grade aggregate specified is recycled or secondary aggregate. In addition to this, there are minimum % for each application that must be met. 2. The recycled or secondary aggregates must be either: Construction, demolition and excavation waste obtained on-site or off-site or secondary aggregates obtained from a non-construction post-consumer industrial by product source.		1			Credit assumed achievable. 16.03.23 ACTION: Elliot wood to review and to confirm achievability.	ELLIOT WOOD CONTRACTOR
		EXEMPLARY CRITERIA-Recycled aggregates 1. In addition to the above, the total high grade recycled aggregate specified is 35% (by weight or volume) and the contributing recycled or secondary aggregate are not be transported more than 30 km by road transport.			1		ACTION: Potential to achieve credit to be reviewed.	ELLIOT WOOD CONTRACTOR
WST 03 - Operational waste	1	**One credit-Operational waste** 1. A dedicated, clearly labelled, and accessible area is provided for the storage of recyclable materials compliant with the following size: - At least 2m2 per 1000m2 of net floor area for buildings < 5000m - A minimum of 10m2 for buildings ≥5000m2 - An additional 2m2 per 1000m2 of net floor area where catering is provided (with an additional minimum of 10m2 for buildings ≥5000m2). The net floor area should be rounded up to the nearest 1000m 2. Where the consistent generation in volume of the appropriate operational waste streams is likely to exist, the following facilities are provided: - Static waste compactor(s) or baler(s); - Vessel(s) for composting OR adequate space(s) for storing segregated food waste and compostable organic material. - Where organic waste is to be stored/composted on-site, a water outlet is provided adjacent to or within the facility. **This credit is a minimum requirement for Excellent and Outstanding ratings.**		1			Credit confirmed achievable by Haptic. 16.03.23	HAPTIC
WST 04 - Speculative finishes	1	**One credit-Speculative Floors and ceilings** For tenanted areas (where the future occupant is not known), prior to full fit-out works, interior finishes (including carpets, other floor finishes, ceiling finishes and any other interior finishes) have been installed in a show area only. In a building being refurbished or fitted out for a specific occupant, that occupant has selected (or agreed to) the specified interior finishes		1			Credit confirmed achievable by Haptic. 16.03.23	HAPTIC
WST 05 - Adaptation to climate change	1	One credit-Adaptation to climate change - structural and fabric resilience Conduct a climate change adaptation strategy appraisal for structural and fabric resilience no later than RIBA Stage 2 or equivalent. The strategy should be based on an iterative risk assessment to identify and evaluate the impact on the building over its projected life cycle from expected extreme weather conditions arising from climate change and, where feasible, mitigate against these impacts. The assessment should cover the following stages: Hazard identification, Hazard assessment, Risk estimation, Risk evaluation and Risk management.		1			Credit assumed achievable. ACTION: T&E to issue template. RIBA STAGE 2	HAPTIC GDM ELLIOT WOOD
		EXEMPLARY CRITERIA In addition to the above, the following credits have been achieved: - HEA 04 thermal comfort credit - At least 8 credits under ENE 01 - The passive design credit of ENE 04 - A minimum of 3 credits under WAT 01 - Material degradation credit of MAT 05 - One flood risk credit and two surface run-off credits under POL 03						-
WST 06 - Functional adaptability	1	**One credit-Functional adaptability** 1. A building-specific functional adaptation strategy study has been undertaken by the client and design team no later than RIBA Stage 2, which includes recommendations for measures to be incorporated to facilitate future adaptation. the strategy should consider: - The potential for major refurbishment, including replacing the façade. - Replacement of all major plant within the life of the building - Adaptability of the internal environment to accommodate changes in working practices. - Adaptability to change in-use. - Accessibility to local services. 2. Measures are adopted no later than RIBA Stage 4 unless unfeasibility is demonstrated.		1			**Stage 2 action:** HAPTIC to review against circular economy statement draft and provide feedback. ACTION: Haptic to issue CE statement 16.03.23 **Stage 4 action:** Updates to be included at Stage 4. A disassembly guide will be required.	HAPTIC GDM ELLIOT WOOD

		A LAND USE AND ECOLOGY - Requirements		T	P	U	Comments	Resp.
