Integration

Date
25.09.2023

25 Old Gloucester Street
Energy & Sustainability Statement

integrationuk.com

Integration
+44 (0)20 7183 8610

52—54 Rosebery Avenue
London EC1R 4RP

Integration Consultancy Limited
Registered in England
No. 07573777

Document status

Project no	**Project**	**Client**	**In conjunction with:**
773	25 Gloucester Street, London WC1N 3AF	Box Associates Limited Thompson House 42-44 Dolben Street London SE1 0UQ	ATP Group Brook House Coventry Road Ilford Essex IG1 4QR

Revision	**Date**	**Status**	**Prepared by**	**Checked by**
—	29.08.2023	Issue	Natasha Sidhu	Alan Harries
1	05.09.2023	Issue	Natasha Sidhu	Alan Harries
2	25.09.2023	Issue	Oscar Akam	Alan Harries

Contents

Executive Summary

This Energy Assessment and Sustainability Statement has been prepared by Integration Consultancy Limited in support of the full planning application for the proposed development at 25 Old Gloucester Road in Camden, London. This includes an extension of basement to accommodate additional cultural centre accommodation (use class F1 and F2) and conversion of front part of building at second and third floor levels to create 2 x studio dwellings.

Camden Policy CC1 requires all developments to reduce carbon dioxide emissions through following the steps in the energy hierarchy. The Energy Efficiency SPD states "All newbuild residential developments must meet 19% carbon reduction" and the London Plan 2021 requires "major" schemes to achieve 35% below Part L. Although this is not a new build or a "major" scheme, these targets have been used as a guide. In addition, the Camden energy efficiency SPD states Developments more than 500m^2 to achieve 20%. However, the floor area subject to this planning application is less than this threshold.

In relation to this, the proposed development has been shown to have:

– 23 % total onsite improvement in carbon dioxide (CO_2) emissions over the Target Emission Rate (TER) outlined in the national Building Regulations 2021

A second benchmark has been modelled relating to the current performance of the existing building envelope. The improvement relative to this benchmark is 52.5%.

This includes 4 kWpeak of solar photovoltaic (PV) modules located at roof level and a shift to all electric heating and hot water including heat pumps and mechanical ventilation with heat recovery (MVHR) for the non-domestic areas.

To reduce energy associated with hot water use, and water use in general, the studios and other areas will use water fittings in line with the higher 105 l/p/d water use target. Health and wellbeing is supported by aspects such as high levels of fresh air provided by mechanical ventilation with heat recovery in the non-domestic areas. In terms of sustainable travel, the scheme achieves a the highest possible PTAL rating including a 5 minute walk to Russel Square and Holborn tube stations with 24 bus routes within a 7 minute walk.

The scheme aims to protect occupiers from high prices by reducing energy demands; generating energy onsite via solar PV and creating residents user guides to help occupants to reduce energy bills and promote the use of smart energy tariff to provide cheaper electricity during non-peak times.

The table below shows the overall regulated and unregulated energy use.

Carbon dioxide emissions (Tonnes CO2 per annum)	**Regulated**	**Unregulated**
Baseline: Part L 2021 (Building Regulations) Compliance	3.13	1.0
After "Be Lean" (energy demand reduction)	2.59	1.0
After "Be Clean" (heat network / CHP)	2.59	1.0
After "Be Green" (renewable energy)	2.41	1.0

Table 1: Regulated and unregulated CO_2 emissions after each stage of the energy hierarchy

This performance can be expressed as savings between each stage in the energy hierarchy.

Regulated carbon dioxide emissions (Tonnes CO2 per annum)	**(Tonnes CO_2 per annum)**	**(%)**
Savings from "Be Lean" (energy demand reduction)	0.54	17.3%
Savings from "Be Clean" (heat network / CHP)	0.00	0.0%
Savings from "Be Green" (renewable energy)	0.18	5.6%
Total cumulative on-site savings	0.72	23.0%

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

1 Introduction

Integration Consultancy Limited has been appointed to undertake an Energy and Sustainability Assessment in support of the full planning application for the proposed development at 25 Old Gloucester Road in Camden, London. The report is one of several that accompany the planning application and should be read in conjunction with these documents.

The importance of developing a robust well-considered energy and sustainability strategy cannot be overstated. This strategy sets out the roadmap for the entire project and ultimately the success of the strategy will translate into the success of the building's performance on practical completion and throughout its lifecycle.

Underpinning the energy strategy is the 'Be Lean', 'Be Clean' and 'Be Green' design framework which has been adopted by the London Plan.

- 'Be Lean' (energy demand minimisation through 'passive' and 'active' design measures)
- 'Be Clean' (efficient energy supply)
- 'Be Green' (renewable energy generation)

This report sets out the scheme's energy and sustainability aspirations and demonstrates, via the approved calculation methodologies, how these will be achieved through the detailed design and construction stages.

As part of this exercise, the feasibility of implementing a variety of low carbon technologies and renewable energy systems is considered based on aspects such as site location and climate, potential carbon savings, economic viability, environmental impacts and practical aspects such as integration and maintenance considerations.

1.1 THE DEVELOPMENT SITE

The site is located at 25 Old Gloucester Street, London WC1N 3AF

Figure 1: Site Location

1.2 PROPOSED DEVELOPMENT OVERVIEW

The proposed development includes an extension of basement to accommodate additional cultural centre accommodation (use class F1 and F2) and conversion of front part of building at second and third floor levels to create 2 x studio dwellings.

