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REEF GROUP

UBB PLOT B

ST PANCRAS WAY, LONDON

ENERGY STATEMENT

REVISION P01

Document History

SUITABILITY	REVISION	DATE	DETAILS	BY	CHKD
S2	P01	15th January 2021	First issue	MC	BH
S2	P02	22nd April 2021	Comments incorporated from DP9	MC	BH

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EXECUTIVE SUMMARY

KJ Tait Engineers were appointed by Reef Group to develop the Energy Strategy and produce an Energy Statement for a full planning application to redevelop Plot B of the Ugly Brown Building (UBB) at 6A St Pancras Way, London, NW1 0TB. The site is located between St Pancras Way and Regents Canal.

The proposed development consists of 8 storeys above ground and two basement levels. The proposed building shall contain a designated loading bay at ground floor and open plan office accommodation to the floors above. The building will be fitted out to Cat A standard.

The gross internal area of the proposed development is 20,912m^2.

The building is being assessed under BREEAM UK New Construction 2014 and is targeting an Excellent rating.

The building's energy strategy has been developed in accordance with the London Plan 2021 (Adopted March 2021), which at time of writing has not been adopted but is a material consideration in new Planning applications.

To obtain likely energy demands for the proposed development, IES Virtual Environment 2019 has been used to develop a thermal simulation model of the proposed building.

In line with guidance from the Greater London Authority (GLA)[1] for referable applications, the carbon emissions factors have been altered from SAP 2012 to SAP10 figures. The GLA Carbon Emissions Reporting spreadsheet has been provided alongside the application.

The following Energy Strategy is proposed to reduce the emissions from the proposed development. This follows the structure set out within the London Plan 2021 and the GLA guidance with respect to the Energy Hierarchy.

Be Lean

The following elements have been considered and optimised:

- Thermal insulation bettering Building Regulations Part L (2013) values, with the figures in the LETI Climate Emergency Design Guide targeted where possible.
- Minimising solar gains by the installation of high performance glazing with sufficient g-values.
- Optimising fabric air permeability improvements over the minimum Building Regulations Part L (2013) standard.
- Utilising mechanical ventilation with heat recovery to all areas with appropriate time and temperature control. Fan coil units with integral EC motors and low specific fan powers to be utilised.
- Efficient building services systems, including the use of smart metering and controls.

[1] Energy Assessment Guidance, Greater London Authority guidance on preparing energy assessments as part of planning applications (April 2020)

- All lighting will be efficient LED fittings with automatic controls.

Be Clean

The London Heat Mapping tool indicates that there are no known existing or proposed district heat networks in the vicinity of the development.

An on-site district energy network will be created to link all Plots within the UBB development site.

Be Green

Through detailed design development of the adjacent Plot A, it has been shown that air source heat pumps (ASHP) are the best suited renewable technology for the redevelopment. Similarly, with Plot B ASHPs are proposed to serve the proposed development. The key driver behind using an electricity-based technology offers the opportunity to reduce the reliance on natural gas and to take advantage of the increasing improvement of the carbon intensity of the National Grid.

Roof-mounted photovoltaic (PV) panels are also proposed to available roof space, with a PV array of approximately 130m^2.

CO_2 Savings Summary

By utilising good design principles led by the Energy Hierarchy and then incorporating low/zero carbon generating technologies, there has been a total saving of **40%** of non-domestic regulated CO_2 emissions compared to Part L2A 2013 compliance, using SAP10 carbon factors as per the GLA Energy Assessment Guidance.

Carbon Offset

To comply with the GLA and Camden's Local Plan for Net Zero Carbon, the development will be required to pay an offset payment into the Borough's carbon offset fund. The current rate for this payment is £95 per tonne over a period of 30 years. This results in a carbon offset payment of £298,580.

Cooling Demand

In line with London Plan policy SI 4 – Managing Heat Risk, the proposed building's cooling demand is lower than the Notional Building.

	Area weighted average non-domestic cooling demand (MJ/m^2)	Total area weighted non-domestic cooling demand (MJ/year)
Actual	15.19	317,653
Notional	24.55	513,431

1.0 INTRODUCTION

Planning approval for the redevelopment of the Ugly Brown Building (UBB) on St Pancras Way, London was granted by the London Borough of Camden under application reference 2017/5497/P. Since making the original Planning application and receiving the conditional approval, the development has been through a process of rationalisation and technical development, including the overall energy strategy and the proposals for Plot B. This Energy Statement describes the revised energy strategy for Plot B of the proposed development.

Since the development was originally submitted for Planning there has been significant improvement in the carbon intensity of the National Grid. This has resulted in a move away from the use of natural gas in generating heat for buildings and this change is a key element of the London Plan 2021 and the Mayor's zero carbon target by 2050. The energy strategy originally proposed for the building was heavily reliant on natural gas and is therefore not ideally suited to current and emerging energy strategies and policies.

This report details the Energy Strategy for Plot B and follows guidance from the GLA with respect to preparing energy assessments for proposed developments within London. The scheme has been modelled in IES VE 2019 to determine the following parameters:

- The baseline carbon emissions prescribed from Part L2A Building Regulations known as the Target Emission Rate (TER)
- The site's regulated CO_2 emissions from the 'Be Lean' analysis after passive energy saving measures are added
- The site's regulated CO_2 emissions from the 'Be Clean' analysis after investigating any connections to existing district heating networks or incorporating combined heat & power (CHP) where applicable
- The site's regulated CO_2 emissions from the 'Be Green' analysis which involves the installation of renewable energy where applicable.

This step-by-step approach will ensure that that the site is sustainable and that any energy provided by any district heating or renewable installation is not being used for energy that could otherwise have been mitigated earlier in the design process. Emissions associated with unregulated energy will also be calculated using guidance contained within CIBSE Guide F – Energy Efficiency in Buildings.

1.1 Site Information

The UBB site is split into three plots – Plot A (Office and Retail), Plot B (Office and Retail), and Plot C1-4 (Office, Residential and Retail). This Energy Statement will focus only on Plot B. The site will be redeveloped sequentially, with Plot A currently under construction.

Plot B comprises two basement levels with a cycle park, changing room facilities and plant space. The ground floor will host a large open foyer with a loading bay at the north of the building. The upper floors are intended for office spaces that are to be fitted out to a Cat A standard. The gross internal area of the development is approximately 19,714m^2.

For energy assessment purposes, the following notional use mix has been applied:

- 3% Retail
- 97% Office

Plot B Location Plan

1.2 Policy Review

The following policies have been identified as being essential to follow with regards to Part L2A Building Regulations and local Planning requirements.