LE 02 - Ecological value of site and	1	**One credit - Protection of ecological features** 2. All existing features of ecological value (see Relevant definitions) within the assessment zone are adequately protected from damage during clearance, site preparation and construction activities in line with BS42020: 20131. 3. In all cases, the principal contractor is required to construct ecological protection recommended by the Suitably Qualified Ecologist (SQE), prior to any preliminary site construction or preparation works (e.g. clearing of the site or erection of temporary site facilities).		1			PEA provided by Chevron confirms that the site is of low ecological value and provided a list of actions that the contractor will not to employ to protect features on site.	Chevron
LE 04 - Enhancing site ecology	1	**One credit-Ecologist's report and recommendations** A suitably qualified Ecologist (SQE) is appointed no later than RIBA Stage 1 an Ecology Report based on a site visit/survey by the SQE is developed no later than RIBA Stage 2 and the recommendations are implemented.		1			Chevron to complete the GN15 and LE03/04 calculator tool.	Chevron
LE 05 - Long term impact on biodiversity	2	**Up to two credits-Long term impact on biodiversity** 1. A Suitably Qualified Ecologist (SQE) is appointed prior to commencement of activities on-site and they confirm that all relevant UK and EU legislation relating to the protection and enhancement of ecology has been complied with during the design and construction process. 2.A landscape and habitat management plan, is produced covering at least the first five years after project completion in accordance with BS 42020:2013 Section 11.1. 3.Where in addition to the above the below is implemented (2 measures - 1 point; 4 measures - 2 points). - The contractor nominates a Biodiversity Champion. - The contractor trains the site workforce on how to protect site ecology during the project. - The contractor records actions taken to protect biodiversity and monitor their effectiveness throughout key stages of the construction process. - Where a new ecologically valuable habitat appropriate to the local area is created. - Where flora and/or fauna habitats exist on-site, the contractor programmes site works to minimise disturbance to wildlife.		2			Chevron to provide a landscape and habitat management plan.	Chevron

		A POLLUTION - Requirements	C	T	P	U	Comments	Resp.
POL 01 - Impact of refrigerants		**Pre-requisite** All systems (with electric compressors) comply with the requirements of BS EN 378:2008 (parts 2 and 3) and where refrigeration systems containing ammonia are installed, the Institute of Refrigeration Ammonia Refrigeration Systems Code of Practice.		Y			Cooling systems will be designed in line with the credit requirements.	GDM
	2	**Up two credits - Impact of refrigerant** - Two credits - the Direct Effect Life Cycle CO2 equivalent emissions (DELC CO2e) ≤ 100 kgCO_2e 2e /kW cooling/heating capacity or if GWP ≤10. - One credit - the DELC CO2e ≤ 1000 kgCO_2e 2e /kW cooling/heating capacity.		1	1		One credit has been assumed targeted based on refrigerant based system. Low GWP refrigerant options to be reviewed during Stage 3 ACTION: GDM to review Pol 01 to assess achievability of 2nd credit.	
	1	**One credit-Leak detection** 1. A permanent automated refrigerant leak detection system or an in-built automated diagnostic procedure for detecting leakage is installed. 2. The system must be capable of continuously monitoring for leaks and of automatically isolating and containing the remaining refrigerant(s) charge in response to a leak detection incident.		1			Credit confirmed achievable by GDM. 16.03.23	GDM
POL 02 - NOx emissions	3	**Up to three credits-NOx emissions** Where NOx emissions associated to heating and hot water demand under normal operating conditions are as follows: - One credit ≤100 mg/kWh - Two credits ≤70mg/kWh - Three credits ≤40mg/kWh				3	Unachievable as it is assumed an electric based system for the refrigerant.	-
POL 03 - Surface water run-off	2	**Up to two credits-Flood resilience** **Two credits - Low flood risk** 1. A site-specific flood risk assessment (FRA) confirms low annual probability of flooding from all sources. **One credit - Medium/high flood risk** 2. A site specific FRA confirms medium or high annual probability of flooding the is not in a functional floodplain and one of the following is achieved: - The ground level of the building and access to both the building and the site, are designed at least 600mm above the design flood level - The final design of the building and the wider site reflects the recommendations made by an appropriate consultant in accordance with the hierarchy approach outlined in section 5 of BS 8533:2011.		2			According to the Environmental Agency Flood Risk Maps the site in located within Flood Zone 1. Low probability of flooding. A compliant FRA has been provided by Elliot Wood	TWIN&EARTH
