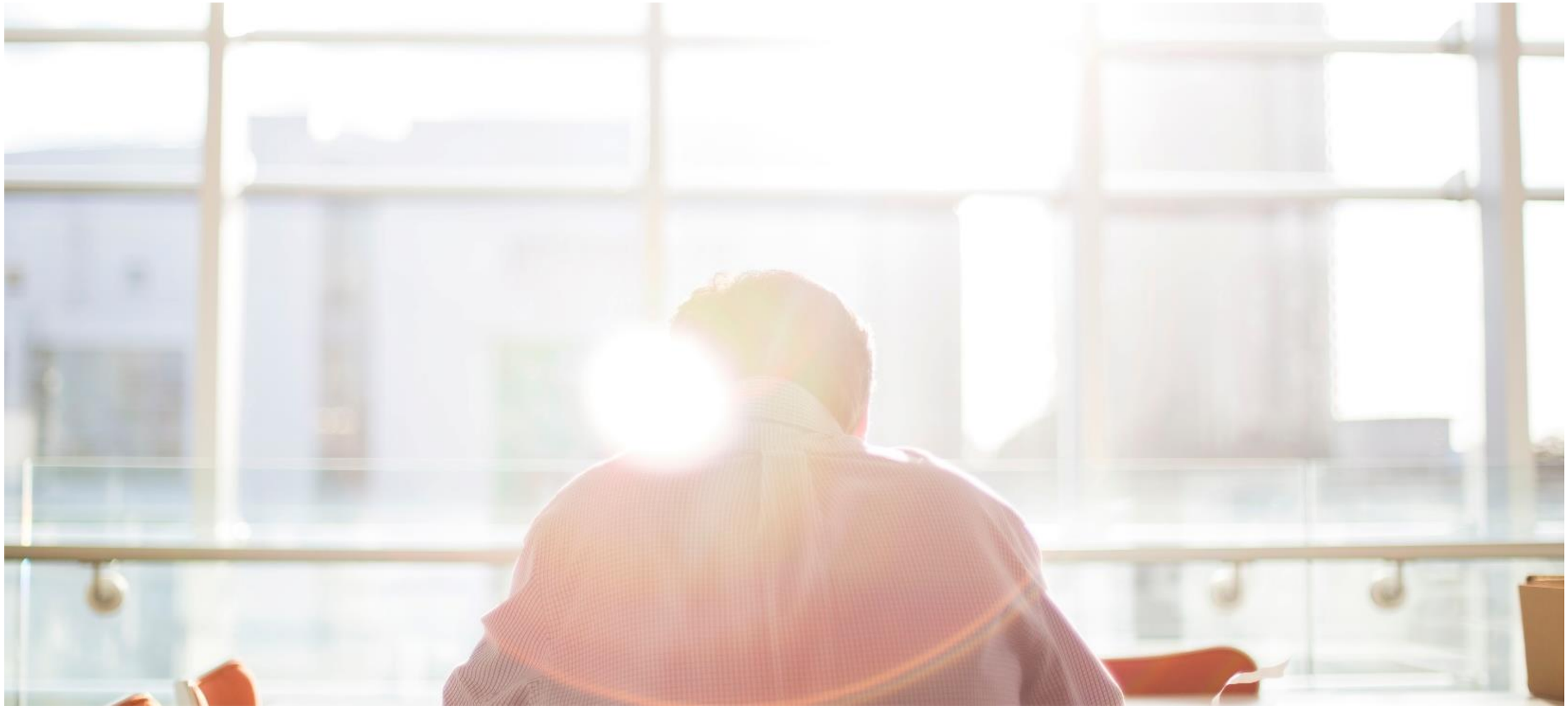
Sustainability Statement Report
Jones Lang LaSalle Incorporated

164 Shaftesbury Avenue

Sustainability Statement

JLL Net Zero Design Consulting
May 2022



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Record of Revisions

Revision	Issue	Issue Date	Prepared By	Reviewed By
1.0	Draft for comments	25/04/2022	Areti Makantasi	Katie Krelle
2.0	Final planning issue	03/05/2022	Areti Makantasi	Katie Krelle
3.0	Updated - Final planning issue	06/05/2022	Areti Makantasi	Katie Krelle

This Sustainability Statement has been prepared by JLL's Net Zero Design team for Daejan Investments LTD ('the Applicant'), to support a full planning application for the refurbishment of the existing building at 164 Shaftesbury Avenue, London, WC2H 8HL ('the Site').

164 Shaftesbury Avenue is an existing building, which primarily accommodates office areas and comprises seven floors (including a basement).

The proposed scheme (hereafter 'the Development') involves the following:

- the erection of two-storey infill extension at ground and first floor and single-storey extension at fifth floor on the corner of Shaftesbury Avenue and Mercer Street,
- external alterations including relocation of main entrance from Shaftesbury Avenue to Mercer Street, replacement gates on Mercer Street,
- replacement of three terraces fronting Mercer Street with one at fifth floor level, erection of new roof terrace at sixth floor level,
- replacement glazing and cladding at ground to fifth floor levels, and overhaul of building services including a new lift overrun and replacement and installation of plant.

Sustainability has been embedded in the design proposals for the refurbishment of 164 Shaftsbury Avenue since the early stages of the project; and it will continue to drive the design and construction, in order to deliver a highly sustainable development.

This Sustainability Statement presents the key elements of the sustainability strategy developed for the proposed refurbishment, in response to the planning policy requirements related to environmental sustainability.

The proposed Sustainability Strategy involves design and construction measures covering the following themes:

- **Energy and CO_2 emissions**
- **Water**
- **Sustainable materials**
- **Transport**
- **Circular economy and waste management**
- **Pollution**
- **Health and wellbeing,**
- **Ecology & biodiversity**
- **Adaptation to climate change**
- **Sustainable design and construction management**

The proposed refurbishment is also being assessed under the BREEAM Refurbishment and Fit-Out (RFO) 2014 scheme, with the aim to achieve a BREEAM Excellent rating.

The project team reviewed the BREEAM requirements during a dedicated pre-assessment workshop and concluded that the proposed development is able to achieve a BREEAM Excellent rating, in line with the planning policy requirements of Camden's Local Plan. The BREEAM pre-assessment is included in Appendix A of this report and provides a detailed breakdown of the targeted credits and score.

Summary of Targets and Objectives

The key targets and objectives of the proposed sustainability strategy are summarised below:

BREEAM

164 Shaftesbury Avenue aims to achieve a BREEAM Excellent rating, being assessed under the BREEAM UK Non-Domestic Refurbishment and Fit-Out (RFO) 2014 scheme.

Energy and CO_2 Emissions

The proposed refurbishment will combine energy efficiency measures and low and zero carbon (LZC) technologies to:

- reduce CO_2 emissions following the Camden Planning Guidance, following the energy hierarchy.
  - The proposed energy strategy is estimated to result in 45% reduction of CO_2 emissions, over the baseline building (as defined by the GLA's Energy Assessment Guidance, April 2020).
- provide an all-electric solution with no fossil fuels used on-site.
- incorporate renewable energy technologies and aim to achieve a 20% reduction of CO_2 emissions, through on-site renewables.
  - The proposed Development will comprise a VRF system to provide heating and cooling; and a dedicated heat pump to provide domestic hot water. Roof-mounted PV panels are also proposed to be installed.
  - The heating component of the VRF and the heat pump, which provides domestic hot water, are considered renewable energy technologies. Together with the PV panels, this achieves a 41% reduction of CO_2 emissions, beyond the baseline emissions.

Waste – A Circular Economy Approach

The proposed scheme promotes circular economy and resource efficiency, as it involves the refurbishment of the existing building, retaining the majority of the existing building envelope. This results in use of less new materials and low embodied carbon, as materials remain in use, at their highest value, for longer.

The proposed refurbishment will also aim to:

- Achieve high rate of diversion of demolition and construction waste from landfill
- Reduce the amount of waste generated during the construction phase

Sustainable Materials

The proposed design will aim to:

- prioritise materials that have low embodied carbon, including those that can be reused or recycled.
- prioritise sustainably sourced materials.
- use legally harvested and traded timber; and timber-based products.
- prioritise durable materials and healthy materials (e.g., low VOC emitting materials).

Water and Surface Water Run-off

The proposed refurbishment will aim to:

- reduce potable water consumption, through the specification of efficient water fittings and achieving the BREEAM Excellent standard for the 'Wat 01' water category.
- incorporate water meters and sub-meters to enable monitoring and efficient control of the building's water demand.
- incorporate water leak detection and flow control devices to reduce water consumption.
- explore the feasibility of incorporating a blue roof.

Health and Well-being

The proposed design will be occupant-centric, and it will aim to:

- incorporate design measures to provide a secure, inclusive, and accessible space.
- maximise daylight levels in the main occupied spaces of the building.
- provide thermal comfort and avoid overheating risk in line with the cooling hierarchy.
- provide visual and acoustic comfort to the building occupants.
- incorporate materials that do not emit toxins to the internal or external environment.
- provide high air quality levels which contribute to improved air quality for the surrounding area.

Transport

The proposed scheme will aim to support sustainable means of transport by:

- providing secure and accessible cycle storage in line with the standards set by Camden Local Plan.
- being located in a central location and in close proximity to public transport.

Pollution

The proposed refurbishment will incorporate measures to:

- minimise the generation of air pollution and prevent increased exposure to poor air quality.
- minimise air pollution during construction.
- design against noise to reduce the need for mitigation measures.
- reduce night-time light pollution.

Ecology

The proposed design will aim to:

- Maintain and enhance the ecological value of the site as a result of the development, following the recommendations of the ecologist.
- Incorporate planting and soft landscaping elements.
- Provide bird boxes to enable nesting.

Adaptation to climate change

The Development will incorporate measures to adapt to climate change in line with Policy CC2, of Camden Local Plan:

- The proposed design will aim to incorporate greenery to enhance the ecology of the site, where feasible, working within the space limitations of the existing building.
- The proposed scheme does not increase the area of impermeable surfaces. The feasibility of incorporating a blue roof will be explored.
- The design will aim to minimise the risk of overheating, following the cooling hierarchy. The scheme, which involves the refurbishment of an existing building does not contribute to additional hardstanding areas in the local building environment (the footprint of the existing built is unchanged).

Sustainable Design and Construction Management

The proposed refurbishment will incorporate the following measures:

- Stakeholder Consultation: The relevant project key stakeholders have been involved in the design process, providing feedback on designing and delivering a sustainable, functional and accessible development.
- Sustainability Implementation Plan: JLL have been appointed as the sustainability advisors, to set performance targets for the proposed scheme, provide advice to the design team and monitor progress during the design and construction phases of the project.
- Environmental Management System: The principal contractor will operate an environmental management system (EMS). They will also be required to implement best practice pollution prevention policies and procedures on-site.
- Building User Guide and occupants' training: A building user guide (BUG) will be prepared prior to handover for distribution to the technical and non-technical building users, including the occupiers and managers. A training schedule will be prepared for building occupiers and managers, timed appropriately around handover.

Figure 1: View of the proposed scheme

Site and Surroundings

The site is located at 164 Shaftesbury Avenue, London, WC2H 8HL within the London Borough of Camden. Figure 2 shows the location of the site.

The site is currently an office building, comprising seven floors. The basement level consists of plantrooms, carpark, as well as shower and cycle facilities. The ground floor includes a reception, an amenity area, and a loading bay. All the upper levels of the building (floors 1st to 6th) are offices.

Proposed Development

The proposed scheme involves the comprehensive refurbishment of the existing building at 164 Shaftsbury Avenue. The design proposals involve:

- Replacement of three bays on Mercer Street and one bay on Shaftesbury Avenue with a curtain wall system.
- All other elements of the building envelope will be retained.
- Reconfiguration of the ground floor and relocation of the building entrance to Mercer Street
- Enhanced provision of amenities, including cycle storage spaces and cyclist facilities
- Reconfiguration of the WCs at the core.
- Replacement of existing building services systems to provide an all-electric solution and avoid the use of fossil fuels on-site.
- Installation of PV panels at the roof.
- Provision of new accessible terrace at level 6.

Figure 2: Site plan and location of the Site

The following planning policy documents set out the environmental sustainability targets for the proposed Development:

- **National Planning Policy Framework (NPPF)**, published in February 2019
- **Camden Local Plan**, published in 2017
- **Camden Planning Guidance (CPG): Energy efficiency and adaptation**, published in January 2021

The relevant policies setting performance targets in relation to environmental sustainability are presented below.

National Planning Policy Framework (NPPF)

NPPF contains the Government's planning policies for England and explains how these are anticipated to be applied. The NPPF needs to be considered during preparation of development plans and is a material consideration in planning decisions. The document also determines objectives for sustainable development, which is required to be delivered through the preparation and implementation of local plans.

The NPPF does not set out any specific environmental sustainability and energy targets.

Camden Local Plan

Camden Local Plan, published in 2017, is the key strategic document for planning and development in Camden. It includes the following policies related to environmental sustainability:

Policy C1 - Health and Well-Being requires:

- development to positively contribute to creating high quality, active, safe and accessible places.

Policy C5 - safety and Security requires developments to:

- demonstrate that they have incorporated design principles which contribute to community safety and security.
- Incorporate appropriate security and community safety measures in buildings.

Policy C6 - Access for All requires:

- all buildings and places to meet the highest practicable standards of accessible and inclusive design so they can be used safely, easily and with dignity by all.
- secure car parking for disabled people.

Policy A3 - Biodiversity requires:

- development not to adversely affect the status or population of priority habitats and species.
- developments to realise benefits for biodiversity through the layout, design and materials used in the built structure and landscaping elements proportionate to the scale of development proposed.
- the demolition and construction phase of development, including the movement of works vehicles, to be planned to avoid disturbance to habitats and species and ecologically sensitive areas, and the spread of invasive species.
- secure management plans, where appropriate, to ensure that nature conservation objectives are met.