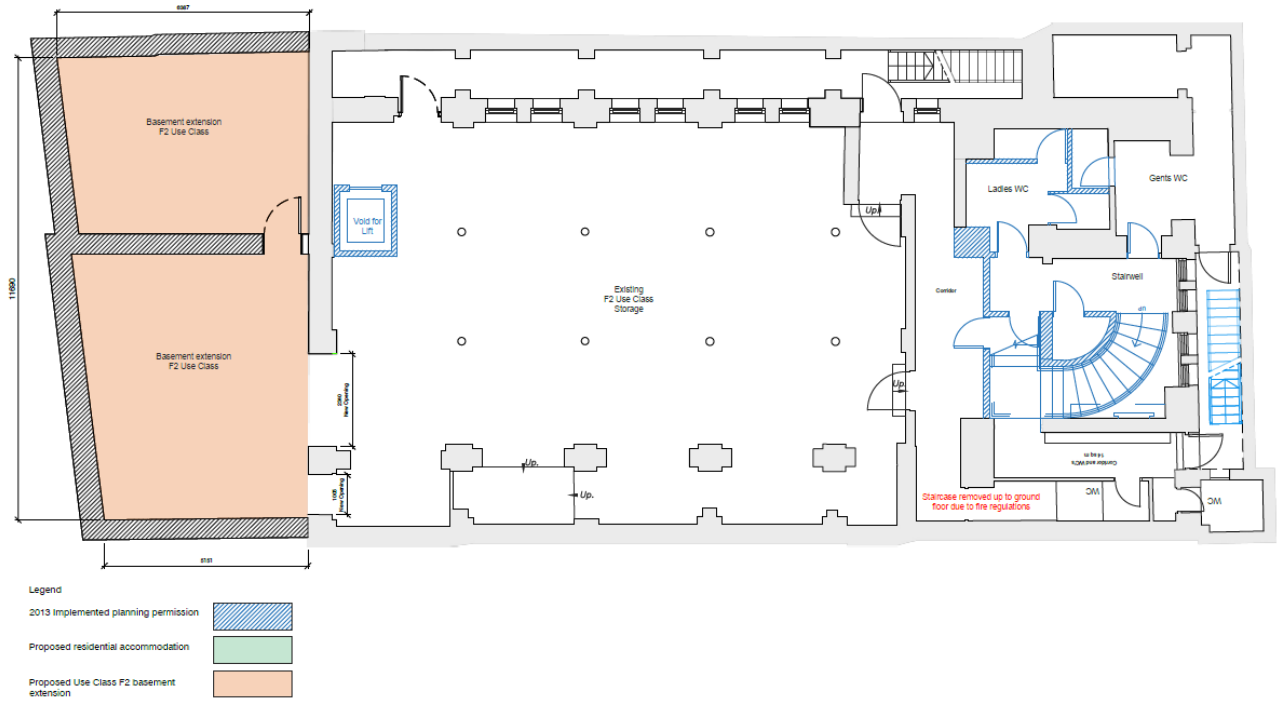

Figure 2: Proposed development – basement

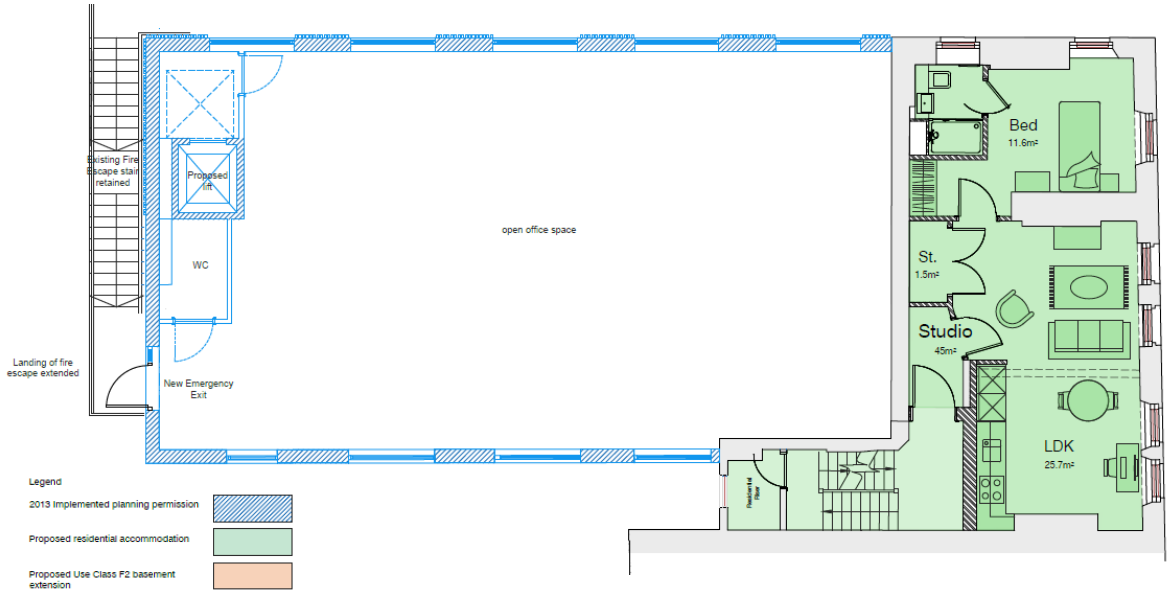

Figure 3: Proposed development – second floor

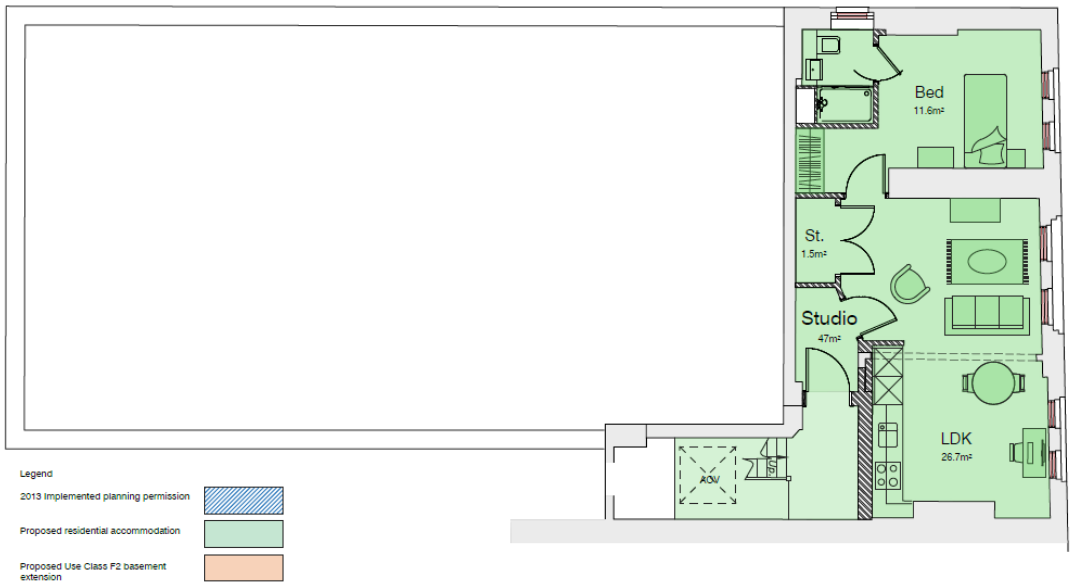

Figure 4: Proposed development – third floor

1.3 ENERGY AND SUSTAINABILITY ASPIRATIONS

The scheme has adopted energy and sustainability targets in line with the national and local policy as detailed in section 2. These include:

Low CO_2 emissions: Achieve a minimum on-site contribution of 19% below Part L for residential areas, with a 20% contribution from renewable technologies.

Low Water Use: The development aims to meeting the London Plan target of achieving 105l/p/d for residential areas.

Sustainable Transport: Promoting public transport.

2 Policy Review

2.1 NATIONAL PLANNING POLICY FRAMEWORK (NPPF – JULY 2021)

2.1.1 Sustainable Development

The NPPF is very clear on the importance of sustainable development with the first line of the first main chapter stating "*The purpose of the planning system is to contribute to the achievement of sustainable development". Sustainable development meaning:*

b. economic objective – to help build a strong, responsive and competitive economy, by ensuring that sufficient land of the right types is available in the right places and at the right time to support growth, innovation and improved productivity; and by identifying and coordinating the provision of infrastructure;

c. a social objective – to support strong, vibrant and healthy communities, by ensuring that a sufficient number and range of homes can be provided to meet the needs of present and future generations; and by fostering well-designed, beautiful and safe places, with accessible services and open spaces that reflect current and future needs and support communities' health, social and cultural well-being; and

d. an environmental objective – to protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy.

At the heart of the Framework is a presumption in favour of sustainable development.

2.1.2 Meeting the Challenge of Climate Change

Section 14 of the NPPF relates to the challenge of climate change. Paragraph 152 states:

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

The importance of renewable energy is also highlighted by paragraph 155 and 156.

2.1.3 National Carbon Targets

The UK government declared a Climate Emergency and amended the Climate Change Act in June 2019 to set a legally-binding carbon emission target for the UK of "at least 100% of 1990 levels by 2050" i.e. net zero carbon emissions[1]. Around 20% of the UK's emissions come directly from residential energy use and government has set out a consultation process leading up to the Future Homes Standard which will define how the housing sector will respond to the emergency. This will replace Building Regulations in 2025.

2.2 LONDON PLAN 2021

Regional policy in London is controlled by The Greater London Authority and is set out in The London Plan adopted on 2nd March 2021 which provides policy and guidance in the London context. One of the key overarching goals for London is to become a zero-carbon city by 2030.

The plan states that all 'major' developments (greater than 1,000m^2 or 10 units or more) must achieve net zero carbon (100% below Part L) with a minimum on site contribution of 35% below Part L. The remaining regulated carbon dioxide emissions to 100% can be off-set using a cash-in-lieu contribution to the local borough, to secure carbon dioxide savings elsewhere.