	2	**Two credits - Surface water run-off** **One credit - neutral impact on surface water** 7. There is no increase in the impermeable surfaces as a result of the refurbishment works; **OR** 8. If there is an increase in the impermeable surface as a result of the refurbishment works then the following must be met: a. **Hard standing areas** - where there is an extension or increase in the hardstanding areas and hence an increase in the total impermeable area as a result of the refurbishment works, the hardstanding area must be permeable or be provided with on-site SuDS to allow full infiltration of the additional volume, to achieve the same end result. The permeable hardstanding must include all pavements and public rights of way, car parks, driveways and non-adoptable roads, but exclude footpaths that cross soft landscaped areas which will drain onto a naturally permeable surface. b. **Building extension** - where there is an increase in building footprint, extending onto any previously permeable surfaces, the additional run-off caused by the area of the new extension must be managed on-site using an appropriate SuDS technique for rainfall depths up to 5mm. **Two credits - reducing run-off** 9. An Appropriate Consultant (see Pol 03 Flood risk management and reducing surface water run-off) has been used to design an appropriate drainage strategy for the site. 10. Either of the following criteria are met: a. There is a decrease in the impermeable area by 50% or more, from the pre-existing impermeable hard surfaces; **OR** b. Where run-off as a result of the refurbishment is managed on-site using source control achieving the following requirements: i. The peak rate of run-off as a result of the refurbishment for the 1 in 100 year event has been reduced by 50% from the existing site. ii. The total volume of run-off discharged into the watercourses and sewers as a result of the refurbishment, for a 1 in 100 year event of 6 hour duration has been reduced by 50%. iii. An allowance for climate change must be included for all of the above calculations; this should be made in accordance with current best practice planning guidance.		1	1		One credit assumed achievable. ACTION: EW to review attenuation measures to be explored for achieving 2nd credit.	ELLIOT WOOD

	1	**One credit-Minimising watercourse pollution** 1. There is no discharge from the developed site for rainfall up to 5mm. 2. Low risk source of watercourse pollution areas have appropriate SuDS techniques. 3. High risk areas have petrol and oil separators. 4. A means of containment is fitted to the site drainage system for chemical/liquid gas storage areas. 5. All water pollution prevention systems have been designed and installed in accordance with Pollution Prevention Guideline 3 (PPG 3). For vehicle washing areas systems comply with Pollution Prevention Guidelines 13 6. A comprehensive and up-to date drainage plan is developed. 7. Relevant maintenance agreements for the ownership, long term operation and maintenance of all specified SuDS must be in place. 8. All external storage and delivery areas designed and detailed in accordance with the current best practice planning guidance.			1		Not achievable currently. ACTION: T&E to follow up with BRE to see if can be justified	ELLIOT WOOD
POL 04 - Reduction of night time light pollution	1	**One credit - Reduction of night time light pollution** 1. External lighting complies with Table 2 (and its accompanying notes) of the ILP Guidance notes for the reduction of obtrusive light, 2011. 2. All external lighting (except for safety and security lighting) can be automatically switched off between 23:00 and 07:00. 3. Safety or security lighting used between 23:00 and 07:00, complies with the lower levels of lighting in Table 2 of the ILP's Guidance notes. 4. Illuminated advertisements comply with ILE Technical Report 5 – The Brightness of Illuminated Advertisements.		1			Credit confirmed achievable by GDM. 16.03.23	GDM
POL 05 - Reduction of noise pollution	1	**One credit-Reduction of noise pollution** 1. The noise level from the proposed site/building, as measured in the locality of the nearest or most exposed noise-sensitive development (within 800m radius), is no greater than +5dB during the day (07:00 to 23:00) and +3dB at night (23:00 to 07:00) compared to the background noise level. The noise impact assessment must be undertaken by a suitably qualified acoustic consultant and must have been developed in compliance with BS 7445.		1			Credit assumed achievable. Auricl carrying out existing noise survey. 16.03.23	AURICL
	A INNOVATION - Requirements		C	T	P	U	Comments	Resp.
Inn.	1	Additional credits are available for Approved Innovations not currently recognised by an existing BREEAM issue.					No points assumed at this stage.	-

www.gdmgroup.co.uk