1.2.1 Building Regulations

Non-Domestic

Non Domestic Building Regulations Technical Standards Part L

Part L2A 2013 incorporating 2016 amendments, Conservation of fuel and power in new buildings other than dwellings, sets maximum carbon dioxide emissions for buildings. The regulations apply to the construction of all new buildings (with an area over 1,000m²) and set a reduction in carbon dioxide emissions of 9% compared to 2010 Regulations for non-domestic buildings.

These targets mean that even with good building fabric and low energy building systems, Low or Zero Carbon Technologies will need to be carefully evaluated to establish the most functional and cost-effective design for compliance and maximum reduction of a building's CO_2 footprint.

Regulation 25B, 'nearly zero-energy requirements for new buildings' is currently enforced at a minimum by passing the Target Emissions Rate (TER) under regulation 26. Consideration of high-efficiency alternative systems and BREEAM credits can also be used as evidence of Regulation 25B being met.

Consideration of High-Efficiency Alternative Systems in New Buildings

Revised legislation within the Building Regulations was introduced on 9 January 2013 in response to Article 6 of Directive 2010/31/EU on the Energy Performance of Buildings.

For new buildings, the technical, environmental, and economic feasibility of high efficiency alternative systems such as those listed below must be considered:

- Decentralised energy supply systems based on energy from renewable sources
- Cogeneration
- District or block heating or cooling
- Heat pumps.

This analysis may be carried out for individual buildings, for groups of similar buildings or for common typologies of buildings in the same area.

Irrespective of whether the building is to be air-conditioned or not, Criterion 3 – Limiting the effects of heat gains in summer must be satisfied within the compliance assessment.

1.2.2 National Planning Policy

The updated National Planning Policy Framework (NPPF) document was published in February 2019. The NPPF states a clear presumption in favour of sustainable development. It supports the transition to a low carbon future in a changing climate, taking full account of flood risk and coastal change, encouraging the re-use of existing resources, and the use of renewable resources.

Chapter 14 of the NPPF specifies the framework for climate change and energy where local planning authorities should:

- Ensure risks associated with vulnerable areas are mitigated through suitable adaptation measures which may include planning of green infrastructure
- Reduce greenhouse gas emissions through a building's location, orientation and design
- Provide a strategy for the implementation of renewable and low carbon energy and heat that maximises their potential
- Identify opportunities for developments to draw energy supply from decentralised, renewable or low carbon energy supply systems and for co-locating potential heat customers and suppliers.

The NPPF allows for Local Planning Authorities to list buildings that are important to the local area to be conserved. This requires that the desirability of sustaining and enhancing the significance of heritage assets is taken into account when planning decisions are made.

1.2.3 The London Plan

The London Plan[2], the London Plan 2021[3] and the GLA Energy Assessment Guidance[4] are considered to be the benchmark for Local Planning Regulation. Together they provide the regulatory framework against which to undertake energy and sustainability assessments.

The London Plan 2021 was formally adopted in March 2021. The London Plan 2021 stipulates that non-domestic buildings should be zero carbon with a mandatory 35% reduction in carbon emissions from Part L2A, 15% of which must be from efficiency measures (Be Lean).

The development's Energy Strategy has been structured in accordance with the GLA energy hierarchy: Be Lean, Be Clean, Be Green and Be Seen. The energy strategy has been developed to comply with the London Plan 2021 and the GLA Energy Assessment Guidance on preparing energy assessments as part of planning applications. The key polices of the London Plan 2021 are as follows:

Policy SI 1: Improving Air Quality

A) Development plans, through relevant strategic, site specific and area-based policies, should seek opportunities to identify and deliver further improvements to air quality and should not reduce air quality benefits that result from the Mayor's or Borough's activities to improve air quality.

B) To tackle poor air quality, protect health and meet legal obligations the following criteria should be addressed:

1. Development proposals should not:

   a) Lead to further deterioration of existing poor air quality
   b) Create any new areas that exceed air quality limits, or delay the date at which compliance will be achieved in areas that are currently in exceedance of legal limits
   c) Create unacceptable risk of high levels of exposure to poor air quality.

2. In order to meet the requirements in Part 1, as a minimum:

   a) Development proposals must be at least Air Quality Neutral
   b) development proposals should use design solutions to prevent or minimise increased exposure to existing air pollution and make provision to address local problems of air quality in preference to post-design or retro-fitted mitigation measures
   c) Major development proposals must be submitted with an Air Quality Assessment. Air quality assessments should show how the development will meet the requirements of B1
   d) Development proposals in Air Quality Focus Areas or that are likely to be used by large numbers of people particularly vulnerable to poor air quality, such as children or older people should demonstrate that design measures have been used to minimise exposure.

[2] The London Plan (March 2016)
[3] London Plan 2021 (March 2021)
[4] Energy Assessment Guidance, GLA guidance on preparing energy assessments as part of planning applications (April 2020)

C) Masterplans and development briefs for large-scale development proposals subject to an Environmental Impact Assessment should consider how local air quality can be improved across the area of the proposal as part of an air quality positive approach. To achieve this a statement should be submitted demonstrating:

a) How proposals have considered ways to maximise benefits to local air quality, and
b) What measures or design features will be put in place to reduce exposure to pollution, and how they will achieve this.

D) In order to reduce the impact on air quality during the construction and demolition phase development proposals must demonstrate how they plan to comply with the Non-Road Mobile Machinery Low Emission Zone and reduce emissions from the demolition and construction of buildings following best practice guidance.151

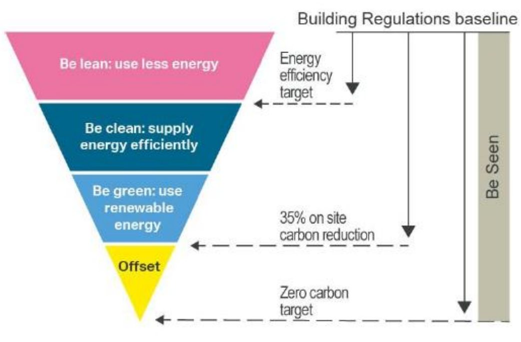
E) Development proposals should ensure that where emissions need to be reduced to meet the requirements of Air Quality Neutral or to make the impact of development on local air quality acceptable, this is done on-site. Where it can be demonstrated that emissions cannot be further reduced by on-site measures, off-site measures to improve local air quality may be acceptable, provided that equivalent air quality benefits can be demonstrated within the area affected by the development.

Policy SI 2: Minimising Carbon Dioxide Emissions

Major non-domestic developments must achieve an on-site reduction of at least 35% beyond baseline Building Regulations.