Policy A4 - Noise and Vibration requires developments to:

- consider Camden's Noise and Vibration Thresholds.
- avoid generating unacceptable noise and vibration impacts.
- incorporate noise attenuation measures, where required.
- minimise impact on local amenity from deliveries and from the demolition and construction phases of development.

Policy CC1 - Climate Change Mitigation requires:

- developments to promote a zero-carbon development and reduce carbon dioxide emissions through following the steps in the energy hierarchy.
- the location of development and mix of land uses to minimise the need to travel by car and help to support decentralised energy networks.
- refurbishments to support and to encourage sensitive energy efficiency improvements to existing buildings.
- all developments to optimise resource efficiency.

Policy CC2 Adapting to Climate Change requires developments to:

- protect the existing green spaces and to promote new appropriate green infrastructure.
- wherever possible, reduce surface water runoff through increasing permeable surfaces.
- incorporate bio-diverse roofs (combination green and blue roofs) and green walls, where appropriate.
- reduce the impact of urban overheating, including application of the cooling hierarchy.
- achieve a BREEAM Excellent rating.

Policy CC3 Water and Flooding requires:

- developments to incorporate water efficiency measures.
- to avoid harm to the water environment and to improve water quality.
- to consider the impact of development in areas at risk of flooding (including drainage).

Policy CC4 Air Quality requires developments to:

- maintain and increase green infrastructure.
- support and to encourage sensitive energy efficiency improvements to existing buildings.
- develop Air Quality Assessments (AQAs) where a development is likely to expose occupants to high levels of air pollution.
- assess the risk of dust and emissions impacts.
- include appropriate mitigation measures to be secured in a Construction Management Plan.

Policy CC5 Waste requires developments to:

- reduce the amount of waste produced on site and to increase recycling and the reuse of materials.
- produce a Waste Plan, which will ensure that sufficient land is allocated to manage the amount of waste.
- ensure that a development includes facilities for the storage and collection of waste and recycling.

Camden Planning Guidance (CPG): Energy Efficiency and Adaptation

Camden Planning Guidance (CPG) on energy and resources was published in January 2021 to support the policies in the Camden Local Plan (2017). The guidance forms a Supplementary Planning Document (SPD) which is an additional material consideration in planning decisions.

CPG Energy Efficiency and Adaptation sets out the following requirements:

Section 2 - The Energy Hierarchy requires:

- developments to reduce carbon dioxide emissions by following the energy hierarchy in accordance with Local Plan policy CC1.
- energy strategies to be designed following the steps set out in the energy hierarchy.

The proposed scheme is classified as a minor refurbishment, hence a specific CO_2 emissions reduction target is not applicable, as per the CPG.

Section 3 - Making Buildings More Energy Efficient requires:

- natural 'passive' measures to be prioritised over the active measures to reduce energy.
- building layouts to be designed to maximise sunlight and daylight.
- to achieve a balance between benefitting from solar gain and preventing overheating.
- to encourage natural cooling.
- to ensure a high thermal performance.

Section 5 - Renewable Energy Technologies requires:

- to consider the feasibility of on-site renewable energy generation.
- to aim targeting a 20% reduction in carbon dioxide emissions from on-site renewable energy technologies, where feasible.

Section 7 - Energy Reduction Requires:

- to reduce carbon dioxide emissions through the application of the energy hierarchy.
- developments of more than 500m^2 of gross internal floorspace to aim to achieve 20% reduction in carbon dioxide emissions from on-site renewable energy generation, if possible.

Section 8 Energy Efficiency in Existing Buildings requires:

- all developments to demonstrate how sustainable design principles have been considered and incorporated.
- warm buildings to be key to good health and wellbeing; as a guide – at least 10% of the project cost should be spent on environmental improvements.

Section 9 - Reuse and Optimising Resource Efficiency requires:

- to repurposing existing buildings and avoiding demolition where feasible.
- all development to seek to optimise resource efficiency and use circular economy principles.

Section 10 - Sustainable Design and Construction Measures requires:

- all developments involving 500m^2 or more of any additional floorspace to address sustainable design and construction measures (proposed in design and implementation) in a Sustainability Statement.
- active cooling (air conditioning) only to be permitted where its need is demonstrated and the steps in the cooling hierarchy to be followed.
- to reduce overheating risk through following the steps in the cooling hierarchy.
- to seek opportunities to make a positive contribution to green space provision or green.

Section 11 Sustainable Assessment tools requires:

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

Overview

The proposed sustainability strategy has been developed in response to the national, regional and local planning policy framework.

The following sections present the measures that have been incorporated in the design and will be implemented during the construction phase of the refurbishment.

BREEAM Refurbishment & Fit-Out (R&FO) 2014

The proposed scheme aims to promote high sustainability standards and to incorporate sustainability measures, during the design, construction, and operational phase.

The proposed refurbishment has been assessed under the following scheme:

- The proposed office areas will achieve a BREEAM Excellent rating. The scheme will be assessed under BREEAM Refurbishment & Fit-Out (R&FO) 2014 scheme.
- The BREEAM pre-assessment indicates that the proposed development is targeting to achieve a score of **73.62%** which corresponds to a BREEAM **Excellent** rating, in line with Policy CC2 of the Camden Local Plan.

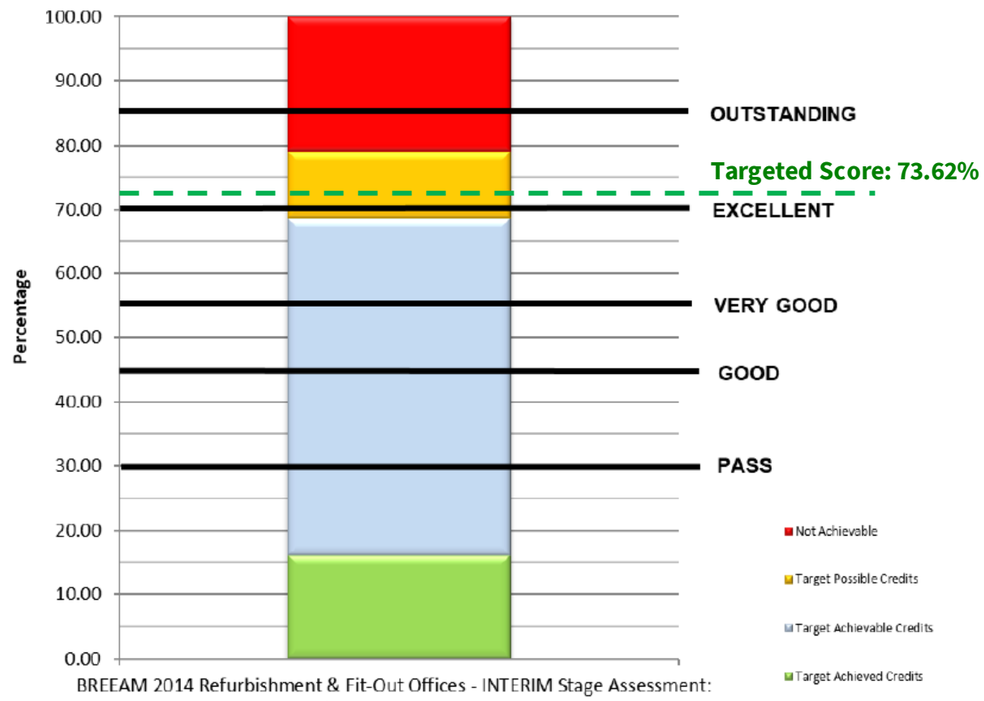

Figure 3. BREEAM Refurbishment & Fit-Out 2014 targeted score for 164 Shaftesbury Avenue [source: Watkins Payne]

Energy and CO_2 Emissions

The refurbishment of 164 Shaftesbury Avenue will be designed and constructed to reduce energy consumption in operation and minimise the associated CO_2, following the energy hierarchy set out in the Camden Local Plan and CGP's:

- **Be Lean**: Use less energy and manage demand during operation
- **Be Clean:** Exploit local energy resources and supply energy efficiently and cleanly
- **Be Green**: Maximise opportunities for renewable energy by producing, storing and using renewable energy on-site

The proposed scheme is classified as a minor refurbishment and hence the Camden Local Plan does not require the provision of a full energy statement, or a specific percentage reduction in carbon emissions over the existing building to be achieved. However, the scheme is required to follow the GLA's energy assessment methodology to demonstrate compliance with the energy hierarchy and that the greatest possible reduction in carbon emissions over Part L 2013 of Building Regulations is achieved.

In accordance with the GLA's Energy Assessment Guidance (April 2020), the energy assessment for the proposed Development used the SAP 10 carbon factors and the GLA's carbon reporting spreadsheet to estimate the percentage reduction of carbon emissions over the baseline building.

Note: A new version of Part L of the Building Regulations has been released (Part L 2021 Edition), however it will be formally enforced after the 15th of June 2022. As such, Part L 2013 is still the applicable version for this planning application.

This section summarises the energy strategy proposed for the refurbishment of 164 Shaftsbury Avenue. **The energy strategy and the resulting energy consumption and CO_2 emissions reduction are provided in detail in Appendix B of this report.**

Be Lean – Energy Demand Reduction Measures

The passive design measures considered for the proposed refurbishment scheme are:

- New thermal elements will incorporate high levels of thermal insulation to reduce heating and cooling demand. The proposed U-values align with the new version of Part L (2021 edition), to future-proof the building.
- The new facades will comprise improved window-to-wall ratio to optimise daylight provision and reduce artificial lighting demand.
- New curtain walling systems will comprise high performing lighting, with low g-value to limit solar gains; and good light transmittance to avoid compromising daylighting.

The active design measures included in the retrofit scheme include:

- Highly efficient mechanical ventilation with heat recovery.
- Variable air flow rates controlled by CO_2 sensors.
- Building Management System (BMS) installation to control and monitor the building services systems.
- Highly efficient LED lighting with PIR and daylight sensors at zones along the building perimeter.

Be Clean – Heat Networks

The feasibility of connecting the building to a district heating or cooling network has been investigated. As shown by the London Heat Map, no existing, or proposed district heating or cooling networks are located within a viable distance from the site.

Be Green – Low and Zero Carbon Technologies

A study has been carried out to assess the feasibility of incorporating low and zero carbon (LZC) technologies to the proposed development (see Appendix B). This feasibility study concluded that the following LZC technologies are feasible for the Development and they have been incorporated in the proposed energy strategy:

- A VRF system will be installed to provide space heating and cooling and a dedicated heat pump is proposed to provide domestic hot water. The heating component of the VRF (which is a heat pump technology) is considered as a renewable energy technology.
- PV panels: PV panels are proposed to be installed at the roof. Due to space limitations, as the roof also comprises plant equipment, the area available for PV installation is estimated at 11m^2.

Energy Modelling Results

The tables and figure below illustrate the carbon emissions savings achieved at each stage of the energy hierarchy; and the CO_2 emissions reduction achieved by the proposed energy strategy over the baseline building (which is defined by the GLA's Energy Assessment Guidance, April 2020, see Appendix B).

Table 1: CO_2 emissions at each stage of the energy hierarchy

	Carbon Dioxide Emissions for non-domestic buildings (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline: Part L 2013 of the Building Regulations Compliant Development	96.2	44.0
After energy demand reduction (be lean)	93.0	44.0
After heat network connection (be clean)	93.0	44.0
After renewable energy (be green)	53.1	44.0

Table 2: CO_2 emissions savings at each stage of the energy hierarchy

	Regulated non-domestic carbon dioxide savings	
	(Tonnes CO_2 /annum)	(%)
Be lean: savings from energy demand reduction	3.3	3%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	39.9	41%
Total Cumulative Savings	**43.2**	**45%**

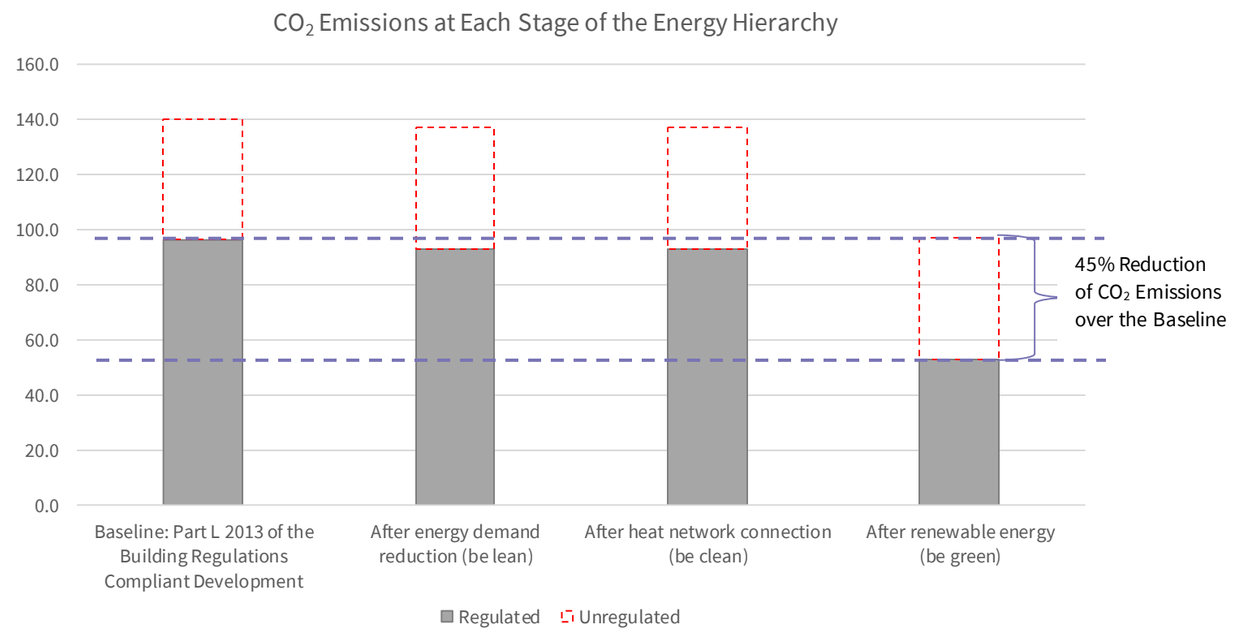

Figure 4: CO_2 emissions at each stage of the energy hierarchy

Materials and Waste – A Circular Economy approach

Circular economy is defined as a model of production and consumption, which involves sharing, leasing, reusing, repairing, refurbishing and recycling existing materials and products as long as possible. It intends to reduce waste to a minimum, while the materials are retained in use at their highest value for as long as possible; and are then reused or recycled.