The London Plan sets out a range of policies in relation to sustainability, including air quality improvement, reducing greenhouse gas emissions, managing infrastructures, minimising waste and protecting waterways

The details of the main London Plan policy requirement are given below:

POLICY SI 2 – MINIMISING GREENHOUSE GAS EMISSIONS

a. Major development should be net zero-carbon. This means reducing greenhouse gas emissions in operation and minimising both annual and peak energy demand in accordance with the following energy hierarchy:

[1] Climate Change Act 2008 (c. 27) as amended by The Climate Change Act 2008 (2050 Target Amendment) Order 2019 [SI 2019 No. 1056]

- *Be lean: use less energy and manage demand during operation*
- *Be clean: exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly*
- *Be green: maximise opportunities for renewable energy by producing, storing and using renewable energy on-site*
- *Be seen: monitor, verify and report on energy performance.*

b. Major development proposals should include a detailed energy strategy to demonstrate how the zero-carbon target will be met within the framework of the energy hierarchy.

c. A minimum on-site reduction of at least 35 per cent beyond Building Regulations is required for major development. Residential development should achieve 10 per cent, and non-residential development should achieve 15 per cent through energy efficiency measures. Where it is clearly demonstrated that the zero-carbon target cannot be fully achieved on-site, any shortfall should be provided, in agreement with the borough, either:

- *through a cash in lieu contribution to the borough's carbon offset fund, or*
- *off-site provided that an alternative proposal is identified and delivery is certain.*

d. Boroughs must establish and administer a carbon offset fund. Offset fund payments must be ring-fenced to implement projects that deliver carbon reductions. The operation of offset funds should be monitored and reported on annually.

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

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

Other key policies within the London Plan applicable to the proposed development and addressed in this report are:

POLICY SI 4 – MANAGING HEAT RISK

a. Development proposals should minimise adverse impacts on the urban heat island through design, layout, orientation, materials and the incorporation of green infrastructure.

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

c. Reduce the amount of heat entering a building through orientation, shading, high albedo materials, fenestration, insulation and the provision of green infrastructure

d. Minimise internal heat generation through energy efficient design

e. Manage the heat within the building through exposed internal thermal mass and high ceilings

f. Provide passive ventilation

g. Provide mechanical ventilation

h. Provide active cooling systems.

The Chartered Institution of Building Services Engineers (CIBSE) has produced guidance on assessing and mitigating overheating risk in new developments, which can also be applied to refurbishment projects. TM 59 should be used for domestic developments and TM 52 should be used for non-domestic developments. In addition, TM 49 guidance and datasets should also be used to ensure that all new development is designed for the climate it will experience over its design life.

POLICY SI 5 – WATER INFRASTRUCTURE

a. *In order to minimise the use of mains water, water supplies and resources should be protected and conserved in a sustainable manner.*

b. Development Plans should promote improvements to water supply infrastructure to contribute to security of supply. This should be done in a timely, efficient and sustainable manner taking energy consumption into account.

c. Development proposals should:

- *through the use of Planning Conditions minimise the use of mains water in line with the Optional Requirement of the Building Regulations (residential development), achieving mains water consumption of 105 litres or less per head per day (excluding allowance of up to five litres for external water consumption)*
- *achieve at least the BREEAM excellent standard for the 'Wat 01' water category 160 or equivalent (commercial development)*
- *incorporate measures such as smart metering, water saving and recycling measures, including retrofitting, to help to achieve lower water consumption rates and to maximise future-proofing.*

2.3 CAMDEN LOCAL POLICY

Policy CC1 - Climate change mitigation

We will:

a. promote zero carbon development and require all development to reduce carbon dioxide emissions through following the steps in the energy hierarchy;

b. require all major development to demonstrate how London Plan targets for carbon dioxide emissions have been met;

c. ensure that the location of development and mix of land uses minimise the need to travel by car and help to support decentralised energy networks;

d. support and encourage sensitive energy efficiency improvements to existing buildings;

e. require all proposals that involve substantial demolition to demonstrate that it is not possible to retain and improve the existing building; and f. expect all developments to optimise resource efficiency.

8.6 The Council's Sustainability Plan 'Green Action for Change' commits the Council to seek low and where possible zero carbon buildings

*8.8 All developments involving **five or more dwellings and/or more than 500 sqm** of (gross internal) any floorspace will be required to submit an energy statement demonstrating how the energy hierarchy has been applied to make the fullest contribution to CO2 reduction. All new residential development will also be required to demonstrate a 19% CO2 reduction below Part L 2013 Building Regulations (in addition to any requirements for renewable energy). This can be demonstrated through an energy statement or sustainability statement.*

*8.11 The Council will expect developments of **five or more dwellings and/or more than 500 sqm** of any gross internal floorspace to achieve a 20% reduction in carbon dioxide emissions from on-site renewable energy generation (which can include sources of site related decentralised renewable energy), unless it can be demonstrated that such provision is not feasible. This is in line with stage three of the energy hierarchy 'Be green'. The 20% reduction should be calculated from the regulated CO2 emissions of the development after all proposed energy efficiency measures and any CO2 reduction from non-renewable decentralised energy (e.g. CHP) have been incorporated*

8.28 Monitoring. The installation of monitoring equipment in all major developments will provide important information showing actual energy performance and will aid the Council's and developers' understanding of the effectiveness of measures implemented in the borough. Such data would also inform the Council as to whether policy requirements are being met. Monitoring shall include any renewable or low carbon technology that contributes to meeting London Plan Policy 5.2.

Policy CC2 - Adapting to climate change

The Council will require development to be resilient to climate change.

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

a. the protection of existing green spaces and promoting new appropriate green infrastructure;

b. not increasing, and wherever possible reducing, surface water runoff through increasing permeable surfaces and use of Sustainable Drainage Systems;

c. incorporating bio-diverse roofs, combination green and blue roofs and green walls where appropriate; and

d. measures to reduce the impact of urban and dwelling overheating, including application of the cooling hierarchy. Any development involving 5 or more residential units or 500 sqm or more of any additional floorspace is required to demonstrate the above in a Sustainability Statement.

e. ensuring development schemes demonstrate how adaptation measures and sustainable development principles have been incorporated into the design and proposed implementation;

f. encourage new build residential development to use the Home Quality Mark and Passivhaus design standards;

g. encouraging conversions and extensions of 500 sqm of residential floorspace or above or five or more dwellings to achieve "excellent" in BREEAM domestic refurbishment; and

h. expecting non-domestic developments of 500 sqm of floorspace or above to achieve "excellent" in BREEAM assessments and encouraging zero carbon in new development from 2019.

8.37 Sustainable drainage and biodiversity. To support a sustainable approach to drainage, all development should install green roofs, permeable landscaping, green walls and combination green and blue roofs, where appropriate. Further information on these systems can be found in our supplementary planning document Camden Planning Guidance on sustainability

8.41 Cooling. All new developments will be expected to submit a statement demonstrating how the London Plan's 'cooling hierarchy' has informed the building design. Any development that is likely to be at risk of overheating (for example due to large expanses of south or south west facing glazing) will be required to complete dynamic thermal modelling to demonstrate that any risk of overheating has been mitigated.

8.42 Active cooling (air conditioning) will only be permitted where dynamic thermal modelling demonstrates there is a clear need for it after all of the preferred measures are incorporated in line with the cooling hierarchy.

8.50 The Home Quality Mark, launched 2015, is one way of demonstrating the standard of a new residential dwelling, which includes measures for low CO2, sustainable materials, good air quality and natural daylight. The Council will strongly encourage schemes to use the Home Quality Mark. The use of Passivhaus standard is also encouraged in demonstrating energy efficient design. Further details on energy efficient design and principles and Passivhaus are set out in our supplementary planning document Camden Planning Guidance on sustainability.

Local Plan Policy CC1 requires all major developments to assess the feasibility of connecting to an existing decentralised energy network.

Policy CC3 - Water and flooding

We will require development to:

a. incorporate water efficiency measures;

b. avoid harm to the water environment and improve water quality;

c. consider the impact of development in areas at risk of flooding (including drainage);

d. incorporate flood resilient measures in areas prone to flooding;

e. utilise Sustainable Drainage Systems (SuDS) in line with the drainage hierarchy to achieve a greenfield run-off rate where feasible; and

f. not locate vulnerable development in flood-prone areas.