Major developments should be net zero-carbon. By making a contribution to minimising carbon dioxide emissions and minimising both annual and peak energy demand in accordance with the following energy hierarchy:

1. Be Lean: use less energy
2. Be Clean: supply energy efficiently
3. Be Green: use Renewable energy
4. Be Seen: Monitor and report energy performance



Source: Greater London Authority

A new requirement in the new London Plan 2021, Be Seen, explores the management of energy carried out post occupancy. The Energy Statement must contain proposals on how this will be monitored post construction for at least five years. Proposals on how to future proof the site to achieve net zero-carbon emissions by 2050 must also be investigated along with the expected cost to the occupants of the proposed Energy Strategy.

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

Development proposals that are referable to the Mayor should calculate whole life-cycle carbon emissions through a nationally recognised Whole Life-Cycle Carbon Assessment and demonstrate actions taken to reduce life-cycle carbon emissions.

Where it is demonstrated that the zero-carbon target cannot be met on site, any shortfall should be provided either through a cash in lieu contribution to the relevant Borough's carbon offset fund or by providing an alternative proposal.

Policy SI 3 - Energy Infrastructure

Developers should engage at an early stage with relevant energy companies and bodies to establish the future energy requirements and infrastructure arising from large-scale developments. Energy masterplans should be developed for large scale developments which establishes the most effective energy supply options.

Major development proposals within Heat Network Priority areas should have a communal low-temperature heating system. The heat source for this should be assessed in line with the heating hierarchy.

- Connect to local existing or planned heat network
- Use zero-emission or local secondary heat sources in conjunction with heat pump, if required
- Use low emission CHP (only if there is a case for CHP to enable the delivery of an area wide heat network)
- Use ultra-low NO_x gas boilers.

Where a heat network is planned but not yet in existence, the development should be designed for connection at a later date.

Policy SI 4 – Managing Heat Risk

Developments should minimise adverse impacts on the urban heat island through design, layout, orientation materials and the incorporation of green infrastructure. Major development proposals should indicate how they will reduce the potential for internal overheating and reliance on air conditioning systems in accordance with the cooling hierarchy.

- Reduce the amount of heat entering the building through orientation, shading, high albedo materials, fenestration, insulation and the provision of green infrastructure
- Minimise internal heat generation through energy efficient design
- Provide passive ventilation
- Provide mechanical ventilation

- Provide active cooling systems.

CIBSE Guide TM52 – Limits of thermal comfort: Avoiding overheating in European buildings should be used to assess the overheating risk in non-domestic buildings.

1.2.4 Local Policy

The Camden Local Plan (June 2017) sets out the council's planning policies and replaces the Core strategy and Development Policies planning documents (adopted in 2010). Policies CC1 and CC2 of *Section 8 – Sustainability and Climate Change* of the Camden Local Plan, must be adhered to.

Policy CC1 Climate Change Mitigation

All developments shall be required to minimise the effect of climate change and be encouraged to meet the highest feasible environmental standards that are financially available.

The local council will:

- Promote zero carbon development and require all developments to reduce carbon dioxide emissions through the steps stipulated in the energy hierarchy.
- Require major developments to demonstrate how the London Plan targets have been met.
- Support decentralised energy networks.
- Encourage sensitive energy efficiency improvements to existing buildings
- Expect all developments to optimise resource efficiency

Policy CC2 Adapting to Climate Change

The council requires new developments to adopt appropriate climate change adaptations measures such as:

- Incorporating bio-diverse roofs, green and blue roofs where appropriate
- Demonstrations to show the impact of urban overheating and the application of mitigating the risk of overheating
- Expecting non-domestic developments of 500sqm of floor space or above to achieve Excellent in BREEAM assessments and encouraging zero carbon in new developments from 2019.

Policy CC4 Air Quality

The council will ensure that the impact of development on air quality is mitigated and ensure the exposure to poor air quality is reduced in the borough.

The council will take into account the impact of air quality when assessing development proposals, through the consideration of both the exposure of occupants to air pollution and the effect of the development on air quality. Consideration must be taken to the actions identified in the Councils Air Quality Action Plan.

Air Quality Assessments (AQAs) are required where development is likely to expose residents to high levels of air pollution. Where the AQA shows that a development would cause harm to air quality, the council will not grant planning permission unless measures are adopted to mitigate the impact.

Development that involved significant demolition, construction or earthworks will also be required to assess the risk of dust and emissions impacts in an AQA and include appropriate mitigation measures to be secured in a Construction Management Plan.

2.0 DEMAND REDUCTION (BE LEAN)

2.1 Introduction

In line with good design principles and London Plan requirements, the development will follow the energy hierarchy so that any low or zero carbon generation is not supplying energy to areas that could have been mitigated early in the design process. The relevant steps in this process are shown below:

Stage 1 - Maximise Passive Design

In the first instance the building design should be efficient, incorporating measures such as good fabric and glazing insulation levels, control of solar heat gain whilst providing good levels of day lighting.

Stage 2 - Minimise Active Design

Having reduced the energy demand, energy requirements will then need to be minimised where possible by installing energy efficient plant and systems to meet the building's energy demands. Suitable control systems should be provided to ensure system energy efficiencies can be realised. Where mechanical intervention cannot be avoided, the design should incorporate the lowest possible level of intervention and energy use.

2.2 Stage 1 - Maximise Passive Design

Passive design measures will be optimised across the development and in conjunction with active measures, such as efficient building services systems, will reduce demand (Be Lean). Building design should be optimised to limit heat loss, reduce cooling loads by limiting solar gain and optimise the use of natural light and ventilation.

The following elements have been considered and optimised:

- Solar gain will be limited through limiting the extent of glazing, specifying high-performance glazing system, external shading, etc.
- High-performance building fabric, to significantly exceed the minimum criteria set by Part L.

Improving the thermal insulation standards beyond the minimum Building Regulations (2013) standards has been applied to achieve reduction to the annual CO_2 emissions associated with the building heating systems by limiting the heat loss through the building fabric. The performance criteria from the LETI Climate Emergency Design Guide have been targeted where practicable.

In accordance with the requirements of a low energy building, attention has been focussed on the air tightness. The air permeability rate of the redevelopment has been designed to 3.0 $m^3/hr.m^2$ at 50Pa which is a significant improvement over Part L2A Building Regulations of 10.0 $m^3/hr.m^2$.

Glazing has been carefully selected to ensure that solar gains have been limited to reduce the risk of overheating and to reduce the annual cooling loads. Fins on all facades of the office floors also assist in creating local shade to the occupied areas and in turn reduce solar gains to the building.