The key strategic approach for 164 Shaftesbury Avenue in terms of circular economy involves:

- The reuse of the existing building, including a significant part of the existing facades. This results in materials efficiency, use of less new materials and hence lower embodied carbon, as existing materials are remaining in use for longer.
- Any materials or products removed from the building as per of the strip-out works to be reused or recycled, off-site, to divert waste from landfill.

Sustainable Materials

The proposed design will incorporate following circular economy principles:

- **Minimise the quantities of materials and resources:**
  - All structural frame elements and the majority of the existing envelope will be retained, reducing the amount of new materials used.
  - A pre-demolition audit will be carried out, prior to commencement of the strip out works. The audit will identify materials and products that can be reused or recycled, off-site, and it will identify the relevant facilities.
  - Limited area of ceilings and no floor finishes are proposed for tenancy areas.
  - The base building specification will include a standardised range of products and finishes over all floors (e.g., washrooms) to enable the use of off cuts.
  - New materials with low embodied carbon impacts and high recycled content will be prioritised.
- **Specify and source materials and other resources responsibly and sustainably:**

  The proposed Development will aim to source materials responsibly and sustainably, following the relevant requirements of BREEAM RFO 2014 as follows:
  - All timber and timber-based products used in the project will be legally harvested and traded timber
  - New materials with responsible sourcing certificates will be prioritised, where available to the market
  - A sustainable procurement plan will be produced to ensure materials are sourced sustainably and responsibly
  - Procurement of local materials will be prioritised, where feasible
- **Design for longevity, adaptability or flexibility and reusability or recoverability**
  - A functional adaptability study has been developed by the architects in RIBA stage 2, in line with BREEAM Wst 06, to enable accommodation of future changes of operation or use of the building over its lifespan.
  - The proposed design will aim to be flexible to suit a variety of tenants, with efficient open plan layout.
  - The proposed design will provide adequate protection of exposed elements of the building to minimise the frequency of replacement and maximise materials optimisation, in line with BREEAM Mat 05.
  - Materials specified in areas with high pedestrian traffic (such the main entrance, circulation areas) and areas with vehicular access (such as the cycle storage space) will be durable and will incorporate adequate measures to protect materials from damage.
  - All MEP services and plant will be selected to be of good quality to provide a long economic life.

Waste management

Diversion of Resources from Landfill

The following percentages of non-hazardous construction and demolition waste generated have been diverted from landfill (tonnes):

- Refurbishment works: 90%
- Demolition: 95%

Minimisation of Construction Waste

The amount of non-hazardous on-site/off-site construction waste to be generated to be 4.5 $m^3/100m^2$ or 1.2 tonnes/$100m^2$ as a maximum.

Site Waste Management Plan

The Principal contractor will be required to produce a Site Waste Management Plan to manage construction waste in a sustainable manner.

Operational Waste

A dedicated space will be provided for the segregation and storage of operational recyclable waste volumes generated by the building. This space will be:

- located at the basement level of the building
- clearly labelled
- accessible to building occupants or facilities operators for the deposit of materials and collections by waste management contractors
- of a capacity appropriate to the building type and size.

Objective	**Enable materials efficiency, reduce the demolition, construction and operational waste to minimum**
Targets	▪ 100% of timber used in the buildings to be legally sourced (e.g., FSC certified). ▪ Materials with low environmental impact to be prioritised to minimise environmental impact. ▪ A Sustainable Procurement Plan (SPP) will be produced. ▪ Procurement of materials, services and fittings with responsible sourcing certification are ensured. ▪ Frequency of material replacement and maintenance during operation to be minimised through adequate protection. ▪ Achieve at least ≥ 18% of the available RSM points under BREEAM RFO 2014. ▪ Demolition waste will be managed sustainably, with the aim to achieve 95% diversion of waste from landfill. ▪ A Site Waste Management Plan will be produced and implemented by the principal contractor. ▪ The amount of non-hazardous on-site/off-site construction waste generated is either less than $4.5m^3/100m^2$ or less than 1.2 tonnes/$100m^2$ as a maximum.

Health and well-being

The proposed design will encourage the increase of comfort, as well as health and safety of the occupants.

Visual Comfort

The proposed design aims to maximise daylight in the office areas; hence the proposed new facades provide improved window-to-wall ratio. Additionally, high-performing glazing will be specified for the new facades, comprising low g-value, to reduce the amount of solar radiation entering the space, whilst maintaining good daylight levels. The configuration of floor plates also provides adequate view out to occupants in the office areas.

Internal & External Lighting

Internal lighting in all relevant areas of the building will be designed in accordance with the SLL Code for Lighting 2012 and CIBSE Lighting Guide 7. External lighting will be specified in accordance with BS5489-1:2013 Code.

Thermal Comfort

A thermal comfort study will be carried out in line with BREEAM Hea 04. The study will provide a thermal comfort assessment (utilising software compliant with CIBSE AM11) and will aim to demonstrate that the design will deliver thermal comfort levels in accordance with CIBSE Guide A, for current weather data and future projections.

Indoor Air Quality

An Indoor Air Quality (IAQ) plan will be prepared to minimise indoor air pollution during the design, construction, and occupation of the building. The plan will describe either removal or testing and control of contaminant sources, protection of HVAC systems and procedures for pre-occupancy flush out. The building will also be mechanically ventilated, providing adequate fresh air to the building occupants, in line with the relevant industry standards (CIBSE Guide A). The mechanical ventilation system will comprise appropriate level of filtration to provide high quality air to the building occupants.

Acoustic Performance

Clarke Saunders (Acoustic Consultants) have produced an acoustic report for the proposed refurbishment. This report sets the acoustic design criteria for the scheme, in accordance with:

- the standard requirements of Camden Council
- the criteria required for compliance with BREEAM UK RFO 2014 and
- British Council for Offices Guide 2019 Best practice in the specification for offices

Objective	**Enhance the quality of life in buildings by encouraging a healthy and safe internal and external environment for occupants**
Targets	▪ External lighting is designed in line with BS5489-1:2013 Lighting of roads and public amenity areas and BS EN 12464-2:2014 Light and lighting - Lighting of workplaces - Part 2: Outdoor workplaces. ▪ Internal lighting levels will be determined in accordance with SLL Code for Lighting 2012 and CIBSE Lighting Guide 7. ▪ The proposed heating and cooling systems will be designed to provide thermal comfort of the occupiers. ▪ The proposed ventilation strategy ensures the sufficient fresh air supply into the building.

Water and Surface Water Run-off

Low Risk of Flooding

The site is located in a zone of no significant flood risk from rivers and sea, as shown on Figure 5.

Potable Water Consumption

The aim of the design is to achieve the BREEAM Excellent standard for the 'Wat 01' water category as well as to reduce potable water consumption as much as possible (over the BREEAM baseline). Therefore, the development will incorporate low consumption water fittings and appliances, with the specific efficiencies, as per the graph on the right-hand side.

Leak Detection System

Watkins Payne will provide a specification for a permanent automated water leak detection system that detects the major water leaks on the mains water supply and alerts the managers to the leak. The system will be able to identify different flow and therefore leakage rates; and it will be programmable to suit the occupiers' needs. The flow control devices will be fitted to each toilet facility to prevent minor water leaks.

Water Metering

Remotely readable water meters will be provided to monitor and to reduce mains water use. Accessible water sub-meters will also be installed. All the water meters will be either pulsed or with have other open protocol communication output to enable connection to an appropriate utility monitoring and management system, e.g., BMS.

The proposed development will also minimise the unregulated water consumption in sanitary applications.

Objective	**Minimise potable water consumption and reduce reliance on mains water supplies**
Targets	▪ The building will comprise water meters and sub-meters to allow for detailed monitoring of water consumption during building operation. ▪ Efficient water fittings and appliances will be specified, with the aim to achieve a 50% reduction compared to the BREEAM baseline. This corresponds to a BREEAM Excellent level. ▪ A permanent automated water leak detection system is provided to minimise otherwise undetected water leaks.

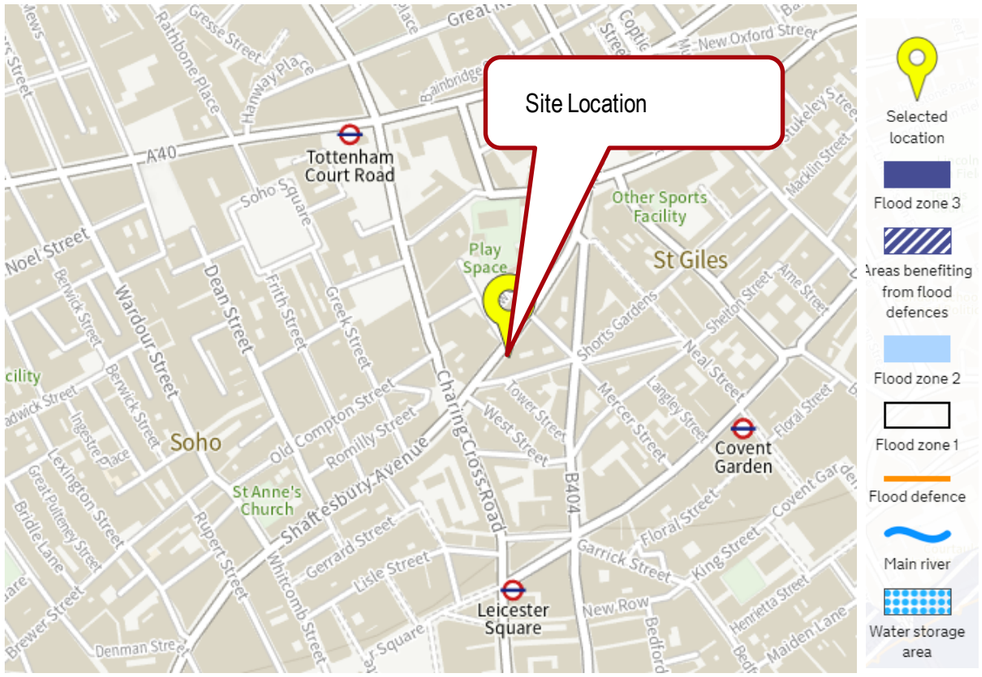

Figure 5: Flood risk map (Source: https://flood-map-for-planning.service.gov.uk/)

Transport

The development is located in the centre of London and is in close proximity to public transport networks and all the local amenities, as shown in Figure 6. The public transport access level (PTAL) is 6b (the highest level).

Car Park Spaces

The proposed Development will only provide two in total car parking spaces, at the basement level, including an electric vehicle charging point and wheelchair parking space.

Cycle Storage Spaces and Cyclists' Facilities

The proposed refurbishment will support sustainable means of transport, providing cycle storage spaces and cyclists' facilities.

The proposed scheme will provide 46 bikes racks in total, 10 of which will be short stay and 36 long stay spaces. In addition to this, the scheme also provides space for a new maintenance/repair station, electric scooters and one non typical cycle parking space.

164 Shaftesbury Avenue will also provide cyclist facilities including the following showers, lockers and changing facilities.

Figure 6: Public transport access level (Source: https://tfl.gov.uk/info-for/urban-planning-and-construction/planning-with-webcat/webcat)

Objective	**Reduce the CO_2 emissions from transport and encourage the use of sustainable means of transport**
Targets	▪ A total of 46 cycle storage spaces will be provided, including 10 short stay and 36 long stay spaces ▪ Showers, lockers and changing facilities will be provided to encourage people to cycle to the building. ▪ The use of sustainable means of transport is encouraged. The location of the building provides excellent connectivity to public transport networks.

Pollution

Air Quality

The proposed scheme incorporates an all-electric strategy, with no use of fossil fuels on site. The use of the air-source heat pumps to provide heating and cooling, as well as a dedicated heat pump to provide domestic hot water, will result in no negative impact on the air quality of the local environment.

Figures 7, 8, 9 and 10 provide the air quality maps for the local area of the Site, showing that the Site in not located in an area of poor air quality.

Noise Levels

A Noise Impact Assessment will be undertaken by Clarke Saunders. This assessment evaluated the noise impact from the proposed external plant equipment on the surrounding properties, recommending the following attenuation measures:

- The pre-existing 1200mm high solid and imperforate roof parapet will be retained, enclosing the rooftop plant area.
- A 1m attenuation zone allowance shall be provided on all atmosphere side connections. This distance may be reduced in later stages, when the design will have been developed in further detail.

Night-time Light Pollution

Watkins Payne confirmed that the external lighting together with the safety and security lighting will be designed in accordance with ILP Guidance.

Moreover, all external lighting will be automatically switched off between 23:00 and 07:00.