8.55. Residential developments will be expected to meet the requirement of 110 litres per person per day (including 5 litres for external water use).

Policy CC4 Air quality

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

8.83 A development can affect air quality in three significant ways:

• emissions from construction and demolition;

• emissions from the combustion of fuel for energy within the building; and

• emissions from transport to and from the building.

Policy CC5 Waste

a. aim to reduce the amount of waste produced in the borough and increase recycling and the reuse of materials to meet the London Plan targets of 50% of household waste recycled/composted by 2020 and aspiring to achieve 60% by 2031;

b. deal with North London's waste by working with our partner boroughs in North London to produce a Waste Plan, which will ensure that sufficient land is allocated to manage the amount of waste apportioned to the area in the London Plan;

c. safeguard Camden's existing waste site at Regis Road unless a suitable compensatory waste site is provided that replaces the maximum throughput achievable at the existing site; and

d. make sure that developments include facilities for the storage and collection of waste and recycling.

8.98 Waste Management Plan. To ensure an integrated approach to waste management and the highest possible reuse and recycling rates, the Council will encourage the submission of a site waste management plan prior to construction. For further details please refer to our supplementary planning document Camden Planning Guidance on sustainability

2.3.1 SUMMARY OF KEY POLICY

Low Water Use. Residential development should be designed so that mains water consumption would meet a target of 105 litres or less per head per day, excluding an allowance of 5 litres or less per head per day for external water use.

3 Design Approach - Sustainability

3.1 WATER USE

For studio accommodation areas the development adopts equipment specification in line with the higher water use standard of 105 l/p.day. Non domestic area will also follow this standard where relevant e.g. basin taps and WCs.

Fitting	Water Consumption
WC	4 / 2.6 litres dual flush
Shower	8 litres / minute
Washbasin	5 litres / minute
Kitchen sink	6 litres / minute
Dishwasher	1.25 litres/place setting
Washing machine	8.17 litres/kg

Table 3: Minimum water fitting standards for units.

3.2 AIR QUALITY

The scheme supports air quality by:

- The use of electric / air-source heat pumps for space heating and hot water use, avoiding on site fossil fuel combustion.
- Mechanical ventilation with heat recovery (MVHR) offers a means for occupants to filter fresh air.
- Construction environmental management plan (CEMP) to incorporate best practice for air quality and dust control.

3.3 SUSTAINABLE MATERIALS & MINIMISING WASTE

New materials will be sustainably procured and using local supplies where feasible, following the BRE Green Guide to Specification. The construction build-up for each element can be rated from A+ to E where A+ is least likely to affect the environment and E is the likely to have the most impact.

The materials for the new extension will aim to achieve a rating between A to C where feasible.

https://www.bregroup.com/greenguide/podpage.jsp?id=2126

All timber used during the site preparation and construction will be Forest Stewardship Council (FSC) certified or Programme for the Endorsement of Forestry Certification (PEFC) and all nontimber materials to be sourced from organisations with an environmental management system such as ISO 14001 or BES 6001. This standard enables construction product manufacturers to ensure and then prove that their products have been made with constituent materials that have been responsibly sourced. The standard describes a framework for the organisational governance, supply chain management and environmental and social aspects that must be addressed in order to ensure the responsible sourcing of construction products.

A construction waste recycling requirement will be included in the contractor specification to ensure a construction waste management plan is in place. This will include ways to design out waste, reduce amounts of packaging and to participate in packaging take back schemes as well as ensuring that all waste is sent to private local dedicated construction waste plants with high landfill diversion rates.

3.4 SUSTAINABLE TRANSPORT

The site achieves a the highest possible PTAL rating (6b - see image below) which analyses proximity to frequent public transport services. Links to low energy public transportation include a 5 minute walk to Russel Square and Holborn tube stations with 24 bus routes within a 7 minute walk.

Figure 5: Transport for London PTAL rating (6b)

3.5 DEMAND SIDE RESPONSE

Demand-side response / flexibility initiatives are encouraged by the London Plan. Demand side flexibility refers to the ability of a system to reduce or increase energy consumption for a period of time in response to an external driver (e.g. energy price or carbon signal change, grid availability).

Smart buildings have been identified and acknowledged as key enablers of future energy systems for which there will be a larger share of renewables, distributed power and heat generation, and demand-side flexibility to match demand to supply and make best use of existing network connection and local generation capacity.

The scheme facilitates the use of Demand Side Response and reduces peak energy demand by:

- The use of electrical equipment such as heat pumps which can be turned up/down.
- The installation of smart meters.
- The use of on-site generation, solar PV.

4 Design Approach - Energy

4.1 THE ENERGY HIERARCHY

The energy hierarchy, as referred to in the London Plan and illustrated below, sets out a four-stage approach to strategic decision-making for the reduction of energy and associated greenhouse gas emissions. The evaluation of the scheme's carbon emissions, as presented in the subsequent sections, follows this structure.

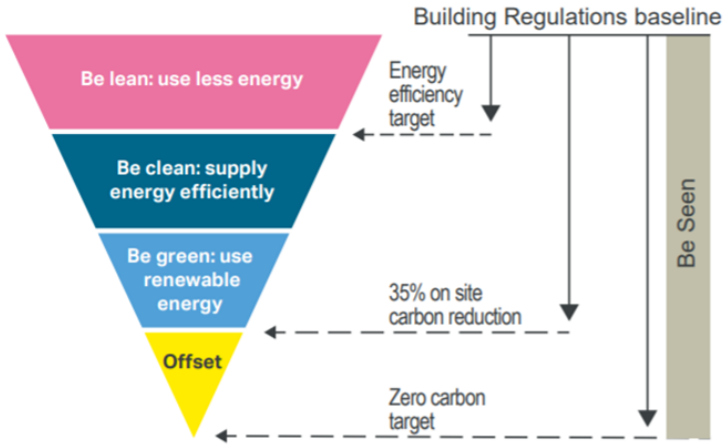

Figure 6: Energy Hierarchy Methodology

BE LEAN - Minimise Energy Demand
Passive design such as optimising form, orientation and site layout, natural ventilation with thermal mass, daylight and solar shading as well as active design measures such as LED lighting and efficient mechanical ventilation with heat recovery.

BE CLEAN - Deliver Energy Efficiently
Efficient energy provision for space heating and cooling infrastructure e.g. high efficiency cooling plant, combined heat and power (CHP) or, if available, connection to a district heating/cooling network.

BE GREEN - Use Renewable Energy
Energy supply derived from local renewable resources including solar irradiation, wind energy, hydropower and local heat sources such as geothermal energy. Provision of non-local options can also be considered.

BE SEEN – Control Energy
Monitor, verify and report on energy performance.

4.2 CLIMATE ANALYSIS

The London climate is heating dominated, hence the key passive measure to be implemented are improving levels of insulation and air-tightness. Temperatures in the summer can occasionally rise above comfortable levels and this will tend to intensify as a consequence of climate change and further urbanisation.

The diurnal temperature variations are high with an average daily temperature swing of 8-10°C even during peak summer. This creates potential for passive summertime cooling using night-time cooling via openable windows or mechanical ventilation.