2.3 Summary of Be Lean Passive Measures

Element	As Designed
Wall U-value (W/m^2K)	0.2
Basement Slab (W/m^2K)	0.13
Roof (W/m^2K)	0.13
Glazing (W/m^2K)	1.3 (0.28 g)
Air Permeability ($m^3/hr.m^2$ at 50Pa)	3.0

2.4 Stage 2 - Maximise Active Design

The development will be served by mechanical ventilation with heat recovery to all areas. The air handling units (AHU) will be fitted with a direct drive EC motor with low specific fan powers (SFP) with variable speed drives fitted to all pumps and fans. Control of the HVAC system will include local time and temperature control along with an optimum start program. Fan coil units (FCUs) will be used to deliver heating, cooling and ventilation to the main spaces. Motors within FCUs will incorporate EC motor technology and low SFPs.

All lighting will be efficient LED fittings with a minimum efficacy of 100lm/W with occupancy sensor and daylight controls.

2.5 Summary of Be Lean Active Measures

Element	As Designed
Lighting Efficacy (lm/W)	100 (as minimum)
AHU Heat Recovery Efficiency (%)	0.71
AHU SFP (W/l/s)	1.13
Terminal Fan Coil Unit SFP (W/l/s)	0.12

2.6 Energy Demand Following Energy Efficiency Measures

The energy demand across the site, including unregulated electricity and gas following the implementation of energy efficiency measures is the following:

Building use	Energy demand following energy efficiency measures (MWh/year)						
	Space Heating	Hot Water	Lighting	Auxiliary	Cooling	Unregulated electricity	Unregulated gas
Non-domestic	76	132	117	139	122	98	0.0

2.7 Pavilion Building

The energy strategy for the separate Pavilion building is unchanged from the original application in that it will be supplied with heating and cooling energy from Plot C via the on-site energy network. The thermal performance of the proposed building envelope of the Pavilion has been reviewed and the specification matches or betters the original proposals. The energy considerations for the Pavilion therefore remain largely unchanged from the original application and the assessment of the energy use of the Pavilion has been excluded from this application.

3.0 HEATING INFRASTRUCTURE (BE CLEAN)

3.1 Off-Site and On-Site Energy Networks

The Section 106 Agreement (S106) associated with the original Planning decision (207/5497/P_ included requirements for the provision of on-site and off-site energy network studies and connection plans.

Clause 2.59 (a) of the S106 stipulates a requirement to safeguard Plot C for a future connection to an off-site decentralised energy network (DEN). Clause 3 of the S106 sets out the requirements for the DEN off-site feasibility study and connection plan.

The S106 Agreement stipulates that Plot C should be connected to Plots A and B to form an on-site energy network across all plots. The development is intended to be constructed in three phases; Plots A to C chronologically. As noted above, this Energy Statement is only for Plot B and a revised Energy Statement for Plot A has been submitted separately. The energy systems for Plot C will be developed in due course, however the principles set out here are anticipated to be applicable to the future plots. Under the alternative energy strategy it is proposed that heat pump systems are provided on a per plot basis, rather than Plot A & B sharing heating plant as per the original proposal.

Each plot's individual heating/cooling plant can be interconnected to provide an on-site energy network, as per the original proposals and as required by the S106 Agreement. The heat pump system on each site could connect to a central energy buffer/store, which could be located in Plot B or C. With this configuration, there is potential to run the full development from a reduced number of heat pumps during periods of lower demand, e.g. only heat pumps in Plots B & C operating with Plot A drawing energy from the central buffer. The network would incorporate efficient monitoring and controls to enable an efficient on-site energy network.

The contribution of the on-site energy network has not been quantified at this stage as it will be necessary to further develop and analyse Plots B and C to estimate the Be Clean contribution. This analysis will be carried out at a later date, however it should be noted that there will be some contribution to Plots A and B.

The S106 requirements for permission 2017/5497/P in terms of Off-Site and On-Site Energy Networks are unaffected and can be met by the alternative energy strategy proposals.

3.2 Secondary Heat Generation

Secondary heat can potentially be obtained from various heat sources such as infrastructure and environmental sources within the vicinity. Regents Canal, which runs behind the plot, could potentially be a source for heat generation, however this was discounted in the original Max Fordham energy strategy for various reasons, including low flow rate, shallow water depth, potential to be drained for maintenance, etc.

There are no other viable potential secondary heat sources known to be within the vicinity of the site.

4.0 RENEWABLE ENERGY (BE GREEN)

The incorporation of low and zero carbon technologies (LZCT) can reduce demand on finite natural energy sources, benefit the environment and reduce running costs.

Potential Sources of Energy

Due to the unique constraints of the development, there is limited scope to incorporate many of the available renewable energy technologies within the scheme. As well as the selected LZC technologies, the following were reviewed and the implications are summarised below:

Technology	Implications
Ground source heat pump	- Complex borehole construction logistics beneath basement - Expensive
River Source Heat Pump	- Canal has low flow rate, discharging heat to canal will cause canal water temperature to rise - Canal is periodically drained for maintenance - Potential of environmental harm to aquatic life
Wind turbines	- Not feasible in this location
Biomass boiler	- Air quality implications - Delivery and storage implications

Air source heat pumps shall be installed on the roof of Plot B to provide simultaneous heating and cooling, improving the energy efficiency on site with their high seasonal performance.

A PV array of 130m² shall be installed on the roof facing in a south and west orientation. The PV panels will be able to optimise their full efficiency with no local or topical shading of surrounding buildings or vegetation.

The savings after applying the Be Green measures are outlined below.

	Regulated non-domestic carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Savings from energy demand reduction	45	26%
Savings from heat network / CHP	0	0%
Savings from renewable energy	25	14%
Total Cumulative Savings	**69**	**40%**

5.0 CARBON OFFSETTING

By utilising good design principles and Be Lean, Be Clean, Be Green, the development is estimated to save at least 40% of non-domestic regulated CO2 emissions compared to Part L 2013 compliance using SAP10 Carbon Factors as suggested in the GLA Energy Assessment Guidance.

The London Plan calls for at least 15% to be offset from the Be Lean step. As shown above, the predicted carbon dioxide savings achieve the requirements set out in the London Plan. By adding ASHP and PV panels, the carbon reductions have been improved by a further 14%.

As part of the London Plan 2021 and Local Camden Plan, new developments must target a Net Zero Carbon building where any remaining emissions must be offset by means of a monetary payment into the Boroughs Carbon Offset Fund. The Camden Local Plan states that the updated London Plan price of £95 per tonne of CO_2 shall be used. This equates to £298,580.