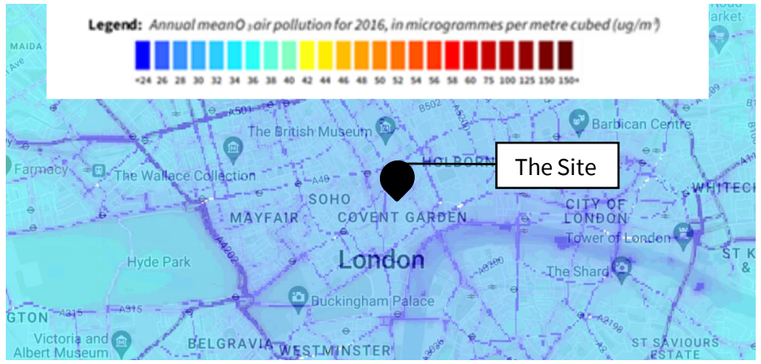

Figure 7: Annual mean O_3 air pollution, based on measurements made during 2016 [source: www.londonair.org.uk]

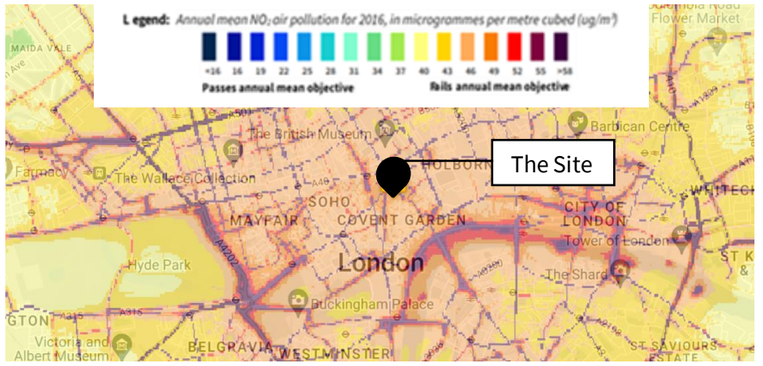

Figure 8. Annual mean NO_2 air pollution, based on measurements made during 2016 [source: www.londonair.org.uk]

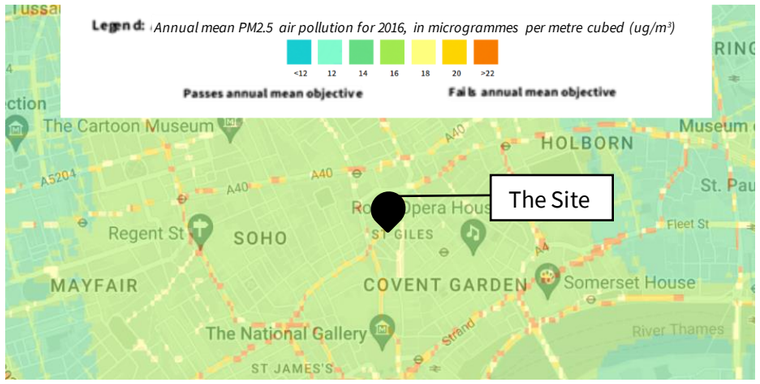

Figure 9: Annual mean PM2.5 air pollution, based on measurements made during 2016 [source: www.londonair.org.uk]

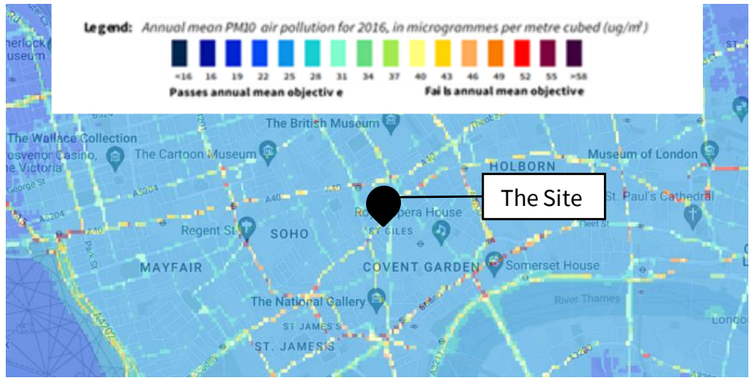

Figure 10: Annual mean PM10 air pollution, based on measurements made during 2016 [source: www.londonair.org.uk]

Objective	**Reduce the adverse impacts of the development on the local air quality, night-time pollution and noise levels**
Targets	▪ The development has no negative impact on noise levels and air quality. ▪ Negative impact from nigh-time light pollution is avoided. ▪ The electric heating system ensures elimination of direct NO_x emissions.

Ecology and Biodiversity

An ecology report has been produced by RPS for 164 Shaftesbury Avenue.

Landscape and Habitat Management Plan

A landscape and habitat management plan will be produced and handed over to the building owner for use by the ground's maintenance staff. The plan will cover at least the first five years after project completion (in accordance with BS 42020:2013).

Enhanced Ecological Value

The Ecological report confirms that the existing site is of low ecological value.

The proposed design aims to maximise opportunities to enhance ecology and biodiversity of the site, within the context of retaining the existing building, which creates limitations in terms of areas available for urban greening.

RPS have been appointed to provide Ecology advice, since early stage 2. The ecology report produced by RPS proposes the following measures to support and enhance ecology and biodiversity:

- Plantation at the terraces and provision of suitable planting species,
- installing bird nest boxes,
- provision of climbing shrubs,

Objective	**Protect the existing ecological features and enhance the ecological value of the site. Minimise the long-term impact of the development on the local biodiversity**
Targets	▪ A landscape and habitat management plan (covering at least the first five years after project completion) are produced. ▪ The key recommendations of the ecologist that aim to enhance the ecological value of the site (inc. provision of climbing shrubs, suitable planting species, bird nest boxes) are incorporated.

Sustainable Design and Construction Management

The Management category strongly encourages the adoption of sustainable practices in relation to design, refurbishment, commissioning, handover and aftercare activities. This ensures the robust sustainability objectives being set and followed through the key stages into the operation of the building.

Stakeholder Consultation

The relevant project key stakeholders have been involved in the design process for the purpose of delivering a sustainable, functional and accessible development with an optimised building performance.

Sustainability Champion

JLL have been appointed as the sustainability advisors for the Development, during design and construction stages. JLL's role relates to setting sustainability targets and objectives for the proposed scheme, advice the design and construction teams and implement a sustainability implementation plan, monitoring progress during the duration of the project.

Environmental Management System

The site will be managed in considerate manner by the principal contractor, who operates a third party certified environmental management system (EMS). The contractor will be also required to implement best practice pollution prevention policies and procedures on-site.

Building User Guide & training

A building user guide (BUG) will be prepared prior to handover for distribution to the technical and non-technical building users, including the occupiers or building managers. The BUG will cover information regarding the operation, access, and environmental performance of the building.

A training schedule will be prepared for building occupiers and managers, timed appropriately around handover.

Objective	**Recognise, encourage and implement sustainable management solutions throughout the design, construction and in-use stages**
Targets	▪ Energy and water consumption, as well as transport of materials and waste will carefully monitored, recorded and reported during the construction phase. ▪ The principal contractor will operate an environmental management system. ▪ An adequate training and a Building User Guide for technical and non-technical users, building occupants and managers are provided. ▪ Effective commissioning and handover are planned and will be implemented.

Conclusion

This Sustainability Statement presents the sustainability strategy developed for the proposed refurbishment of 164 Shaftsbury Avenue, in line with the national, regional and local planning policy requirements. The proposed strategy covers measures from the following main thematic categories:

- **Energy and CO_2 emissions**
  - The proposed refurbishment is estimated to result in a 45% reduction in regulated carbon emissions compared to the baseline building, based on the proposed energy strategy.
  - The energy strategy comprises a VRF system which provides space heating and cooling and dedicated heat pump which provides domestic hot water. The scheme is also proposed to incorporate roof mounted PV panels.

    The proposed PVs, alongside the VRF (the heating component of which is considered a renewable energy technology) and the domestic hot water heat pump, result in 41% reduction of emissions, which exceeds the 20% required by the CPG.
- **Water and surface water run-off**
  - The building will comprise water meters and sub-meters to allow for detailed monitoring of water consumption during building operation.
  - Efficient water fittings and appliances will be specified.
  - A permanent automated water leak detection system is provided to minimise otherwise undetected water leaks.
  - The building is located in a low flood risk zone.
  - The proposed refurbishment will not result in an increased of the areas of impermeable surfaces.
- **Sustainable materials and waste – A circular economy approach**
  - 100% of timber used in the buildings to be legally sourced (e.g., FSC certified).
  - Materials with low environmental impact and those responsibly sourced will be prioritised to minimise environmental impact.
  - Demolition waste will be managed sustainably, with the aim to achieve 95% diversion of waste from landfill.
  - A Site Waste Management Plan will be produced and implemented by the principal contractor.
  - The amount of non-hazardous on-site/off-site construction waste generated is either less than 4.5m3/100m2 or less than 1.2 tonnes/100m2 as a maximum.
- **Transport**
  - A total of 46 cycle storage spaces will be provided, including 10 short stay and 36 long stay spaces
  - Showers, lockers and changing facilities will be provided to encourage people to cycle to the building.
  - The use of sustainable means of transport is encouraged. The location of the building provides excellent connectivity to public transport networks.
- **Pollution**
  - The development has no negative impact on noise levels and air quality.
  - Negative impact from nigh-time light pollution is avoided.
  - The electric heating system ensures elimination of direct NO_x emissions.
- **Health and wellbeing**
  - The proposed design will aim to provide visual, thermal and acoustic comfort
  - The proposed design will incorporate measures to provide good indoor air quality.
  - The proposed refurbishment will be accessible and inclusive.
- **Ecology & biodiversity**
  - A landscape and habitat management plan (covering at least the first five years after project completion) are produced.
  - The key recommendations of the ecologist that aim to enhance the ecological value of the site (inc. provision of climbing shrubs, suitable planting species, bird nest boxes) are incorporated.
- **Sustainable design and construction management**
  - Energy and water consumption, as well as transport of materials and waste, is carefully monitored, recorded and reported during the construction phase.
  - The principal contractor will be required to operate an environmental management system.
  - An adequate training and a Building User Guide for technical and non-technical users, building occupants and managers are provided.
  - Effective commissioning and handover are planned and will be implemented.
- **Benchmarking**

The scheme will achieve an 'Excellent' rating under the BREEAM UK Refurbishment and Fit-Out 2014 scheme.

Appendix A: BREEAM Pre-Assessment

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designed engineered focused

164 Shaftesbury Avenue, London, WC2H 8HL

BREEAM 2014 Refurbishment & Fit-Out

Pre-Assessment Report – Issue Planning

Prepared for:
Daejan Investments Limited c/o Freshwater Group

April 2022

BREEAM®

Prepared on behalf of Watkins Payne by

Name Jamie Daniel 

Position Senior Sustainability Consultant / BREEAM AP

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Issue and Date	Reason for Issue
Issue Planning – 20/04/2022	For planning application submission

1.00 Introduction

Sustainability is defined as the ability to meet the needs of today, without compromising the ability of future generations to provide for the needs of tomorrow. It can be described as the equilibrium between environmental and financial considerations, and the needs of the community. A truly sustainable development will achieve a balance between fitness-for-purpose, value-for-money and environmental impact together with the integration as part of a larger, sustainable community.

Watkins Payne has been commissioned by Daejan Investments Limited c/o Freshwater Group to carry out BREEAM 2014 Refurbishment & Fit-Out Offices Pre-Assessment in conjunction with the preparation of the detailed application for the development.

This report details the performance of the development against the BREEAM 2014 Refurbishment & Fit-Out criteria. The development's performance is in accordance with specification documentation and verbal expressions of credit conformity/non-conformity established with members of the design team prior to issue of this pre-assessment report.

Description of proposed development:

The existing building comprises office accommodation across ground to 6th floor, with plant located at roof level and basement level. The main entrance to the offices is through the ground floor reception accessed from Mercer Street or via the car park.

The proposed development is to refurbish the existing office floors with the addition of new plant at roof level. The existing envelope will be retained and partly improved to the main elevations on Shaftesbury Avenue and Mercer Street. The remaining fabric is relatively new and in good condition.