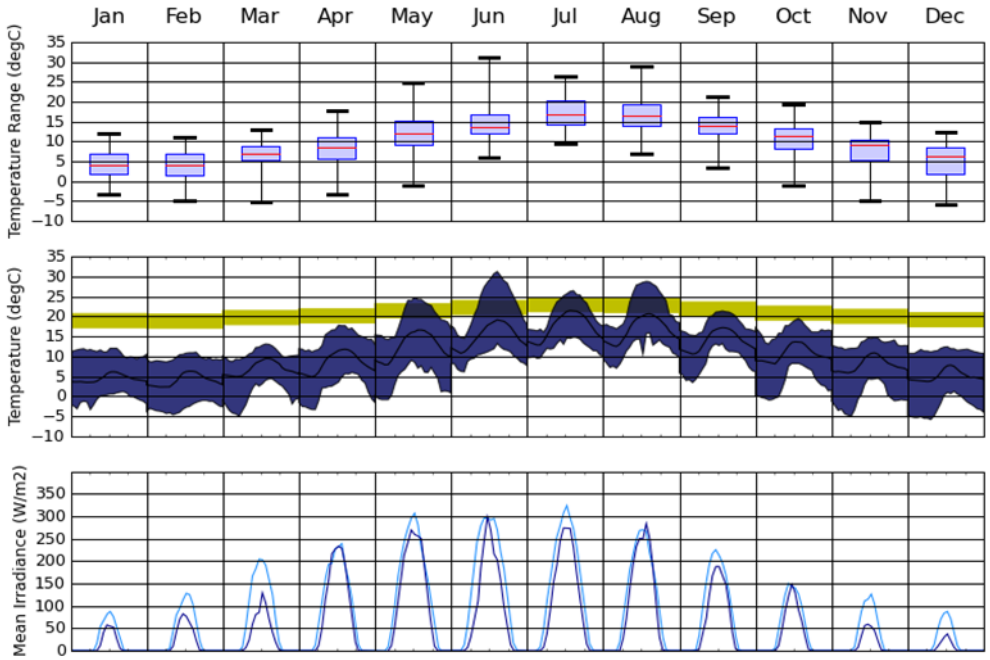

Figure 7: Average historic climate data for London

4.3 BUILDING FABRIC PERFORMANCE & INSULATION

Improved levels of insulation are proposed where possible as summarised later in this section. The thermal performance of all exposed elements equals or exceeds the minimum requirements for Building Regulations 2021 where feasible. The building is Grade II listed therefore to retain the original cornices, wood panelling, and lime plaster walls, improvements to the u-value for the studio external walls is not possible. Improvements to the windows and doors are proposed, which will significantly reduce energy consumption and ensure optimum occupant comfort all year round by retaining heat in the winter and reducing heat gains in the summer.

This is particularly relevant for glazed surfaces that can be a cause of overheating in summer or overcooling and condensation formation in winter. High-performance secondary glazing will also improve occupant comfort by reducing radiant temperature asymmetry which can be a comfort issue especially during the winter months.

4.4 AIR TIGHTNESS, INFILTRATION AND THERMAL BRIDGING

An improved air-permeability rate has been targeted as summarised later in this section. The key to achieving high levels of airtightness is the build quality of construction.

4.5 NATURAL VENTILATION & THERMAL MASS

Daytime natural ventilation can assist in removing excess heat during the mid-season and summer months and enables the provision of high air quality. When used in combination with exposed thermal mass, natural ventilation will reduce high internal daily temperature fluctuations and minimise the overheating risk in the summer. Therefore, occupant comfort can be maintained with reduced reliance on mechanical cooling systems.

The summer ventilation strategy includes openable areas for windows to allow for good natural ventilation. The scheme also benefits from the existing heavyweight constructions, which will be pre-cooled at night to lower the risk of overheating during the day.

4.6 SOLAR EXPOSURE & DAYLIGHT

Maximising exposure to solar energy and daylight is essential to reduce reliance on artificial lighting, reducing winter daytime heating requirements and to contribute to the general wellbeing of occupants.

The site has good access to solar energy and natural daylight, as there is limited overshadowing during the main solar hours. This makes the development roofs suitable for some solar energy harvesting.

Fenestration on the facades maximises natural daylight to provide amenity and reduce artificial lighting energy use. Internal shading can be incorporated to minimise the risk of overheating and glare without overly compromising daylight availability.

4.7 ACTIVE BUILDING SERVICES SYSTEMS

In the two studio apartments, space heating and hot water provision will be by electric boiler supplying a wet radiator system. The studio will use natural ventilation with kitchen and bathrooms extracts.

In the non-domestic spaces all-electric, air-source heat pump system will provide heating and cooling with hot water provision through point of use electric hot water heaters. Ventilation in non-domestic spaces will be provided by mechanical ventilation with heat recovery.

Energy use associated with domestic hot water (DHW) will be minimised by the use of water efficient fittings.

Low-energy fixed lighting, generally comprising of high-efficiency LED fittings, will be installed throughout the development with timer, daylight dimming, and motion-sensor control as appropriate.

All building services systems will be in accordance with and exceed the efficiency requirements outlined in the Building Service Compliance Guide.

4.8 COOLING & OVERHEATING

The cooling and overheating strategies are summarised in the table below using the cooling hierarchy which has been applied to the design.

Hierarchy Measure	Application to proposed development
1. Minimise Internal Heat Gains	- Low energy LED lighting.
2. Minimise External Heat Gains	- Secondary glazing reduces g-value - Internal blinds with light coloured external facing surfaces can be fitted where required..
3 & 4 Heat Management and Passive Ventilation	- Openable windows in conjunction with high thermal mass existing structure including a night time ventilation strategy
5. Mechanical Ventilation	- Mechanical Ventilation with Heat Recovery (MVHR) is specified in non domestic areas.
6. Active Cooling Ensuring they are the lowest carbon options	-Fan coils will provide cooling in commercial areas during peak periods. Local solar PV will in part power the units during these periods.

Table 4: Cooling hierarchy

5 Carbon Emissions – Non - Domestic

5.1 BASELINE

Energy demand and annual carbon emissions are calculated using BRE accredited energy compliance software SBEM for the non-domestic areas.

The amount of carbon emission reductions achieved by the proposed scheme is compared to the notional Target Emission Rate (TER) which forms the baseline comparison target. This notional building/dwelling is produced by the energy model and intends to replicate the actual building in terms of area, form, orientation and usage. The fabric parameters and system efficiencies for this notional building meets and, in some parts, exceeds the minimum requirements for compliance with Part L of the Building Regulations as summarised in the table below.

The Notional Building baseline values, which apply to new-build non-domestic areas, are:

Element	Building Regulations L2 2021
External walls U value (limiting)	0.18 (0.26) W/m^{2}K
Floor U value (limiting)	0.15 (0.18) W/m^{2}K
Roof U value (limiting)	0.15 (0.16) W/m^{2}K
Windows U value (limiting)	1.4 (1.6) W/m^{2}K
Air tightness (limiting)	5.0 (8.0) m^3/m^2/h @50Pa
Ventilation type	Mechanical ventilation with heat recovery
Heating (SSEEF)	ASHP: heating 264%
Cooling (SSEER)	Cooling 2.7
Lighting	95 lm/W

Table 5: Notional Building Specification for Non Domestic (Part L2 2021)

5.2 "BE LEAN" EMISSIONS

As part of the "Be Lean" approach, seeking to minimise energy demand, the building fabric has been specified to meet or exceed the minimum fabric parameters outlined in Part L of the Building Regulation 2021 as per table below.

Element	Proposed basement extension
External walls U-value (W/m²/°C)	0.26 W/m²K
Ground floor U-value (W/m²/°C)	0.18 W/m²K
Roof U-value (W/m²/°C)	NA
Window U-value (W/m²/°C)	NA
Air tightness (m³/m²/h @50Pa)	0 (no leakage in basement)
Space heating type	Air source heat pump (VRF)
Space heating efficiency (SSEER)	2.64 (Be Lean) 4.15 (Be Green)
Heating controls	Room Stats
Hot water type	Electric Point of Use
Hot water heating efficiency	100%
Ventilation type	Mechanical ventilation with heat recovery (e.g Nuaire XBC-85)
Ventilation specific fan power (W/l/s)	1.6
Ventilation heat recovery efficiency (%)	85%
Cooling type	VRF
Cooling efficiency (SEER)	4.90
Lighting efficiency (lm/W)	120
Solar PV (kW)	4 kW – south west 15 degrees

Table 6: Proposed non-domestic development (Be Lean)

5.2.1 "Be Lean" Total Carbon Emissions

The Be Lean CO_2 emissions associated with regulated energy consumption (Building Emissions Rate - BER) are given below in relation to the baseline TER (Target Emission Rate).