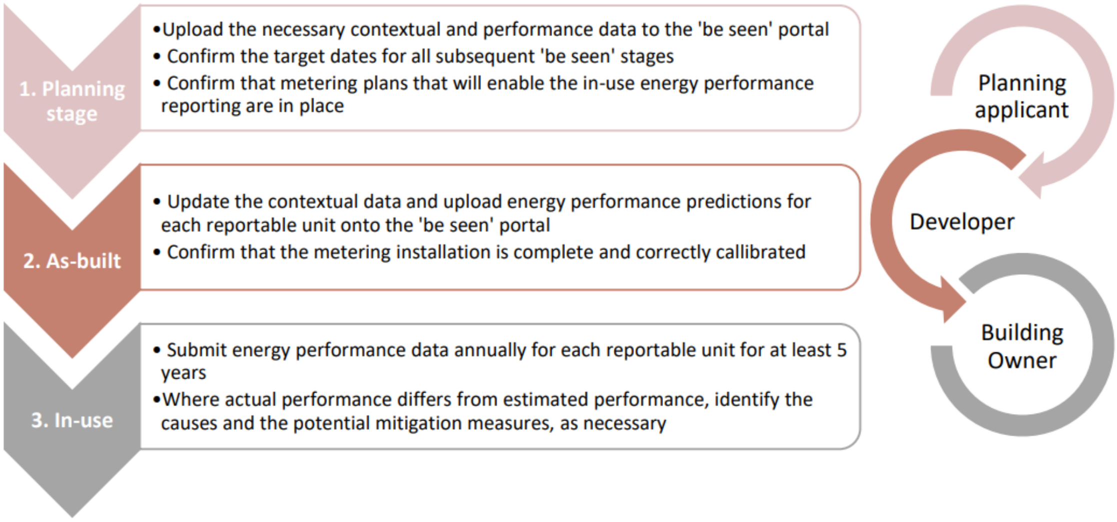
	Annual Shortfall (Tonnes CO_2)	Cumulative Shortfall (Tonnes CO_2)
Total Target Savings	174	-
Shortfall	105	3,143
Cash in-lieu contribution (£)	**298,580**	-

6.0 MEASUREMENT & VERIFICATION (BE SEEN)

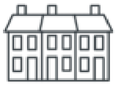
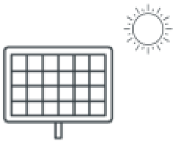
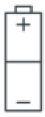
6.1 Requirements

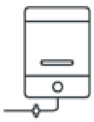
To address the gap between theoretical and actual performance of new buildings, the London Plan Policy SI 2 introduces a fourth stage to the energy hierarchy. The 'Be Seen' stage requires monitoring and reporting of the actual operational energy performance of major developments for at least five years via the Mayor's Be Seen monitoring portal. This establishes post-construction monitoring as good practice, enabling developers and building owners to better understand their buildings and identify methods for improving energy performance from the project inception stage and throughout the building's lifetime.

The below sets out the expected Be Seen process through the mandated 5-year period from planning stage to in use.



There are expected to be six performance indicators that are required to be reported on within the GLA Be Seen reporting spreadsheet.

Performance indicator group	Description
 **Contextual data**	Applicants will be expected to provide contextual data relating to the development's reportable units (RUs) (see section 3.4). This includes non-energy information such as data on location and typology of buildings.
 **Building energy use**	Applicants will be expected to report on the energy and fuel imports into each RU of a development. This includes data from national energy grids (e.g. electricity, gas etc.) and district heating connections. This information will enable the building owner to report on the amount of energy being consumed on-site for distinct building uses.
 **Renewable energy**	Applicants will be expected to report on the renewable energy generation within the development to identify how much energy is being generated on-site and where this is used.
 **Energy storage equipment**	Applicants will be expected to report on building energy storage equipment data.

Performance indicator group	Description
 **Plant parameters**	Applicants will be expected to report on parameters that relate to the performance of heat or cooling generation plant within energy centres that form part of a development. This will include energy inputs and outputs of energy centres, energy use and contribution of heating and cooling technologies, and network efficiency data to monitor losses in district and communal energy networks.
 **Carbon emissions**	Applicants will be expected to report on the development's estimated carbon emissions at planning stage based on the appropriate carbon emission factors, as set out in the GLA's Energy Assessment Guidance. When on-site carbon reductions have been maximised, but a carbon shortfall still exists, applicants will be expected to report on and confirm the carbon offsetting contribution to the relevant local authority's fund in line with the net zero carbon target.

For planning, a CIBSE Guide TM54 – Operational Performance of Buildings at the Design Stage has been built that will assess the carbon emissions and energy demand of the building as a whole.

Once the as-built design has been completed (upon commencement of RIBA Stage 6) and prior to the building being handed over, an update should be provided to the GLA of the estimated performance indicators submitted at planning stage. This will include a number of additional indicators and a greater level of detail over the actual operation of the building.

The Be Seen portal will be hosted on the London Building Stock Model (LBSM) website and will contain a summary of the building's estimated and actual performance. From here the xml output files, used to predict Display Energy Certificate (DEC) ratings, should be uploaded for individual RUs.

During the in use stage, the responsibility for monitoring and reporting actual performance rests with the building owner. This will require actual data from the whole building and individual RUs. This period lasts for a total of five years. If the building owner changes, then responsibility for reporting reverts to the new owner.

6.2 Be Seen Strategy

Good metering is a fundamental energy monitoring and targeting tool and an essential part of energy management. Sub metering energy end uses such as lighting, fans and pumps provides the means to identify where and when energy is being wasted. As such, the development will incorporate metering in line with guidance contained within CIBSE Guide TM39 – Building Energy Metering.

The office floors will be split to provide individual RU electrical metering as follows:

- 01 First Floor Open Plan Office
- 02 Second Floor Open Plan Office
- 03 Third Floor Open Plan Office
- 04 Fourth Floor Open Plan Office
- 05 Fifth Floor Open Plan Office
- 06 Sixth Floor Open Plan Office
- 07 Seventh Floor Open Plan Office
- 08 Eighth Floor Open Plan Office

WCs and core areas shall be metered via the associated above meters. Heat meters for communal heating and cooling will be provided to each unit,

Each retail unit will be split to create individual RUs where electrical and communal heat is metered.

An online platform where data from the above meters can be sent back ready for analysis by interested parties will be provided. This will help to ensure that data from the meters are being used to reduce energy consumption on site. The BSRIA Soft Landings framework will be utilised to ensure that the transition from building construction to occupation is smooth and that systems are operating as they are designed to.