The development's scope of works align with the following assessment scope of the BREEAM 2014 Refurbishment & Fit-Out scheme:

- Part 1 – Fabric & Structure
- Part 2 – Core Services
- Part 3 – Local Services

The proposed servicing strategy for the buildings is:

- The office areas will utilise Air Source Heat Pumps (ASHPs) in their variable refrigerant flow (VRF) format will provide all the heating and cooling requirements of the office areas.
- Domestic hot water will be provided from a central hot water storage system. The system will incorporate three HWS storage calorifiers located in the basement plantroom. Heating to the domestic hot water (DHW) calorifiers will be provided by a constant temperature variable flow low temperature hot water (LTHW) circuit generated by dedicated ASHP located on the roof
- Low Zero Carbon / Renewable energy technologies: Air source heat pumps (ASHP)

2.00 BREEAM 2014 Refurbishment & Fit-Out' Pre-assessment Scores

<30	UNCLASSIFIED
≥30	PASS
≥45	GOOD
≥55	VERY GOOD
≥70	EXCELLENT
≥85	OUTSTANDING

Project No:	4881
Project Name:	164 Shaftesbury Ave
Engineer/Verified:	JD / KP
Date	April 22
Rev:	Planning Issue

Bold & Shading denotes mandatory credit achievement / requirement for VERY GOOD & ABOVE RATING

Bold & Shading denotes mandatory credit achievement / requirement for EXCELLENT & ABOVE RATING ONLY

Credit Summary - BREEAM 2014 Refurb / Fit-Out PRE-ASSESSMENT SCORES		**Assessment Credit**	**Max No of Credits Available**	**ACHIEVABLE**
Management	Project Brief & Design	Man 01	4	3
Credit Value %	Life Cycle Costing & Service Life Planning	Man 02	4	1
0.72	**Responsible Construction Practices [Site Timber AND CCS = 1 credit for EXCELLENT]**	**Man 03**	**6**	**6**
	Commissioning & Handover Building User Guide	**Man 04**	**4**	**4**
Section Credit Total			**18**	**14**
Weighted Section Total			**12.90%**	**10.03%**
Health & Wellbeing	Visual Comfort	Hea 01	6	1
Credit Value %	Indoor Air Quality	Hea 02	3	1
0.86	Thermal Comfort	Hea 04	3	3
	Acoustic Performance	Hea 05	2	2
	Safety & Security	Hea 06	1	0
Section Credit Total			**15**	**7**
Weighted Section Total			**12.83%**	**5.99%**
Energy	**Reduction of Energy Use & Carbon Emissions [6 credits for EXCELLENT]**	**Ene 01**	**15**	**15**
Credit Value %	**Energy Monitoring 1st Credit**	**Ene 02**	**2**	**2**
0.72	External Lighting	Ene 03	1	1
	Low Carbon Design	Ene 04	3	2
	Energy Efficient Transportation Systems	Ene 06	3	3
Section Credit Total			**24**	**23**
Weighted Section Total			**17.34%**	**16.62%**
Transport	Sustainable Transport Accessibility	Tra 01	3	3
Credit Value %	Proximity to Amenities	Tra 02	1	1
0.84	Cyclist Facilities	Tra 03	2	2
	Travel Plan	Tra 05	1	1
Section Credit Total			**7**	**7**
Weighted Section Total			**5.85%**	**5.85%**
Water	**Water Consumption 1 Credit for GOOD & ABOVE**	**Wat 02**	**5**	**4**
Credit Value %	**Water Monitoring**	**Wat 02**	**1**	**1**
0.84	Water Leak Detection & Prevention	Wat 03	2	2
Section Credit Total			**8**	**7**
Weighted Section Total			**6.69%**	**5.85%**

Credit Summary - BREEAM 2014 Refurb / Fit-Out PRE-ASSESSMENT SCORES		Assessment Credit	Max No of Credits Available	ACHIEVABLE
Materials	Environmental Impact of Materials	Mat 01	6	4
Credit Value %	**Responsible Sourcing of Materials [All timber - legally sourced for PASS and above]**	**Mat 03**	**4**	**2**
1.21	Insulation	Mat 04	1	1
	Designing for Robustness & Resilience	Mat 05	1	1
	Material Efficiency	Mat 06	1	0
Section Credit Total			**13**	**8**
Weighted Section Total			**15.68%**	**9.65%**
Waste	Construction Waste Management	Wst 01	7	4
Credit Value %	**Operational Waste**	**Wst 03**	**1**	**1**
0.78	Speculative Finishes	Wst 04	1	1
	Adaption to Climate Change	Wst 05	1	1
	Functional Adaptability	Wst 06	1	1
Section Credit Total			**11**	**8**
Weighted Section Total			**8.63%**	**6.28%**
Land Use & Ecology Credit Value %	Enhancing Site Ecology	LE 04	1	1
2.51	Long Term Impact on Biodiversity	LE 05	2	2
Section Credit Total			**3**	**3**
Weighted Section Total			**7.53%**	**7.53%**
Pollution	Impact of Refrigerants	Pol 01	3	0
Credit Value %	NOx Emissions	Pol 02	3	0
0.97	Flood Risk & Reducing Surface Water Run-Off	Pol 03	5	3
	Reduction of Night Time Light Pollution	Pol 04	1	1
	Noise Attenuation	Pol 05	1	1
Section Credit Total			**13**	**5**
Weighted Section Total			**12.55%**	**4.83%**
Innovation	Responsible Construction Practices	Inn Man 03	1	1
Credit Value %	Visual Comfort	Inn Hea 01	1	0
1.00	Indoor Air Quality	Inn Hea 02	2	0
	Reduction of Energy Use & Carbon Emissions	Inn Ene 01	5	0
	Water Consumption	Inn Wat 01	1	0
	Environmental Impact of Materials	Inn Mat 01	1	0
	Responsible Sourcing of Materials	Inn Mat 03	1	0
	Construction Waste Management	Inn Wst 01	2	0
	Adaption to Climate Change	Inn Wst 05	1	0
	Flood Risk & Reducing Surface Water Run-Off	Inn Pol 03	1	0
Section Credit Total			**10**	**1**
Weighted Section Total			**10.00%**	**1.00%**
		Totals:		**73.62%**
		Rating:		**EXCELLENT**

3.00 Summary

The below details the pre-assessment results for the project under BREEAM 2014.

The BREEAM 2014 Refurbishment & Fit-Out Pre-Assessment Results are:

Credit Strategy	***'Achievable'***
Score	**73.62%**
Rating	**EXCELLENT**

This report therefore demonstrates that a planning compliant pre-assessment can be provided at the site.

Introduction

JLL Net Zero Design Consulting have been instructed to conduct a Part L2B compliance modelling exercise in support of the planning application for the refurbishment of the existing office building at 164 Shaftsbury Avenue, located in the London borough of Camden.

The refurbishment scheme is required to:

- Meet the requirements of Part L2B of the Building Regulations
- Satisfy local planning policy requirements stipulated by the London Borough of Camden, and to reduce carbon dioxide emissions through the application of the energy hierarchy
- Follow the London Plan planning policy principles

The scheme is considered a Minor refurbishment and therefore the Camden Local Plan does not require the provision of a full energy statement, as indicated within the London Plan, or a target percentage reduction from the baseline existing building. However, it is expected that the scheme will follow the GLA's energy assessment methodology to indicate compliance with the energy hierarchy and that the greatest possible reduction in carbon emissions below Part L 2013 of Building Regulations is achieved.

The purpose of this document is to summarise how the project follows the energy hierarchy principles and the carbon savings achieved through the proposed refurbishment works.

Baseline – Existing Building

In line with the GLA's Energy Assessment Guidance (April 2020), the baseline CO_2 emissions have been calculated assuming the notional specification for existing buildings (Table 1) as shown in Appendix 4 of GLA's Energy Assessment Guidance (April 2020).

Table 1: Non-domestic notional specification for existing buildings

Element	Specification
External Wall U-value	0.55 W/m²K
Roof U-value	0.18 W/m²K
Floor U-value	0.25 W/m²K
Glazing U-value	1.80 W/m²K
Glazing g-value	0.40
Air permeability	25 – Buildings built to Building Regulations pre-1995
HVAC System	System type as per actual building and heating provided by gas boiler
Heating and hot water	84% gross efficiency gas boiler
Cooling (air-condition)	3.90 – Vapour compression cycle chillers, water cooled < 750 kW
Central ventilation SFP	2.20 W/l/s
Terminal unit SFP	0.50 W/l/s
Heat recovery efficiency	70%
Lighting	50

Source: GLA Energy Assessment Guidance (April 2020)

The table below presents the calculated regulated and unregulated CO_2 emissions resulting from the baseline building, which will the basis of comparison against the performance of the proposed scheme.

Table 2: CO_2 emissions of baseline building (existing)

	Carbon Dioxide Emissions (tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline:	**92**	**38**

Be Lean – Energy Efficiency

Passive design and energy efficiency measures

At this stage of the energy hierarchy, passive design and energy efficient measures are prioritised over any active design measures to ensure that the energy demand is reduced as far as possible.

The passive design measures considered for the proposed refurbishment scheme are:

- New thermal elements will incorporate high levels of thermal insulation to reduce heating and cooling demand. The proposed U-values align with the new version of Part L (2021 edition), to future-proof the building.
- The new facades will comprise improved window-to-wall ratio to optimise daylight provision and reduce artificial lighting demand.
- New curtain walling systems will comprise high performing lighting, with low g-value to limit solar gains and good light transmittance, to avoid compromising daylighting.

The active design measures included in the retrofit scheme include:

- Highly efficient mechanical ventilation with heat recovery.
- Variable air flow rates controlled by CO_2 sensors.
- Building Management System (BMS) installation to control and monitor the building services systems.
- Highly efficient LED lighting with PIR and daylight sensors at zones along the building perimeter.

The following tables indicate how this development will reduce the baseline energy consumption required, through the implementation of passive design and energy efficiency measures (Be Lean)

Table 3: Passive design measures

Element	Proposed Value
New external wall U-value ((W/m²K)	0.26
New roof U-value ((W/m²K)	0.16
New Curtain Wall – spandrel panels U-value ((W/m²K)	0.8
New Curtain Wall – glazing elements including frame U-value (W/m²K)	1.4
New Curtain Wall glazing g-value	0.40
New Curtain Wall glazing VLT	70%
Air permeability (m³/h m²@ 50 Pa)	10

Table 4: Building services design parameters

Element	Proposed Value
Central ventilation SFP (W/l/s)	1.8
Heat recovery efficiency (%)	75%
Terminal Unit SFP	0.20
Lighting	LED throughout
Daylight Dimming	Provided in office areas
Lighting Efficiency	100 lm/W in offices and 80 lm/W in the rest of the spaces

Cooling Hierarchy

The proposed Development aims to reduce cooling demand, following the cooling hierarchy, as described below:

- **Reduce the amount of heat entering the building through orientation, shading, high albedo materials, fenestration, insulation, and the provision of green infrastructure**:

  The proposed scheme involves the refurbishment of the existing building, with parts of the existing facades being retained. As such, the orientation, external shading, materials are not feasible to be changed as part of these refurbishment works.

  The new parts of the facades will comprise high performing glazing, with low g-value, to reduce the amount of solar radiation entering the space, and good light transmittance to avoid compromising the daylight levels.

- **Minimise internal heat generation through energy efficient design:**

  The proposed Development will utilise highly efficient LED lighting, which will result in lower internal heat gains.

  All pipework will comprise high levels of thermal insulation, to avoid heat losses.

- **Manage the heat within the building through exposed internal thermal mass and high ceilings:**

  Parts of the proposed office areas are proposed to have exposed ceilings, hence there is potential to utilise the thermal mass on the concrete floor slabs. The areas with exposed ceilings will be determined in the next design stage.

- **Provide passive ventilation:**

  Some of the existing windows are openable. However, the potential of the proposed Development to be naturally ventilated is considered limited, due to its location in central London, which is likely to be associated with high external noise levels, not appropriate for an office use.

- **Provide mechanical ventilation:**

  The Development will be mechanically ventilated, through a high efficiency mechanical ventilation with heat recovery system. The system will comprise summer-time by-pass.

- **Provide active cooling systems:**

  The proposed design is anticipated to result in lower cooling demand, compared to that of the existing building. This will be due to the use of highly efficient LED lighting, which will reduce internal heat gains and due to the high-performing glazing proposed at the new facades, which will control solar gains.

  As such, whilst active cooling will be required to provide thermal comfort, the proposed design resulted in lower cooling demand, hence less reliance on active cooling compared to the baseline building.

Be Lean –Energy Modelling Results after the Energy Efficiency Measures

The following tables summarise the percentage improvement from the existing development (baseline). The GLA's carbon reporting spreadsheet was used to calculate carbon emissions with the SAP 10 carbon factors.

Table 5: CO_2 emission reductions due to energy efficiency measures (Be Lean)

Carbon Dioxide Emissions (tonnes CO_2 per annum)		
	Regulated	**Unregulated**
Baseline:	96.2	44.0
After energy demand reduction (be lean)	93.0	44.0
	Tonnes CO_2 per annum	(%)
Savings from demand reduction	3.3	3%

Be Clean – Heat Networks

Local Plan Policy CC1 requires all major developments to assess the feasibility of connecting to an existing decentralised energy network, and where this is not possible establishing a new network. As this scheme is considered a minor refurbishment, such feasibility assessment is not required for the planning application process.

However, the feasibility of connecting the Development to a district heating network has been explored. The London Heat Map, an extract of which is shown in Figure 1, shows that no existing or proposed networks are located within a viable distance from the Site. As such, connecting the development to a district heating network (existing or planned) is not considered feasible.

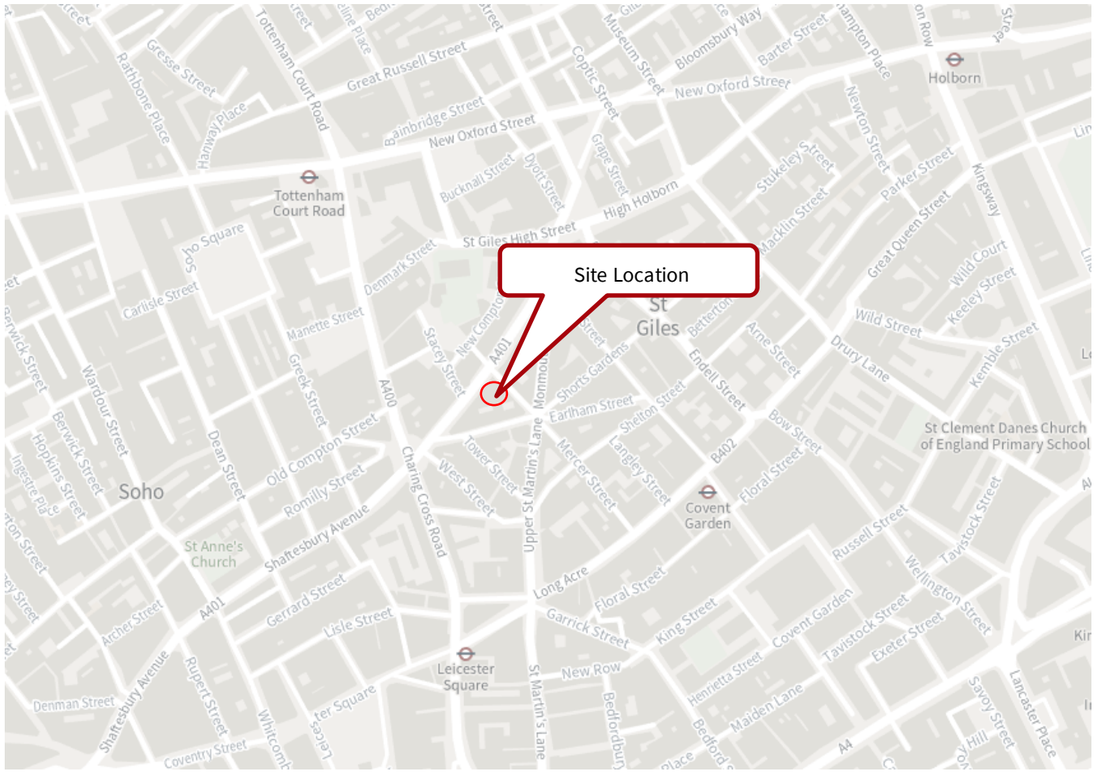

Figure 1: Extract from the London heat map (https://maps.london.gov.uk/heatmap)

Be Green – Low and Zero carbon technology

An analysis of potential Low and Zero Carbon (LZC) technologies that can be used for the office refurbishment was carried out. The proposed refurbishment will provide high efficiency variable refrigerant flow (VRF) technology with heat recovery and roof mounted photovoltaics, delivering an all-electric, fossil fuel free, solution.