Space (Area m²)	TER (kg.CO_2/m²/yr.)	BER (kg.CO_2/m²/yr.)
Basement extension (73.9 m²)	4.7	4.28

Table 7: Be Lean non-domestic regulated emissions

5.3 "BE CLEAN" EMISSIONS

5.3.1 Connection to Third Party Heat Networks

Heat networks are encouraged by the London Plan and the Mayor has identified Heat Network Priority Areas. The London Heat Map tool[2] shows that the site is within the heat network priority area and nearby existing heat networks, However, connection for heat networks is relevant for major schemes. As this is a minor scheme, and existing heat networks are not in close proximity, there is no proposal to connect to a heat network.

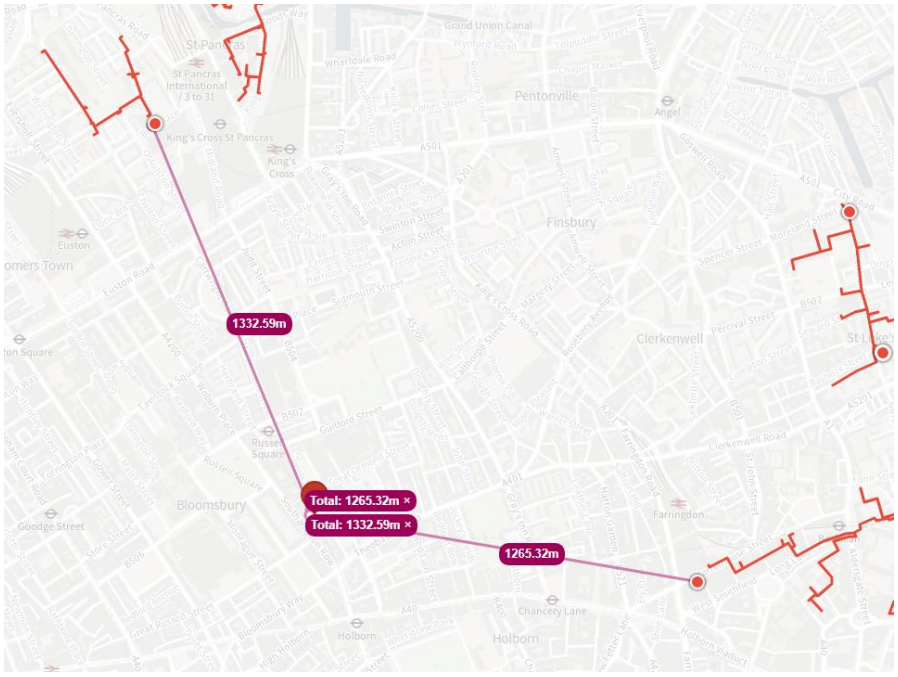

Figure 8: London Heat Map tool showing live networks (red), proposed heat networks (purple)

5.3.2 CHP Combined Heat and Power

The London Plan limits the role of CHP to low-emission CHP and only in instances where it can support the delivery of an area-wide heat network at large, strategic sites, according to the Energy Assessment Guidance Greater London Authority guidance on preparing energy assessments as part of planning applications. Therefore, CHP has not been adopted.

5.4 "BE GREEN" EMISSIONS

The commercial areas will have air source heat pumps for heating.

The 2nd floor roof is relatively constrained with plant, lift overrun and an AOV. However, it is anticipated that solar PV will be viable. It has been assumed that an installed capacity of around 4 kWp PV can be achieved. This system will help to power main building e.g. the ventilation system and the heat pump system.

The details of the proposed PV are:

Total installed capacity of the system:	4 (kWp)
Panel inclination:	min 15°
Panel orientation:	South-west
Total energy generation:	1250 kWh/a
Total carbon emission reduction:	0.17 tonnes of CO_2/y

The performance and output of the renewable energy systems will be monitored.

[2] https://www.london.gov.uk/what-we-do/environment/energy/london-heat-map/view-london-heat-map

5.4.1 "Be Green" Total Carbon Emissions

The CO_2 emissions associated with non-domestic regulated energy consumption are given below.

Space (Area m²)	TER (kg.CO_2/m²/yr.)	BER (kg.CO_2/m²/yr.)
Basement extension (73.9m2)	4.7	1.89

Table 8: Be Green non-domestic carbon emissions

5.5 CARBON EMISSIONS SUMMARY (NON-DOMESTIC)

The predicted total annual CO_2 emissions of the proposed development following the introduction of energy efficiency measures, passive and active design (Be Lean), Low carbon supply technologies (Be Clean) and renewable energy systems (Be Green) are summarised below in the format recommended by the GLA.

The table below shows the regulated and unregulated energy use.

Carbon dioxide emissions (Tonnes CO2 per annum)	Regulated	Unregulated
Baseline: Part L 2021 (Building Regulations) Compliance	0.35	0.2
After "Be Lean" (energy demand reduction)	0.32	0.2
After "Be Clean" (heat network / CHP)	0.32	0.2
After "Be Green" (renewable energy)	0.14	0.2

Table 9: Summary of non-domestic carbon emissions for commercial areas

This performance can be expressed as savings between each stage in the energy hierarchy.

Regulated carbon dioxide savings	(Tonnes CO_2 per annum)	(%)
Savings from "Be Lean" (energy demand reduction)	0.03	8.9%
Savings from "Be Clean" (heat network / CHP)	0.00	0.0%
Savings from "Be Green" (renewable energy)	0.18	50.9%
Total cumulative on-site savings	0.21	59.8%

Table 10: Regulated CO_2 emissions of savings after each stage of the Energy Hierarchy for commercial areas

6 Carbon Emissions – Residential Dwellings

6.1 BASELINE

Energy demand and annual carbon emissions are calculated using BRE accredited energy compliance SAP 10.2 software. For existing buildings, Part L 2021 defines limits for new thermal elements.

	Threshold U Value (W/m2K)	Limiting U Value (W/m2K)
External Walls	0.7	0.3
Floor	0.7	0.25
Roof	0.35	0.16
Windows	3.3	1.4
Doors	3.3	1.4

Table 11: Part L limits for change of use (2021)

6.2 "BE LEAN EMISSIONS"

As part of the "Be Lean" approach, seeking to minimise energy demand, the following energy-related specifications have been adopted for the proposed studio apartments.

	Existing building (Benchmark 1)	Part L 2021 Building Compliance (Benchmark 2)	Proposed studio conversion
External walls U value ($W/m^2/°C$)	1.4 (450mm brick work with 12.5mm plaster)	0.3	1.4
Roof U value ($W/m^2/°C$)	2 (No insulation present)	0.16	0.15 (Plasterboard and 300mm of Knauf Loft Roll 44)
Floor U value ($W/m^2/°C$)	0.25	0.25	0.25
Windows U value ($W/m^2/°C$)	5 (Single glazed)	1.4	2.7 (secondary glazing)
Window G Value (-)	0.8	0.63	0.63
Doors ($W/m^2/°C$)	3.3	1.4	1.4
Air tightness ($m^3/m^2/h$ @50Pa)	15	8	7.5
Thermal Bridging	Default values	Default values	Default values
Lighting efficiency (lm/W)	30	80	120 (7No. LED DL, 3No. LED Pendant, 3No. LED Strip)
Ventilation type	Natural with extracts	Natural with extracts	Natural with extracts
Heating (make / model)	Gas fired boiler	Gas fired boiler	Viessmann Electric Boiler 24kW
Heating emitter (radiators/underfloor)	Wet Radiators	Wet Radiators	Wet Radiators
Hot water (make / model)	Gas fired boiler	Gas fired boiler	Viessmann Electric Boiler 24kW
Hot water tank volume (litres)	N/A	N/A (combi boiler)	N/A (combi boiler)
Hot water tank heat losses (kWh/day)	N/A	N/A (combi boiler)	
Cooling	N/A	N/A	

Table 12: Proposed residential development and baseline comparison

6.3 "BE LEAN" TOTAL CARBON EMISSIONS

The "Be Lean" CO_2 emissions associated with regulated energy consumption, are given below in relation to the benchmark 1 (existing building) and benchmark 2 (Part L).