7.0 REDUCING IN USE ENERGY

As part of the London Plan (March 2021) SI 2 policy: Minimising greenhouse gas emissions, considerations in methods of reducing annual and peak energy demands must be completed.

Smart buildings have been identified and acknowledged as key enablers of future energy systems where will be a larger share of renewables, distributed power and heat generation, and demand-side flexibility to match demand to supply and make best use of existing network connection and local generation capacity. By providing smart metering on site with ease of access to the data, demand side response (DSR) techniques can be incorporated to reduce demand at peak times.

An automatic monitoring and targeting (AM&T) sub-metering system will be provided to assist in managing energy use throughout the development. The system will measure, record and distribute energy data for all energy uses throughout the building and will provide reporting on energy consumption to enable analysis and targeting of energy reduction opportunities.

Monitoring and adjusting control strategies, such as lowering heating set points or turning off the heat pumps earlier in the day when there is enough heat or coolth in the building, could assist in reducing peak loads.

The building has been designed to use point of use water heaters throughout, which in turn negates the requirement of pre-heat times and storage losses. This provides a higher rated domestic hot water distribution efficiency to the end user.

The BRUKL document predicts that the proposed PV array shall provide an annual electricity generation of 22,376kWh. This could be extended further by the introduction of energy storage where electricity is only used during triad periods to reduce strain on the electrical grid.

8.0 WHOLE LIFE CARBON ASSESSMENT

In line with the London Plan (Adopted March 2021), a Whole Life Carbon Assessment has been carried out using GLA approved software, One Click LCA. This analysis was built using the design information for the proposed building. A baseline model was constructed using information for materials contained within the RICS guide – Whole life carbon assessment for the built environment (November 2017). From this baseline, savings from implementing less carbon intensive materials were calculated.

The following measures have contributed to reducing the embodied carbon of the proposed development:

Action	WLC reduction ($kgCO_2e/m^2$ GIA)
Concrete to have at least 60% GGBS replacement	43.0
100% recycled Rebar	13.0
Lime mortar	0.2

This assessment found that the propose building performs well against GLA Aspirational Benchmarks contained within the GLA supplementary guidance.

Module	Aspirational Benchmark ($kgCO_2e/m^2$ GIA)	Actual ($kgCO_2e/m^2$ GIA)
A1-A5	550-600	348
B-C (Excluding B6 – B7)	250-300	251

The complete assessment is contained within the GLA spreadsheet which has been provided alongside the application.

APPENDIX 1 – BRUKL OUTPUT DOCUMENT (BE LEAN)

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

D1 - Camden Plot B Be Lean 150121

As designed

Date: Fri Jan 15 12:59:23 2021

Administrative information

Building Details

Address: 6A St Pancras Way, LONDON, NW1 0TB

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.13

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.13

BRUKL compliance check version: v5.6.b.0

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Criterion 1: The calculated CO_2 emission rate for the building must not exceed the target

CO_2 emission rate from the notional building, $kgCO_2/m^2$.annum	17.5
Target CO_2 emission rate (TER), $kgCO_2/m^2$.annum	17.5
Building CO_2 emission rate (BER), $kgCO_2/m^2$.annum	13.1
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	$U_{a-Limit}$	U_{a-Calc}	U_{i-Calc}	Surface where the maximum value occurs*
Wall**	0.35	0.2	0.2	BS000002:Surf[0]
Floor	0.25	0.13	0.13	BS000006:Surf[0]
Roof	0.25	0.13	0.13	BS000059:Surf[7]
Windows***, roof windows, and rooflights	2.2	1.2	1.2	GR000002:Surf[4]
Personnel doors	2.2	-	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	1.5	1.5	GR00001E:Surf[4]
High usage entrance doors	3.5	-	-	No High usage entrance doors in building

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

* There might be more than one surface where the maximum U-value occurs.
** 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.
N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
m³/(h.m²) at 50 Pa	10	3

APPENDIX 2 – BRUKL OUTPUT DOCUMENT (BE GREEN)

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

F2 - Camden Plot B Be Green 150121

As designed

Date: Fri Jan 15 12:23:15 2021

Administrative information

Building Details

Address: 6A St Pancras Way, LONDON, NW1 0TB

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.13

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.13

BRUKL compliance check version: v5.6.b.0

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Criterion 1: The calculated CO_2 emission rate for the building must not exceed the target

CO_2 emission rate from the notional building, $kgCO_2/m^2$.annum	16.9
Target CO_2 emission rate (TER), $kgCO_2/m^2$.annum	16.9
Building CO_2 emission rate (BER), $kgCO_2/m^2$.annum	11.2
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.15	0.15	BS000002:Surf[0]
Floor	0.25	0.13	0.13	BS000006:Surf[0]
Roof	0.25	0.13	0.13	BS000059:Surf[7]
Windows***, roof windows, and rooflights	2.2	1.2	1.2	GR000002:Surf[4]
Personnel doors	2.2	2.2	2.2	GR00001E:Surf[4]
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building

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

* There might be more than one surface where the maximum U-value occurs.
** 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.
N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
m³/(h.m²) at 50 Pa	10	3

APPENDIX 3 – THERMAL COMFORT REPORT

KJ TAIT ENGINEERS

REEF GROUP

UBB PLOT B

ST PANCRAS WAY, LONDON

THERMAL COMFORT REPORT

REVISION P01

Document History

SUITABILITY	REVISION	DATE	DETAILS	BY	CHKD
S2	P01	15th January 2021	First Issue	MC	BH

CONTENTS

EXECUTIVE SUMMARY

KJ Tait Engineers carried out an overheating assessment of the new build Plot B of the Ugly Brown Building (UBB) at 6A St Pancras Way, London, NW1 0TB as part of the Planning application for the development. The site is located between St Pancras Way and the Regents Canal.

As the occupied spaces have been designed with mechanical cooling, the assessment has been conducted on the basis of the Predicted Mean Vote (PMV) and Percentage of People Dissatisfied (PPD) of the occupants to assess whether the ventilation provisions will be sufficient to prevent overheating and provide thermal comfort throughout the summer period. The modelling has been conducted using Design Summer Year (DSY) weather files.

It was found that under a DSY2 50th percentile weather file, all occupied spaces pass the PMV/PPD and TM52 assessment.

Using a London future weather file, all occupied spaces pass the PMD/PPD criteria and TM52 assessment,

1.0 INTRODUCTION

The purpose of this report is to demonstrate that the internal temperatures at the proposed UBB Plot B, Camden meet the requirements set out in CIBSE TM52: The Limits of Thermal Comfort and CIBSE Guide A.