The LZC technologies feasibility study is provided in Appendix C and the key outcomes are summarised below.

Heat Pumps

The feasibility study appraised at a high level a number of LZC system types and concluded that a heat recovery VRF system is best suited for the building. The VRF system incorporates heat pump technology eliminating the need for gas fired boiler plant. Heat recovery facilities allow waste heat to be used in the building prior to dissipating it to external reducing energy usage and saving on CO_2 emissions.

Heating to the domestic hot water (DHW) calorifiers will be provided by a constant temperature variable flow low temperature hot water (LTHW) circuit generated by dedicated ASHP located on the roof.

It should be noted that only the heating component of the VRF systems and the ASHP providing the DHW are considered as LZC technologies.

The table below indicated the performance of the proposed VRF ASHP technology.

Table 6: Proposed VRF and ASHP performance data

Element	Proposed Value
Space Heating and Cooling	
Heat Pump efficiency – Heating mode (COP)	2.5
Heat Pump efficiency – Cooling mode (SEER)	3.0
Domestic Hot Water	
DHW Heat Pump efficiency	2.0

Solar Photovoltaics

An installation of 11.9m^2 of roof mounted solar photovoltaics is proposed for the development, due to roof space limitations.

Be Green – Low and Zero Carbon Technology Results

The following tables summarise the percentage improvement from the existing development (baseline). The GLA spreadsheet was used to calculate CO_2 emissions with the SAP 10 carbon factors.

Table 7: CO_2 emission reductions due to renewable technology installation (Be Green)

Carbon Dioxide Emissions (tonnes CO_2 per annum)		
	Regulated	Unregulated
Baseline:	96.2	44.0
After energy demand reduction (Be Lean)	93.0	44.0
After heat networks (Be Clean)	93.0	44.0
After renewable energy (Be Green)	53.1	44.0
Regulated CO_2 Savings		
	Tonnes CO_2 /annum	(%)
From demand reduction measures	3.3	3%
From heat networks	0.0	0%
From renewable energy	39.9	41%
Total cumulative savings	53.1	45%

The estimated unregulated load energy consumption and CO_2 emission figures have been extracted from the thermal model (based on pre-defined NCM database figures) and should not be used to try and estimate actual buildings unregulated energy consumption, as these loads are highly variable and predominately determined by the building user.

Energy Modelling Results

The tables and figure below illustrate the carbon emissions savings achieved at each stage of the energy hierarchy; and the CO_2 emissions reduction achieved by the proposed energy strategy over the baseline building (which is defined by the GLA's Energy Assessment Guidance, April 2020).

The results demonstrate that the proposed design would achieve a 45% reduction of CO_2 emissions, compared to the baseline emissions, based on the proposed energy strategy.

The results also show that the proposed renewable energy technologies (the heating component of the VRF system, the heat pump which will provide domestic hot water and the PV panels) will result in a 41% reduction of CO2 emissions, compared to the baseline, which exceeds the minimum 20% required by the CPG Energy Efficiency and Adaptation.

Table 3: CO_2 emissions at each stage of the energy hierarchy

	Carbon Dioxide Emissions for non-domestic buildings (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline: Part L 2013 of the Building Regulations Compliant Development	96.2	44.0
After energy demand reduction (be lean)	93.0	44.0
After heat network connection (be clean)	93.0	44.0
After renewable energy (be green)	53.1	44.0

Table 4: CO_2 emissions savings at each stage of the energy hierarchy

	Regulated non-domestic carbon dioxide savings	
	(Tonnes CO_2 /annum)	(%)
Be lean: savings from energy demand reduction	3.3	3%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	39.9	41%
Total Cumulative Savings	**43.2**	**45%**

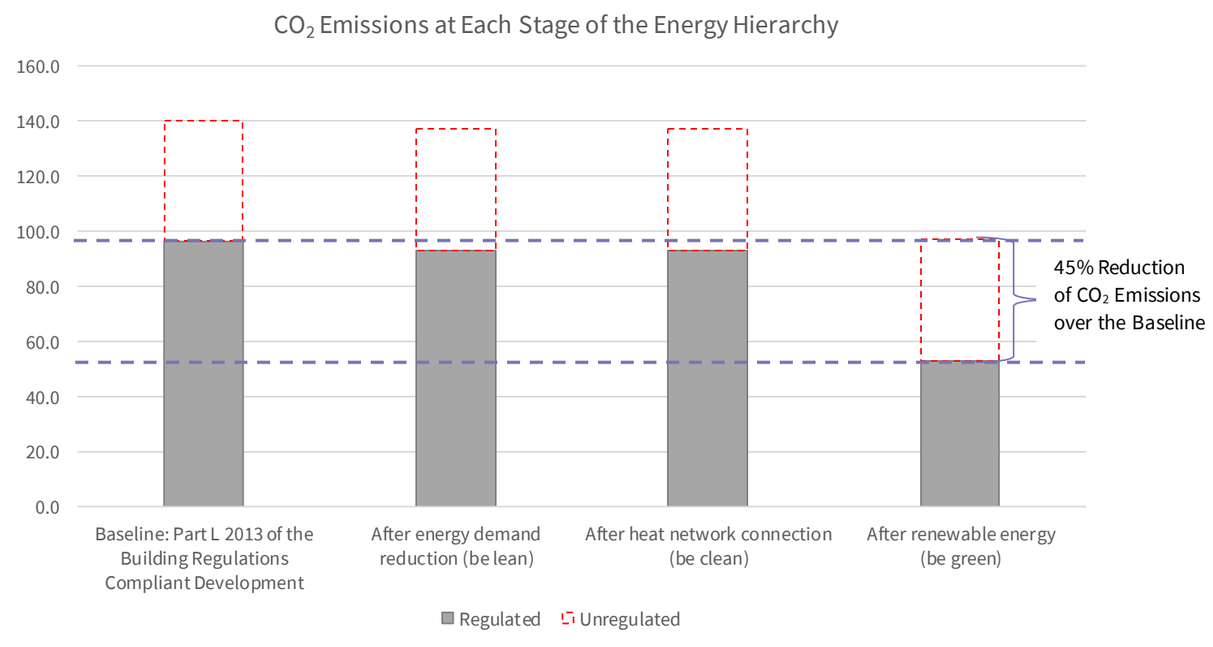

Figure 2: CO_2 emissions at each stage of the energy hierarchy

Appendix C: BRUKL Documents

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

164 Shaftsbury Avenue - Existing building

As designed

Date: Mon Apr 04 16:59:26 2022

Administrative information

Building Details

Address: 164 Shaftsbury Avenue, London, WC2H 8HL

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:

Telephone number:

Address: , ,

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

The building does not comply with England Building Regulations Part L 2013

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	24.2
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	24.2
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	32.2
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	0.36	0.8	GF000003:Surf[8]
Floor	0.25	0.24	0.25	BS000002:Surf[1]
Roof	0.25	0.18	0.18	BS000002:Surf[0]
Windows***, roof windows, and rooflights	2.2	1.66	1.8	GF000003:Surf[2]
Personnel doors	2.2	2.2	2.2	GF00000F:Surf[1]
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
$m^3/(h.m^2)$ at 50 Pa	10	25

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	<0.9

1- Underfloor heating - Basement

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.9	-	0	0	-
Standard value	0.91*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

2- Radiators - Circulation aireas

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.9	-	0	0	-
Standard value	0.91*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

3- Boiler/Chiller + AHU with Fan coil units - Office/Reception

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.9	3.9	0	1.8	0.75
Standard value	0.91*	3.9	N/A	1.6^	0.65
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

^ Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.

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

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
A	Local supply or extract ventilation units serving a single area
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
BS_Showers	-	-	0.5	-	-	-	-	-	-	-	N/A
BS_Changing area	-	-	0.5	-	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
BS_Showers	-	-	0.5	-	-	-	-	-	-	-	N/A
BS_Changing area	-	-	0.5	-	-	-	-	-	-	-	N/A
GF_Tenant meeting rooms	-	-	-	-	-	-	-	0.2	-	-	N/A
GF_Break Out Space	-	-	-	-	-	-	-	0.2	-	-	N/A
4F_Office	-	-	-	-	-	-	-	0.2	-	-	N/A
5F_Office	-	-	-	-	-	-	-	0.2	-	-	N/A
6F_Office	-	-	-	-	-	-	-	0.2	-	-	N/A
6F_Office	-	-	-	-	-	-	-	0.2	-	-	N/A
1F_Office	-	-	-	-	-	-	-	0.2	-	-	N/A
BS_Disable WC	-	-	0.5	-	-	-	-	-	-	-	N/A
BS_Disable Shower	-	-	0.5	-	-	-	-	-	-	-	N/A
BS_Disable WC	-	-	0.5	-	-	-	-	-	-	-	N/A
BS_Disable Shower	-	-	0.5	-	-	-	-	-	-	-	N/A
BS_Stair	-	-	-	-	-	-	-	0.3	-	-	N/A
GF_Reception	-	-	-	-	-	-	-	0.5	-	-	N/A
1F_Office	-	-	-	-	-	-	-	0.2	-	-	N/A
1F_Office	-	-	-	-	-	-	-	0.2	-	-	N/A
2F_Office	-	-	-	-	-	-	-	0.2	-	-	N/A
2F_Office	-	-	-	-	-	-	-	0.2	-	-	N/A
2F_Office	-	-	-	-	-	-	-	0.2	-	-	N/A
3F_Office	-	-	-	-	-	-	-	0.2	-	-	N/A
3F_Office	-	-	-	-	-	-	-	0.2	-	-	N/A
3F_Office	-	-	-	-	-	-	-	0.2	-	-	N/A
4F_Office	-	-	-	-	-	-	-	0.2	-	-	N/A
5F_Office	-	-	-	-	-	-	-	0.2	-	-	N/A
6F_Office	-	-	-	-	-	-	-	0.2	-	-	N/A

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
BS_Switch Room	80	-	-	120
BS_Switch room	80	-	-	85
BS_Electrical Substation	80	-	-	160
BS_Telecom Room	80	-	-	65
BS_Water Plant	80	-	-	132
BS_Services	80	-	-	30
BS_Lobby 2	-	80	-	36
BS_Refuse Store	80	-	-	22
BS_Stairs Parking	-	80	-	31
BS_Electrical Services	80	-	-	137
BS_Showers	-	80	-	35
BS_Changing area	-	80	-	109
BS_Showers	-	80	-	33

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
BS_Changing area	-	80	-	86
BS_Plant Room	80	-	-	74
BS_Chillers	80	-	-	296
BS_Services	80	-	-	41
BS_cupboard	80	-	-	55
BS_Boiler Room	80	-	-	142
BS_Cycle Parking	-	80	-	172
BS_Cycle Parking	-	80	-	36
BS_Lobby 1	-	80	-	54
BS_Parking Area	-	80	-	394
GF_Storage	80	-	-	9
GF_Stairs	-	80	-	39
GF_Disable WC	-	80	-	57
GF_WC	-	80	-	38
GF_Lobby 1	-	80	-	29
GF_Lobby 3	-	80	-	15
GF_Cupboard	80	-	-	3
GF_Storage 2	80	-	-	15
GF_Storage 1	80	-	-	14
GF_Staircore 1	-	80	-	36
GF_Lobby 2	-	80	-	36
GF_Stairs to Basement	-	80	-	33
GF_Tenant meeting rooms	100	-	-	679
GF_Break Out Space	100	-	-	293
1F_Staircore 1	-	80	-	37
1F_Disable WC	-	80	-	42
1F_WC	-	80	-	24
1F_WC	-	80	-	22
1F_WC	-	80	-	23
1F_WC	-	80	-	23
1F_WC	-	80	-	22
1F_Lobby	-	80	-	55
2F_Staircore 1	-	80	-	37
2F_Disable WC	-	80	-	42
2F_WC	-	80	-	24
2F_WC	-	80	-	22
2F_WC	-	80	-	23
2F_WC	-	80	-	23
2F_WC	-	80	-	22
2F_Lobby	-	80	-	54
3F_Staircore 1	-	80	-	37
3F_Disable WC	-	80	-	42
3F_WC	-	80	-	24