Unit type	Area (m^2)	Benchmark 1 ($kg.CO_2/m^2/yr.$)	Benchmark 2 ($kg.CO_2/m^2/yr.$)	Proposed ($kg.CO_2/m^2/yr.$)
Studio 1	47.83	49.46	29.08	23.74

Table 13: Be Lean regulated emissions

6.4 "BE CLEAN" EMISSIONS

Please refer to the Be Clean commentary given for the residential carbon assessment.

6.5 "BE GREEN" EMISSIONS

The solar PV for this project has been assigned to the commercial spaces for the purposes of carbon accounting. Therefore, the Be Green emissions are the same as the Be Lean.

6.6 CARBON EMISSIONS SUMMARY (DWELLINGS)

The predicted total annual CO_2 emissions of the proposed development following the introduction of energy efficiency measures, passive and active design (Be Lean), low carbon supply technologies (Be Clean) and renewable energy systems (Be Green) are summarised below in the format recommended by the GLA.

The table below shows the regulated and unregulated energy use.

Carbon dioxide emissions (Tonnes CO_2 per annum)	Regulated	Unregulated
Baseline: Part L 2021 (Building Regulations) Compliance	2.78	0.8
After "Be Lean" (energy demand reduction)	2.27	0.8
After "Be Clean" (heat network / CHP)	2.27	0.8
After "Be Green" (renewable energy)	2.27	0.8

Table 14: Summary of new build carbon emissions for new build dwelling areas

This performance can be expressed as savings between each stage in the energy hierarchy.

Regulated carbon dioxide savings	(Tonnes CO_2 per annum)	(%)
Savings from "Be Lean" (energy demand reduction)	0.51	18.4%
Savings from "Be Clean" (heat network / CHP)	0.00	0.0%
Savings from "Be Green" (renewable energy)	0.00	0.0%
Total cumulative on-site savings	0.51	18.4%

Table 15: Residential regulated CO_2 emissions savings after each stage of the Energy Hierarchy

7 Summary

Camden Policy CC1 requires all developments to reduce carbon dioxide emissions through following the steps in the energy hierarchy. The Energy Efficiency SPD states "All newbuild residential developments must meet 19% carbon reduction" and the London Plan 2021 requires "major" schemes to achieve 35% below Part L. Although this is not a new build or a "major" scheme, these targets has been used as a guide. In addition, the Camden energy efficiency SPD states Developments more than 500m^2 to achieve 20%. How this floor area subject to this planning application is less than this threshold.

In relation to these targets, this development has been shown to have:

– 23.0 % total onsite improvement in carbon dioxide (CO_2) emissions over the Target Emission Rate (TER) outlined in the national Building Regulations 2021

A second benchmark has been modelled relating to the current performance of the existing building envelope. The improvement relative to this benchmark is 52.5%

This includes 4 kWpeak of solar photovoltaic (PV) modules located at roof level and a shift to all electric heating and hot water including heat pumps and mechanical ventilation with heat recovery (MVHR) for the non-domestic areas.

To reduce energy associated with hot water use, and water use in general, the studios and other areas will use water fittings in line with the higher 105 l/p/d water use target. Health and wellbeing is supported by aspects such as high levels of fresh air provided by mechanical ventilation with heat recovery. In terms of sustainable travel, the scheme achieves a the highest possible PTAL rating including a 5 minute walk to Russel Square and Holborn tube stations with 24 bus routes within a 7 minute walk.

The scheme aims to protect occupiers from high prices by reducing energy demands; generating energy onsite via solar PV and creating a resident's user guides to help occupants to reduce energy bills and promote the use of smart energy tariff to provide cheaper electricity during non-peak times.

The table below shows the total regulated and unregulated energy use.

Carbon dioxide emissions (Tonnes CO2 per annum)

	Regulated	**Unregulated**
Baseline: Part L 2021 (Building Regulations) Compliance	3.13	1.0
After "Be Lean" (energy demand reduction)	2.59	1.0
After "Be Clean" (heat network / CHP)	2.59	1.0
After "Be Green" (renewable energy)	2.41	1.0

Table 16: Summary of carbon emissions for the whole development

This performance can be expressed as savings between each stage in the energy hierarchy.

Regulated carbon dioxide emissions (Tonnes CO2 per annum)

	(Tonnes CO_2 per annum)	**(%)**
Savings from "Be Lean" (energy demand reduction)	0.54	17.3%
Savings from "Be Clean" (heat network / CHP)	0.00	0.0%
Savings from "Be Green" (renewable energy)	0.18	5.6%
Total cumulative on-site savings	0.72	23.0%

Table 17: Regulated CO_2 emissions savings for the whole development after each stage of the Energy Hierarchy.

Appendix A: Technology Feasibility Study Summary

The overall summary of the feasibility exercise is presented below.

Technology		Assessment/Viability	
	Wind Power	Wind turbine installed on the roof of the development.	Due to the high cost per kW for smaller building-mounted turbines and the impacts in terms of visual, noise and shadow flicker, wind turbines are not considered a viable technology for the development. CONCLUSION: NOT CONSIDERED FEASIBLE
	Ground Source Heat Pumps	Open or closed loop GSHP system requiring extraction of ground water and / or deep boreholes.	Ground-source heat pumps are one of the lowest carbon methods of providing reliable low-carbon heat and require low maintenance. However, they have high installation costs and there is limited space available for bore holes. CONCLUSION: NOT CONSIDERED FEASIBLE
	Air Source Heat Pumps	Electric powered external plant serving each unit providing heating and hot water	Air-source heat pumps are one of the lowest carbon methods of providing reliable low-carbon heat. They require low maintenance. External visual or noise impacts can be suitably mitigated by an on roof acoustic enclosure. **CONCLUSION: CONSIDERED FEASIBLE**
	Solar Thermal Collectors	Roof-mounted solar thermal panels providing hot water heating	Roof areas have good potential for solar thermal energy collection. However, the integration with a individual systems would result is a complex system. Therefore, solar PV is preferred over solar thermal technology. CONCLUSION: NOT CONSIDERED FEASIBLE
	Solar Photovoltaic Panels	Roof mounted Photovoltaic panels (PV) provide electricity directly to the scheme, exporting any surplus production to the grid.	The roof has good potential for solar PV. This technology also supports air source heat pumps. **CONCLUSION: CONSIDERED FEASIBLE**
	Combined Heat & Power (CHP)	Gas powered turbine generating electricity on site. Waste heat is also made available for on-site use	Carbon offsetting potential of CHP is significantly reduced now that the UK's electricity grid is much cleaner after the increase in renewable energy deployment and decrease in coal generation. CONCLUSION: NOT CONSIDERED FEASIBLE
	Energy Storage	Energy Storage e.g. batteries	Battery scheme is not considered beneficial as batteries have high embodied carbon. CONCLUSION: NOT CONSIDERED FEASIBLE
	Biomass Heating	Biomass-fired community heating system.	Biomass heating is an established technology but has high maintenance requirements, fuel storage and delivery issues and is a source of increase in pollution, notably particulates (PM10), SO2 and NOX emissions. CONCLUSION: NOT CONSIDERED FEASIBLE