A full dynamic simulation analysis was carried out using the IES VE software, in accordance with CIBSE AM11. A Design Summer Year (DSY) file was used in all simulations in line with CIBSE Guide A.

A further full dynamic simulation analysis was carried out using the same software. In this instance, a '2050 Future Weather File' was used in all simulations in line with BREEAM requirements.

The results contained in this report shall be presented as BREEAM evidence for Hea04 Thermal Comfort and to demonstrate compliance with Policy SI 4 Managing heat risk of the draft London Plan 2020.

2.0 POLICY REQUIREMENTS & DESIGN STANDARDS

2.1 London Plan

Policy SI 4 Managing heat risk of the draft London Plan 2020 states the following regarding overheating within proposed developments:

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

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

As detailed in the Energy Statement, passive design elements have been optimised to reduce the heat entering the building through careful design of the building envelope. Exposed thermal mass and high soffits are also been proposed to contribute to managing the heat within the building.

The proposed development is being future-proofed for Research Laboratory use and passive ventilation and mechanical ventilation only are not compatible with laboratory use, therefore mechanical ventilation and active cooling systems are proposed to meet the required internal environmental conditions.

2.2 BREEAM Compliance

All occupied spaces are required to be in accordance with the criteria set out in CIBSE Guide A Environmental Design 2015, Table 1.5. The building has been designed to limit the risk of overheating in accordance with the adaptive comfort methodology outlined in CIBSE TM52: The limits of Thermal Comfort: Avoiding Overheating in European Buildings 2013.

The building has also been modelled using the relevant 2030 weather file to demonstrate CIBSE Guide A, Table 1.5 and CIBSE TM52 compliance for predicted climate change.

2.3 Predicted Mean Vote (PMV) and Percentage of People Dissatisfied (PPD)

Buildings that are cooled or heated mechanically can also overheat if the ventilation system is, for example, undersized or poorly controlled. The PMV/PPD Model developed by Fanger has the advantage over the CIBSE TM52 assessment by incorporating the influence of temperature, air speed, relative humidity, clothing and activity levels.

The PMV/PPD system is a measurement to predict the occupant's comfortability within the building, taking into account the influence of air temperature, mean radiant temperature, air movement, humidity, clothing and activity levels. Where the system is deemed to be a rough insight into how 'hot' or 'cold' the occupants will be, the aim is to provide to an optimum thermal for the whole group.

To assess human discomfort, the ASHRAE comfort scale can be used. This works by surveying the occupants of the building and averaging the results. Between +1 to -1 would be considered to be comfortable to the occupants as a whole.

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

A building's mechanical conditioning system can be said to have performed its task if the occupants are not conscious of its temperature. Where occupants may be comfortable with conditions when using a building for a particular use, they may become uncomfortable if these conditions are prevalent in a building where the space is used differently.

A mechanically cooled building should aim to provide an indoor environment where the PMV index is near to or equal to zero. As each occupant reacts to warmth or coolth differently, there will always be a minimum of 5% of all occupants that are dissatisfied. Therefore it is recommended to aim as close to the 5% PPD as possible. For Category B buildings, set out in Table A.1 of Annex A of ISO 7730:2005, the building will be considered as overheating if the value of the PMV index is above 0.5 (PPD≥10%).

Operative temperature can also be used for assessing the potential for overheating in mechanically cooled buildings with a temperature of 26°C normally applicable.

3.0 DESIGN CRITERIA

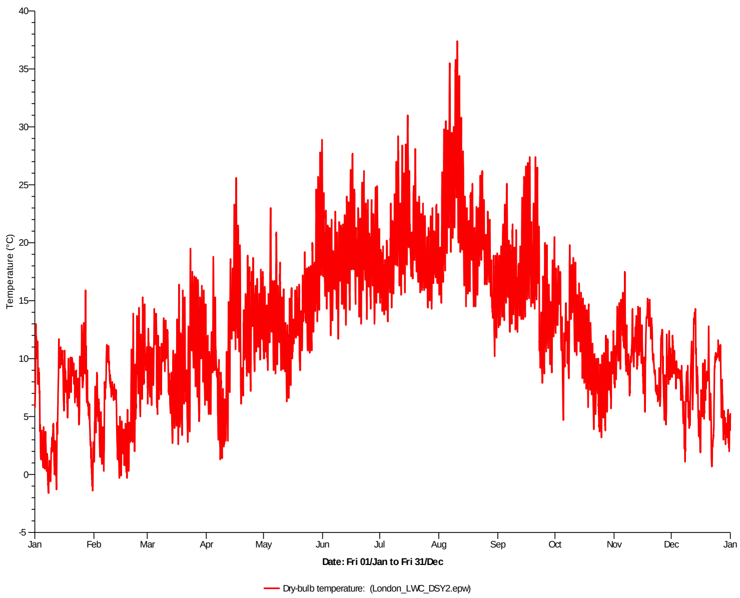
The data used to input into the modelling is presented below. The number of occupants within each room has been entered as recommended in CIBSE Guide A.

3.1 External Conditions & Weather Files

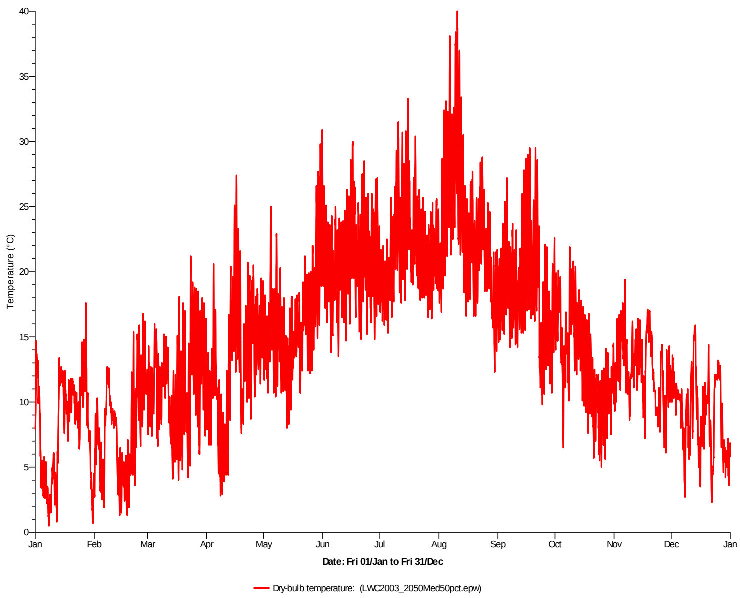
The design has been based upon historical weather data for London. In line with CIBSE guidelines, a "Design Summer Year" (DSY2) weather file was used for the current simulation. BREEAM future weather file 2050 High 50th Percentile has been used for the future condition.