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
3F_WC	-	80	-	22
3F_WC	-	80	-	23
3F_WC	-	80	-	23
3F_WC	-	80	-	22
3F_Lobby	-	80	-	55
4F_Staircore 1	-	80	-	36
4F_Disable WC	-	80	-	41
4F_WC	-	80	-	24
4F_WC	-	80	-	22
4F_WC	-	80	-	23
4F_WC	-	80	-	23
4F_WC	-	80	-	22
4F_Lobby	-	80	-	53
4F_Office	100	-	-	595
5F_Staircore 1	-	80	-	36
5F_Disable WC	-	80	-	41
5F_WC	-	80	-	24
5F_WC	-	80	-	22
5F_WC	-	80	-	23
5F_WC	-	80	-	23
5F_WC	-	80	-	22
5F_Lobby	-	80	-	53
5F_Office	100	-	-	594
6F_Staircore 1	-	80	-	32
6F_Disable WC	-	80	-	34
6F_WC	-	80	-	23
6F_WC	-	80	-	22
6F_WC	-	80	-	23
6F_WC	-	80	-	23
6F_WC	-	80	-	22
6F_Lobby	-	80	-	47
6F_Office	100	-	-	461
6F_Office	100	-	-	26
7F_Plant Room	80	-	-	57
7F_Staircore 1	-	80	-	13
7F_Circulation	-	80	-	36
1F_Office	100	-	-	5
BS_Disable WC	-	80	-	41
BS_Disable Shower	-	80	-	6
BS_Disable WC	-	80	-	42
BS_Disable Shower	-	80	-	6
BS_Staircore	-	80	-	46
BS_Stair	100	-	-	124

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
GF_Reception	-	80	22	527
1F_Office	100	-	-	0
1F_Office	100	-	-	2522
2F_Office	100	-	-	613
2F_Office	100	-	-	10
2F_Office	100	-	-	2144
3F_Office	100	-	-	596
3F_Office	100	-	-	10
3F_Office	100	-	-	2129
4F_Office	100	-	-	1995
5F_Office	100	-	-	1643
6F_Office	100	-	-	700

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
GF_Tenant meeting rooms	NO (-77.1%)	NO
GF_Break Out Space	NO (-56.3%)	NO
4F_Office	NO (-45.2%)	NO
5F_Office	NO (-63.4%)	NO
6F_Office	NO (-66.3%)	NO
6F_Office	NO (-81.6%)	NO
1F_Office	NO (-29.1%)	NO
BS_Stair	N/A	N/A
GF_Reception	NO (-67.9%)	NO
1F_Office	NO (-83.2%)	NO
1F_Office	NO (-75%)	NO
2F_Office	NO (-17.2%)	NO
2F_Office	N/A	N/A
2F_Office	NO (-79.5%)	NO
3F_Office	YES (+3.7%)	NO
3F_Office	NO (-92.8%)	NO
3F_Office	NO (-76.3%)	NO
4F_Office	NO (-70.6%)	NO
5F_Office	NO (-56.1%)	NO
6F_Office	NO (-58.8%)	NO

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m²]	3726.8	3726.8
External area [m²]	4507.5	4507.5
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	25	3
Average conductance [W/K]	2602.91	2254.13
Average U-value [W/m²K]	0.58	0.5
Alpha value* [%]	10.03	10

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

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
100	**B1 Offices and Workshop businesses**
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
	C1 Hotels
	C2 Residential Institutions: Hospitals and Care Homes
	C2 Residential Institutions: Residential schools
	C2 Residential Institutions: Universities and colleges
	C2A Secure Residential Institutions
	Residential spaces
	D1 Non-residential Institutions: Community/Day Centre
	D1 Non-residential Institutions: Libraries, Museums, and Galleries
	D1 Non-residential Institutions: Education
	D1 Non-residential Institutions: Primary Health Care Building
	D1 Non-residential Institutions: Crown and County Courts
	D2 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	59.78	13.71
Cooling	2.19	3.91
Auxiliary	11.58	9.54
Lighting	8.89	14.18
Hot water	34.72	33.58
Equipment*	44.87	44.87
TOTAL**	**117.16**	**74.93**

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

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	190.83	95.86
Primary energy* [kWh/m²]	184.86	140.42
Total emissions [kg/m²]	32.2	24.2

* Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Fan coil systems, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	199.7	32.6	71.3	3.2	15.4	0.78	2.87	0.9	3.9
	Notional	49.1	76.9	15.8	5.6	12.4	0.86	3.79	---	---
[ST] Central heating using water: floor heating, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	550.4	0	190.4	0	14.1	0.8	0	0.9	0
	Notional	174.4	0	56.2	0	14.4	0.86	0	---	---
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	305.6	0	105.7	0	2.1	0.8	0	0.9	0
	Notional	69.1	0	22.3	0	1	0.86	0	---	---
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	---	---

Key to terms

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

Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

Element	$U_{i\text{-}Typ}$	$U_{i\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.26	GF000014:Surf[0]
Floor	0.2	0.22	BS00001D:Surf[0]
Roof	0.15	0.18	BS000002:Surf[0]
Windows, roof windows, and rooflights	1.5	1.6	GF000003:Surf[6]
Personnel doors	1.5	2.2	GF00000F:Surf[1]
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building

$U_{i\text{-}Typ}$ = Typical individual element U-values [W/(m²K)] $U_{i\text{-}Min}$ = Minimum individual element U-values [W/(m²K)]
* There might be more than one surface where the minimum U-value occurs.

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	25

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

164 Shaftsbury Avenue - Lean

As designed

Date: Mon Apr 04 18:12:28 2022

Administrative information

Building Details

Address: 164 Shaftsbury Avenue, London, WC2H 8HL

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:

Telephone number:

Address: , ,

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

The building does not comply with England Building Regulations Part L 2013

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	24.1
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	24.1
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	30.4
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	0.36	0.8	GF000003:Surf[8]
Floor	0.25	0.24	0.25	BS000002:Surf[1]
Roof	0.25	0.18	0.18	BS000002:Surf[0]
Windows***, roof windows, and rooflights	2.2	1.66	1.8	GF000003:Surf[2]
Personnel doors	2.2	2.2	2.2	GF00000F:Surf[1]
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
$m^3/(h.m^2)$ at 50 Pa	10	25

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	>0.95

1- Radiators - Circulation aireas

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	-	0	0	-
Standard value	0.91*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

2- Underfloor heating - Basement

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	-	0	0	-
Standard value	0.91*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

3- Boiler/Chiller + AHU with Fan coil units - Office/Reception

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	3.9	0	1.8	0.75
Standard value	0.91*	3.9	N/A	1.6^	0.65
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

^ Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.

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

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
A	Local supply or extract ventilation units serving a single area
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
BS_Showers	-	-	0.5	-	-	-	-	-	-	-	N/A
BS_Changing area	-	-	0.5	-	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
BS_Showers	-	-	0.5	-	-	-	-	-	-	-	N/A
BS_Changing area	-	-	0.5	-	-	-	-	-	-	-	N/A
GF_Tenant meeting rooms	-	-	-	-	-	-	-	0.2	-	-	N/A
GF_Break Out Space	-	-	-	-	-	-	-	0.2	-	-	N/A
4F_Office	-	-	-	-	-	-	-	0.2	-	-	N/A
5F_Office	-	-	-	-	-	-	-	0.2	-	-	N/A
6F_Office	-	-	-	-	-	-	-	0.2	-	-	N/A
6F_Office	-	-	-	-	-	-	-	0.2	-	-	N/A
1F_Office	-	-	-	-	-	-	-	0.2	-	-	N/A
BS_Disable WC	-	-	0.5	-	-	-	-	-	-	-	N/A
BS_Disable Shower	-	-	0.5	-	-	-	-	-	-	-	N/A
BS_Disable WC	-	-	0.5	-	-	-	-	-	-	-	N/A
BS_Disable Shower	-	-	0.5	-	-	-	-	-	-	-	N/A
GF_Reception	-	-	-	-	-	-	-	0.5	-	-	N/A
1F_Office	-	-	-	-	-	-	-	0.2	-	-	N/A
1F_Office	-	-	-	-	-	-	-	0.2	-	-	N/A
2F_Office	-	-	-	-	-	-	-	0.2	-	-	N/A
2F_Office	-	-	-	-	-	-	-	0.2	-	-	N/A
2F_Office	-	-	-	-	-	-	-	0.2	-	-	N/A
3F_Office	-	-	-	-	-	-	-	0.2	-	-	N/A
3F_Office	-	-	-	-	-	-	-	0.2	-	-	N/A
3F_Office	-	-	-	-	-	-	-	0.2	-	-	N/A
4F_Office	-	-	-	-	-	-	-	0.2	-	-	N/A
5F_Office	-	-	-	-	-	-	-	0.2	-	-	N/A
6F_Office	-	-	-	-	-	-	-	0.2	-	-	N/A

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
BS_Switch Room	80	-	-	120
BS_Switch room	80	-	-	85
BS_Electrical Substation	80	-	-	160
BS_Telecom Room	80	-	-	65
BS_Water Plant	80	-	-	132
BS_Services	80	-	-	30
BS_Lobby 2	-	80	-	36
BS_Refuse Store	80	-	-	22
BS_Stairs Parking	-	80	-	31
BS_Electrical Services	80	-	-	137
BS_Showers	-	80	-	35
BS_Changing area	-	80	-	109
BS_Showers	-	80	-	33
BS_Changing area	-	80	-	86

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
BS_Plant Room	80	-	-	74
BS_Chillers	80	-	-	296
BS_Services	80	-	-	41
BS_cupboard	80	-	-	55
BS_Boiler Room	80	-	-	142
BS_Cycle Parking	-	80	-	172
BS_Cycle Parking	-	80	-	36
BS_Lobby 1	-	80	-	54
BS_Parking Area	-	80	-	394
GF_Storage	80	-	-	9
GF_Stairs	-	80	-	39
GF_Disable WC	-	80	-	57
GF_WC	-	80	-	38
GF_Lobby 1	-	80	-	29
GF_Lobby 3	-	80	-	15
GF_Cupboard	80	-	-	3
GF_Storage 2	80	-	-	15
GF_Storage 1	80	-	-	14
GF_Staircore 1	-	80	-	36
GF_Lobby 2	-	80	-	36
GF_Stairs to Basement	-	80	-	33
GF_Tenant meeting rooms	100	-	-	679
GF_Break Out Space	100	-	-	293
1F_Staircore 1	-	80	-	37
1F_Disable WC	-	80	-	42
1F_WC	-	80	-	24
1F_WC	-	80	-	22
1F_WC	-	80	-	23
1F_WC	-	80	-	23
1F_WC	-	80	-	22
1F_Lobby	-	80	-	55
2F_Staircore 1	-	80	-	37
2F_Disable WC	-	80	-	42
2F_WC	-	80	-	24
2F_WC	-	80	-	22
2F_WC	-	80	-	23
2F_WC	-	80	-	23
2F_WC	-	80	-	22
2F_Lobby	-	80	-	54
3F_Staircore 1	-	80	-	37
3F_Disable WC	-	80	-	42
3F_WC	-	80	-	24
3F_WC	-	80	-	22

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
3F_WC	-	80	-	23
3F_WC	-	80	-	23
3F_WC	-	80	-	22
3F_Lobby	-	80	-	55
4F_Staircore 1	-	80	-	36
4F_Disable WC	-	80	-	41
4F_WC	-	80	-	24
4F_WC	-	80	-	22
4F_WC	-	80	-	23
4F_WC	-	80	-	23
4F_WC	-	80	-	22
4F_Lobby	-	80	-	53
4F_Office	100	-	-	595
5F_Staircore 1	-	80	-	36
5F_Disable WC	-	80	-	41
5F_WC	-	80	-	24
5F_WC	-	80	-	22
5F_WC	-	80	-	23
5F_WC	-	80	-	23
5F_WC	-	80	-	22
5F_Lobby	-	80	-	53
5F_Office	100	-	-	594
6F_Staircore 1	-	80	-	32
6F_Disable WC	-	80	-	34
6F_WC	-	80	-	23
6F_WC	-	80	-	22
6F_WC	-	80	-	23
6F_WC	-	80	-	23
6F_WC	-	80	-	22
6F_Lobby	-	80	-	47
6F_Office	100	-	-	461
6F_Office	100	-	-	26
7F_Plant Room	80	-	-	57
7F_Staircore 1	-	80	-	13
7F_Circulation	-	80	-	36
1F_Office	100	-	-	5
BS_Disable WC	-	80	-	41
BS_Disable Shower	-	80	-	6
BS_Disable WC	-	80	-	42
BS_Disable Shower	-	80	-	6
BS_Staircore	-	80	-	46
BS_Stair	100	-	-	124
GF_Reception	-	80	22	527

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
1F_Office	100	-	-	0
1F_Office	100	-	-	2522
2F_Office	100	-	-	613
2F_Office	100	-	-	10
2F_Office	100	-	-	2144
3F_Office	100	-	-	596
3F_Office	100	-	-	10
3F_Office	100	-	-	2129
4F_Office	100	-	-	1995
5F_Office	100	-	-	1643
6F_Office	100	-	-	700

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
GF_Tenant meeting rooms	NO (-77.1%)	NO
GF_Break Out Space	NO (-56.3%)	NO
4F_Office	NO (-45.2%)	NO
5F_Office	NO (-63.4%)	NO
6F_Office	NO (-66.3%)	NO
6F_Office	NO (-81.6%)	NO
1F_Office	NO (-29.1%)	NO
BS_Stair	N/A	N/A
GF_Reception	NO (-67.9%)	NO
1F_Office	NO (-83.2%)	NO
1F_Office	NO (-75%)	NO
2F_Office	NO (-17.2%)	NO
2F_Office	N/A	N/A
2F_Office	NO (-79.5%)	NO
3F_Office	YES (+3.7%)	NO
3F_Office	NO (-92.8%)	NO
3F_Office	NO (-76.3%)	NO
4F_Office	NO (-70.6%)	NO
5F_Office	NO (-56.1%)	NO
6F_Office	NO (-58.8%)	NO