Table A1: Summary of Low and Zero Carbon Study Analysis Results

Appendix B: Datasheets

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

25 Gloucester Street- Be Lean SBEM

As designed

Date: Fri Aug 25 14:48:42 2023

Administrative information

Building Details

Address: 25 Gloucester Street, London, WC1N 3AF

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.e.0

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: v7.0.20

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

Certifier details

Name:

Telephone number:

Address: , ,

Foundation area [m^2]: 73.9

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

Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	4.7	
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	4.28	
Target primary energy rate (TPER), $kWh_{PE}/m^2.annum$	50.57	
Building primary energy rate (BPER), $kWh_{PE}/m^2.annum$	46.43	
Do the building's emission and primary energy rates exceed the targets?	BER =< TER	BPER =< TPER

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

Fabric element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.26	0.26	BS000000_W1
Floors	0.18	0.18	0.18	BS000000_F
Pitched roofs	0.16	-	-	No heat loss pitched roofs
Flat roofs	0.18	-	-	No heat loss flat roofs
Windows** and roof windows	1.6	-	-	No external windows/roof-windows
Rooflights***	2.2	-	-	No external rooflights
Personnel doors^	1.6	-	-	No external personnel doors
Vehicle access & similar large doors	1.3	-	-	No external vehicle access doors
High usage entrance doors	3	-	-	No external high usage entrance doors

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

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

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

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

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

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

Air permeability	Limiting standard	This building
$m^3/(h.m^2)$ at 50 Pa	8	0

Building services

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

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	<0.9

1- Main heating

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	2.94	6.25	-	1.6	0.85
Standard value	2.5*	N/A	N/A	2^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

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

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

1- SYST0001-DHW

	Water heating efficiency	**Storage loss factor [kWh/litre per day]**
This building	1	-
Standard value	1	N/A

Zone-level mechanical ventilation, exhaust, and terminal units

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

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

Zone name	**SFP [W/(l/s)]**									**HR efficiency**	
ID of system type	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	**Zone**	**Standard**
Basement: Office	-	-	-	-	-	-	-	0.3	-	-	N/A
Basement: Plant room	-	-	-	-	-	-	-	0.3	-	-	N/A
Basement: Meeting Room	-	-	-	-	-	-	-	0.3	-	-	N/A

General lighting and display lighting	**General luminaire**	**Display light source**	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
Basement: Office	120	-	-
Basement: Plant room	120	-	-
Basement: Meeting Room	120	-	-

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

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Basement: Office	N/A	N/A
Basement: Plant room	N/A	N/A
Basement: Meeting Room	N/A	N/A

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	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
Floor area [m^2]	73.9	73.9
External area [m^2]	144.1	144.1
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	0	3
Average conductance [W/K]	31.56	57.99
Average U-value [W/m^2K]	0.22	0.4
Alpha value* [%]	28.86	27.64

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

Building Use

% Area	Building Type
	Retail/Financial and Professional Services
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
	Storage or Distribution
	Hotels
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
	Residential Spaces
100	**Non-residential Institutions: Community/Day Centre**
	Non-residential Institutions: Libraries, Museums, and Galleries
	Non-residential Institutions: Education
	Non-residential Institutions: Primary Health Care Building
	Non-residential Institutions: Crown and County Courts
	General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger Terminals
	Others: Emergency Services
	Others: Miscellaneous 24hr Activities
	Others: Car Parks 24 hrs
	Others: Stand Alone Utility Block

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

	Actual	Notional
Heating	4.22	9.18
Cooling	2.44	4.98
Auxiliary	12.1	9.96
Lighting	9.37	7.44
Hot water	2.48	2.48
Equipment*	20.49	20.49
TOTAL**	**30.6**	**34.05**

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

Energy Production by Technology [kWh/m^2]

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

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	83.18	166.2
Primary energy [kWh_{PE}/m^2]	46.43	50.57
Total emissions [kg/m^2]	4.28	4.7

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Fan coil systems, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	40.1	43.1	4.2	2.4	12.1	2.64	4.91	2.94	6.25
	Notional	87.3	78.9	9.2	5	10	2.64	4.4	----	----

Key to terms

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

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

25 Gloucester Street- Be Green SBEM

As designed

Date: Fri Aug 25 14:33:36 2023

Administrative information

Building Details

Address: 25 Gloucester Street, London, WC1N 3AF

Certifier details

Name:

Telephone number:

Address: , ,

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.e.0

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: v7.0.20

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

Foundation area [m^2]: 73.9

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

Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	4.7	
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	1.89	
Target primary energy rate (TPER), $kWh_{PE}/m^2.annum$	50.57	
Building primary energy rate (BPER), $kWh_{PE}/m^2.annum$	19.14	
Do the building's emission and primary energy rates exceed the targets?	BER =< TER	BPER =< TPER

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

Fabric element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.26	0.26	BS000000_W1
Floors	0.18	0.18	0.18	BS000000_F
Pitched roofs	0.16	-	-	No heat loss pitched roofs
Flat roofs	0.18	-	-	No heat loss flat roofs
Windows** and roof windows	1.6	-	-	No external windows/roof-windows
Rooflights***	2.2	-	-	No external rooflights
Personnel doors^	1.6	-	-	No external personnel doors
Vehicle access & similar large doors	1.3	-	-	No external vehicle access doors
High usage entrance doors	3	-	-	No external high usage entrance doors

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

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

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

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

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

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

Air permeability	Limiting standard	This building
$m^3/(h.m^2)$ at 50 Pa	8	0

Building services

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

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	<0.9

1- Main heating

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	4.62	6.25	-	1.6	0.85
Standard value	2.5*	N/A	N/A	2^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

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

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

1- SYST0001-DHW

	Water heating efficiency	**Storage loss factor [kWh/litre per day]**
This building	1	-
Standard value	1	N/A

Zone-level mechanical ventilation, exhaust, and terminal units

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

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

Zone name	**SFP [W/(l/s)]**									**HR efficiency**	
ID of system type	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	**Zone**	**Standard**
Basement: Office	-	-	-	-	-	-	-	0.3	-	-	N/A
Basement: Plant room	-	-	-	-	-	-	-	0.3	-	-	N/A
Basement: Meeting Room	-	-	-	-	-	-	-	0.3	-	-	N/A

General lighting and display lighting	**General luminaire**	**Display light source**	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
Basement: Office	120	-	-
Basement: Plant room	120	-	-
Basement: Meeting Room	120	-	-

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

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Basement: Office	N/A	N/A
Basement: Plant room	N/A	N/A
Basement: Meeting Room	N/A	N/A

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	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
Floor area [m^2]	73.9	73.9
External area [m^2]	144.1	144.1
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	0	3
Average conductance [W/K]	31.56	57.99
Average U-value [W/m^2K]	0.22	0.4
Alpha value* [%]	28.86	27.64

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

Building Use

% Area	Building Type
	Retail/Financial and Professional Services
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
	Storage or Distribution
	Hotels
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
	Residential Spaces
100	**Non-residential Institutions: Community/Day Centre**
	Non-residential Institutions: Libraries, Museums, and Galleries
	Non-residential Institutions: Education
	Non-residential Institutions: Primary Health Care Building
	Non-residential Institutions: Crown and County Courts
	General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger Terminals
	Others: Emergency Services
	Others: Miscellaneous 24hr Activities
	Others: Car Parks 24 hrs
	Others: Stand Alone Utility Block

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

	Actual	Notional
Heating	2.68	9.18
Cooling	2.44	4.98
Auxiliary	12.1	9.96
Lighting	9.37	7.44
Hot water	2.48	2.48
Equipment*	20.49	20.49
TOTAL**	**29.07**	**34.05**

* 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	16.97	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*16.97*	*0*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	83.18	166.2
Primary energy [kWh_{PE}/m^2]	19.14	50.57
Total emissions [kg/m^2]	1.89	4.7

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Fan coil systems, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	40.1	43.1	2.7	2.4	12.1	4.15	4.91	4.62	6.25
	Notional	87.3	78.9	9.2	5	10	2.64	4.4	----	----

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