Outside peak temperatures:

- Current: 10 August = 38.70°C



- Future: 10 August = 40.30°C



3.2 Internal Conditions

Internal design criteria for the rooms is detailed CIBSE Guide A. This typically provides the following internal design conditions.

Room Type	Summer Operative Temperature (°C)	Winter Operative Temperature (°C)
Offices	23°C DB ± 2°C	21°C DB ± 2°C
Ground Floor Open Area	23°C DB ± 2°C	21°C DB ± 2°C

3.3 Internal Gains/Occupancy

Following guidance contained in CIBSE Guide A, the internal gains modelled for each space is as follows.

Room Type	Occupancy	Equipment Load
Offices	8m^2 per person (8am – 6pm)	10W/m^2 lighting (9am-6pm) 15W/m^2 equipment (9am-6pm)
Ground Floor Open Area	3m^2 per person (7am – 7pm)	10W/m^2 lighting (12pm–10pm) 5W/m^2 equipment (12pm-10pm)

The occupancy profiles were created assuming a typical work day of 8am to 6pm, Monday to Friday and it is expected that internal gains could vary once equipment layouts and schedules will be finalized.

3.4 Auxiliary Ventilation Rates

Windows will be inoperable throughout the development, therefore no allowance has been made for them to open within the modelling. The infiltration rate has been set in line with Part L2A Building Regulations for all spaces at 0.15 ACH. The following temperature and ventilation rates have been assumed in line with CIBSE Guide A.

Unit/Room Type	Ventilation Rate
Offices	10l/s/person
Ground Floor Open Area	10l/s/person

3.5 Building Details

Modelling Software

The software used to predict the internal temperatures within the building is the IES Virtual Environment software v. 2019 which is AM11 approved. In line with CIBSE Guide A, a 'Design Summer Year' (DSY) weather file was used for the simulations.

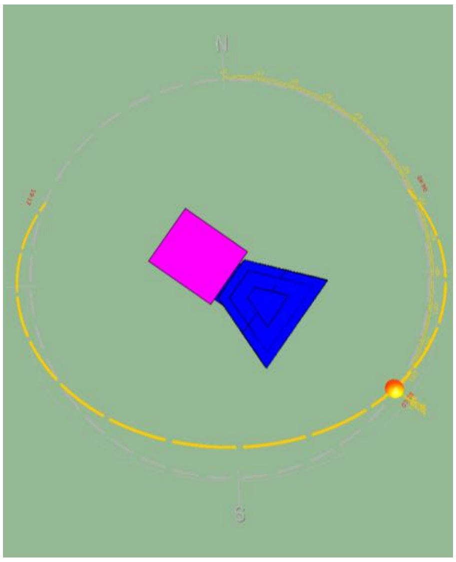
Building Geometry

The building model used for the thermal calculations have been based on the general arrangement drawings prepared by Bennetts Associates.

The air permeability has been entered as $3m^3/m^2$.hr @ 50 Pa in line with Energy Strategy.

Building Orientation

The image below is an extract from the simulation model and indicates the building orientation.



Building Fabric

The building has been constructed with the following U-values which better Part L2A of the Building Regulations. Low g-values of the glazing are used to ensure that during the summer months, solar gains through the building fabric are reduced.

Thermal Element	U-Value (W/m^2K)

Roof	0.13
External Wall	0.2
Floor	0.13
Window	1.6 (g-value: 0.28)

4.0 RESULTS

4.1 PMV/PPD – Current Weather File

The following table shows the output of the simulation, detailing the outcome of the "People dissatisfied" and "Predicted mean vote" analysis.

In Table 1.7 of CIBSE Guide A 2015, the accepted PPD/PMV range for new buildings is 10%/ ±0.5 respectively.

The results below show that under a current weather file, the occupants predicted thermal comfort will be kept in the accepted ranges.

	Current Weather File (2020)	
Room Name	**PPD (predicted percentage of dissatisfied Max)**	**PMV (predicted mean vote Max)**
Ground Floor Foyer	9.36	-0.44
First Floor Open Plan Office	9.31	-0.45
Second Floor Open Plan Office	9.39	-.0.45
Third Floor Open Plan Office	9.51	-0.47
Fourth Floor Open Plan Office	9.44	-0.46
Fifth Floor Open Plan Office	8.98	-0.44
Sixth Floor Open Plan Office	8.90	-0.44
Seventh Floor Open Plan Office	8.92	-0.43
Eighth Floor Open Plan Office	8.63	-0.41

4.2 PMV/PPD – Future Weather File

The results in the following table have been simulated using a predicted future London 2050 DSY2 High 50th percentile weather file for London. This demonstrates that under the predicted future weather file, the occupants predicted thermal comfort will be kept in the accepted ranges.

	Future Weather File (2050)	
Room Name	**PPD (predicted percentage of dissatisfied Max)**	**PMV (predicted mean vote Max)**
Ground Floor Foyer	9.23	-0.44
First Floor Open Plan Office	9.21	-0.45
Second Floor Open Plan Office	9.35	-0.46
Third Floor Open Plan Office	9.43	-0.46
Fourth Floor Open Plan Office	9.24	-0.45
Fifth Floor Open Plan Office	8.56	-0.41
Sixth Floor Open Plan Office	8.65	-0.42
Seventh Floor Open Plan Office	8.59	-0.41
Eighth Floor Open Plan Office	8.27	-0.40

5.0 SUMMARY OF RESULTS

The modelling shows that the there are no hours where the PMV is above 0.5 nor above 10% of people dissatisfied for the building in either the current or future scenario given the ventilation strategy and assumed internal gains.

The Fanger methodology of the PMV/PPD assessment provides a better insight into how occupants would feel in current and future climates where temperatures, humidity and activity levels may change. As it is known that is impossible to keep every occupant happy with the internal resultant temperature, the methodology adopts a 5% base to acknowledge this. The aim from the analysis is to keep a PPD range between 5% and 10%, keeping minimal dissatisfaction across the occupied spaces.

The future weather file futureproofs the building usage, showing that even with predicted climate changes and higher external temperatures, the occupants will still be comfortable within the working environment.

The results displayed in Section 4.2 can be used as evidence for BREEAM HEA04 Thermal Comfort.

The internal conditions used within the model show compliance with CIBSE Guide A, changing such condition in a negative way, such as higher internal gains will cause a knock on effect onto the occupants satisfaction.