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m^2]	3726.8	3726.8
External area [m^2]	4507.5	4507.5
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	25	3
Average conductance [W/K]	2602.91	2254.13
Average U-value [W/m^{2}K]	0.58	0.5
Alpha value* [%]	10.03	10

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

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
100	**B1 Offices and Workshop businesses**
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
	C1 Hotels
	C2 Residential Institutions: Hospitals and Care Homes
	C2 Residential Institutions: Residential schools
	C2 Residential Institutions: Universities and colleges
	C2A Secure Residential Institutions
	Residential spaces
	D1 Non-residential Institutions: Community/Day Centre
	D1 Non-residential Institutions: Libraries, Museums, and Galleries
	D1 Non-residential Institutions: Education
	D1 Non-residential Institutions: Primary Health Care Building
	D1 Non-residential Institutions: Crown and County Courts
	D2 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	54.53	13.63
Cooling	2.16	3.8
Auxiliary	11.54	9.52
Lighting	8.89	14.18
Hot water	34.34	33.58
Equipment*	44.87	44.87
TOTAL**	**111.47**	**74.72**

* 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	0.54	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	190.08	94.09
Primary energy* [kWh/m^2]	176.06	139.92
Total emissions [kg/m^2]	30.4	24.1

* Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Fan coil systems, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	199.8	32.4	64.5	3.1	15.4	0.86	2.87	0.91	3.9
	Notional	49.2	75.1	15.9	5.5	12.4	0.86	3.79	---	---
[ST] Central heating using water: floor heating, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	625.5	0	214	0	17	0.81	0	0.91	0
	Notional	206.5	0	66.5	0	17.5	0.86	0	---	---
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	295.4	0	95.4	0	2.1	0.86	0	0.91	0
	Notional	60.3	0	19.4	0	1	0.86	0	---	---
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	---	---

Key to terms

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

Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

Element	$U_{i\text{-}Typ}$	$U_{i\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.26	GF000014:Surf[0]
Floor	0.2	0.22	BS00001D:Surf[0]
Roof	0.15	0.18	BS000002:Surf[0]
Windows, roof windows, and rooflights	1.5	1.6	GF000003:Surf[6]
Personnel doors	1.5	2.2	GF00000F:Surf[1]
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building

$U_{i\text{-}Typ}$ = Typical individual element U-values [W/(m²K)] $U_{i\text{-}Min}$ = Minimum individual element U-values [W/(m²K)]
* There might be more than one surface where the minimum U-value occurs.

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	25

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

164 Shaftsbury Avenue - Green

As designed

Date: Wed Apr 13 09:47:39 2022

Administrative information

Building Details

Address: 164 Shaftsbury Avenue, London, WC2H 8HL

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:

Telephone number:

Address: , ,

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

The building does not comply with England Building Regulations Part L 2013

CO_2 emission rate from the notional building, kgCO_2/m^2.annum	18.7
Target CO_2 emission rate (TER), kgCO_2/m^2.annum	18.7
Building CO_2 emission rate (BER), kgCO_2/m^2.annum	29.4
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	0.36	0.8	GF000003:Surf[8]
Floor	0.25	0.24	0.25	BS000002:Surf[1]
Roof	0.25	0.18	0.18	BS000002:Surf[0]
Windows***, roof windows, and rooflights	2.2	1.66	1.8	GF000003:Surf[2]
Personnel doors	2.2	2.2	2.2	GF00000F:Surf[1]
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/(m^{2}K)]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m^{2}K)]
$U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [W/(m^{2}K)]

* 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
m^3/(h.m^2) at 50 Pa	10	25

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	>0.95

1- Radiators - Circulation aireas (Electric)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	-	0	0	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

2- Underfloor heating - Basement (Electric)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	-	0	0	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

3- Radiators - Circulation aireas (ASHP)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3	-	0	0	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.

4- VRF

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.5	3.5	0	0	0.75
Standard value	2.5*	1	N/A	N/A	0.65
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.

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

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
A	Local supply or extract ventilation units serving a single area
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	**Zone**	**Standard**
BS_Showers	-	-	0.5	-	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
BS_Changing area	-	-	0.5	-	-	-	-	-	-	-	N/A
BS_Showers	-	-	0.5	-	-	-	-	-	-	-	N/A
BS_Changing area	-	-	0.5	-	-	-	-	-	-	-	N/A
GF_Tenant meeting rooms	-	-	-	2	-	-	-	-	-	-	N/A
GF_Break Out Space	-	-	-	2	-	-	-	-	-	-	N/A
4F_Office	-	-	-	2	-	-	-	-	-	-	N/A
5F_Office	-	-	-	2	-	-	-	-	-	-	N/A
6F_Office	-	-	-	2	-	-	-	-	-	-	N/A
6F_Office	-	-	-	2	-	-	-	-	-	-	N/A
1F_Office	-	-	-	2	-	-	-	-	-	-	N/A
BS_Disable WC	-	-	0.5	-	-	-	-	-	-	-	N/A
BS_Disable Shower	-	-	0.5	-	-	-	-	-	-	-	N/A
BS_Disable WC	-	-	0.5	-	-	-	-	-	-	-	N/A
BS_Disable Shower	-	-	0.5	-	-	-	-	-	-	-	N/A
GF_Reception	-	-	-	2	-	-	-	-	-	-	N/A
1F_Office	-	-	-	2	-	-	-	-	-	-	N/A
1F_Office	-	-	-	2	-	-	-	-	-	-	N/A
2F_Office	-	-	-	2	-	-	-	-	-	-	N/A
2F_Office	-	-	-	2	-	-	-	-	-	-	N/A
2F_Office	-	-	-	2	-	-	-	-	-	-	N/A
3F_Office	-	-	-	2	-	-	-	-	-	-	N/A
3F_Office	-	-	-	2	-	-	-	-	-	-	N/A
3F_Office	-	-	-	2	-	-	-	-	-	-	N/A
4F_Office	-	-	-	2	-	-	-	-	-	-	N/A
5F_Office	-	-	-	2	-	-	-	-	-	-	N/A
6F_Office	-	-	-	2	-	-	-	-	-	-	N/A

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
BS_Switch Room	80	-	-	120
BS_Switch room	80	-	-	85
BS_Electrical Substation	80	-	-	160
BS_Telecom Room	80	-	-	65
BS_Water Plant	80	-	-	132
BS_Services	80	-	-	30
BS_Lobby 2	-	80	-	36
BS_Refuse Store	80	-	-	22
BS_Stairs Parking	-	80	-	31
BS_Electrical Services	80	-	-	137
BS_Showers	-	80	-	35
BS_Changing area	-	80	-	109
BS_Showers	-	80	-	33

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
BS_Changing area	-	80	-	86
BS_Plant Room	80	-	-	74
BS_Chillers	80	-	-	296
BS_Services	80	-	-	41
BS_cupboard	80	-	-	55
BS_Boiler Room	80	-	-	142
BS_Cycle Parking	-	80	-	172
BS_Cycle Parking	-	80	-	36
BS_Lobby 1	-	80	-	54
BS_Parking Area	-	80	-	394
GF_Storage	80	-	-	9
GF_Stairs	-	80	-	39
GF_Disable WC	-	80	-	57
GF_WC	-	80	-	38
GF_Lobby 1	-	80	-	29
GF_Lobby 3	-	80	-	15
GF_Cupboard	80	-	-	3
GF_Storage 2	80	-	-	15
GF_Storage 1	80	-	-	14
GF_Staircore 1	-	80	-	36
GF_Lobby 2	-	80	-	36
GF_Stairs to Basement	-	80	-	33
GF_Tenant meeting rooms	80	-	-	849
GF_Break Out Space	80	-	-	367
1F_Staircore 1	-	80	-	37
1F_Disable WC	-	80	-	42
1F_WC	-	80	-	24
1F_WC	-	80	-	22
1F_WC	-	80	-	23
1F_WC	-	80	-	23
1F_WC	-	80	-	22
1F_Lobby	-	80	-	55
2F_Staircore 1	-	80	-	37
2F_Disable WC	-	80	-	42
2F_WC	-	80	-	24
2F_WC	-	80	-	22
2F_WC	-	80	-	23
2F_WC	-	80	-	23
2F_WC	-	80	-	22
2F_Lobby	-	80	-	54
3F_Staircore 1	-	80	-	37
3F_Disable WC	-	80	-	42
3F_WC	-	80	-	24

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
3F_WC	-	80	-	22
3F_WC	-	80	-	23
3F_WC	-	80	-	23
3F_WC	-	80	-	22
3F_Lobby	-	80	-	55
4F_Staircore 1	-	80	-	36
4F_Disable WC	-	80	-	41
4F_WC	-	80	-	24
4F_WC	-	80	-	22
4F_WC	-	80	-	23
4F_WC	-	80	-	23
4F_WC	-	80	-	22
4F_Lobby	-	80	-	53
4F_Office	80	-	-	743
5F_Staircore 1	-	80	-	36
5F_Disable WC	-	80	-	41
5F_WC	-	80	-	24
5F_WC	-	80	-	22
5F_WC	-	80	-	23
5F_WC	-	80	-	23
5F_WC	-	80	-	22
5F_Lobby	-	80	-	53
5F_Office	80	-	-	743
6F_Staircore 1	-	80	-	32
6F_Disable WC	-	80	-	34
6F_WC	-	80	-	23
6F_WC	-	80	-	22
6F_WC	-	80	-	23
6F_WC	-	80	-	23
6F_WC	-	80	-	22
6F_Lobby	-	80	-	47
6F_Office	80	-	-	576
6F_Office	80	-	-	32
7F_Plant Room	80	-	-	57
7F_Staircore 1	-	80	-	13
7F_Circulation	-	80	-	36
1F_Office	80	-	-	6
BS_Disable WC	-	80	-	41
BS_Disable Shower	-	80	-	6
BS_Disable WC	-	80	-	42
BS_Disable Shower	-	80	-	6
BS_Staircore	-	80	-	46
BS_Stair	80	-	-	155

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
GF_Reception	-	80	22	527
1F_Office	80	-	-	0
1F_Office	80	-	-	3152
2F_Office	80	-	-	766
2F_Office	80	-	-	13
2F_Office	80	-	-	2680
3F_Office	80	-	-	745
3F_Office	80	-	-	13
3F_Office	80	-	-	2661
4F_Office	80	-	-	2493
5F_Office	80	-	-	2054
6F_Office	80	-	-	875

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
GF_Tenant meeting rooms	NO (-77.1%)	NO
GF_Break Out Space	NO (-56.3%)	NO
4F_Office	NO (-45.2%)	NO
5F_Office	NO (-63.4%)	NO
6F_Office	NO (-66.3%)	NO
6F_Office	NO (-81.6%)	NO
1F_Office	NO (-29.1%)	NO
BS_Stair	N/A	N/A
GF_Reception	NO (-67.9%)	NO
1F_Office	NO (-83.2%)	NO
1F_Office	NO (-75%)	NO
2F_Office	NO (-17.2%)	NO
2F_Office	N/A	N/A
2F_Office	NO (-79.5%)	NO
3F_Office	YES (+3.7%)	NO
3F_Office	NO (-92.8%)	NO
3F_Office	NO (-76.3%)	NO
4F_Office	NO (-70.6%)	NO
5F_Office	NO (-56.1%)	NO
6F_Office	NO (-58.8%)	NO

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m^2]	3726.8	3726.8
External area [m^2]	4507.5	4507.5
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	25	3
Average conductance [W/K]	2602.91	2254.13
Average U-value [W/m^{2}K]	0.58	0.5
Alpha value* [%]	10.03	10

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

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
100	**B1 Offices and Workshop businesses**
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
	C1 Hotels
	C2 Residential Institutions: Hospitals and Care Homes
	C2 Residential Institutions: Residential schools
	C2 Residential Institutions: Universities and colleges
	C2A Secure Residential Institutions
	Residential spaces
	D1 Non-residential Institutions: Community/Day Centre
	D1 Non-residential Institutions: Libraries, Museums, and Galleries
	D1 Non-residential Institutions: Education
	D1 Non-residential Institutions: Primary Health Care Building
	D1 Non-residential Institutions: Crown and County Courts
	D2 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	25.12	6.36
Cooling	2.82	3.8
Auxiliary	4.39	2.38
Lighting	9.99	14.18
Hot water	16.31	11.32
Equipment*	44.87	44.87
TOTAL**	**58.62**	**38.03**

* 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	0.54	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	187.71	94.09
Primary energy* [kWh/m^2]	175.46	108.81
Total emissions [kg/m^2]	29.4	18.7

* Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Central heating using water: radiators, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	240.5	0	25	0	2.1	2.68	0	3	0
	Notional	27.8	0	3	0	1	2.56	0	---	---
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	195.8	32.9	22.2	4.1	5	2.45	2.24	2.5	3
	Notional	49.2	75.1	5.3	5.5	2.1	2.56	3.79	---	---
[ST] Central heating using water: radiators, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	300.9	0	97.8	0	2	0.85	0	0.91	0
	Notional	63.9	0	20.6	0	1	0.86	0	---	---
[ST] Central heating using water: floor heating, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	625.5	0	214	0	17	0.81	0	0.91	0
	Notional	206.5	0	66.5	0	17.5	0.86	0	---	---
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	---	---

Key to terms

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

Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

Element	$U_{i\text{-}Typ}$	$U_{i\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.26	GF000014:Surf[0]
Floor	0.2	0.22	BS00001D:Surf[0]
Roof	0.15	0.18	BS000002:Surf[0]
Windows, roof windows, and rooflights	1.5	1.6	GF000003:Surf[6]
Personnel doors	1.5	2.2	GF00000F:Surf[1]
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building

$U_{i\text{-}Typ}$ = Typical individual element U-values [W/(m²K)] $U_{i\text{-}Min}$ = Minimum individual element U-values [W/(m²K)]
* There might be more than one surface where the minimum U-value occurs.

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	25

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