Integration

Date
06.09.2022

89 Holmes Road
Energy Assessment

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Document status

Project no	**Project**	**Client**	**In conjunction with:**
713	The George IV 89 Holmes Road London NW5 3AU	KT Design and Development LTD	KSR Architects

Revision	Date	Status	Prepared by	Checked by
2	06.09.2022	Issue for planning	Oscar Akam	Alan Harries
1	23.08.2022	Issue for planning	Kelly Tan	Alan Harries
-	19.08.2022	Issue for planning	Kelly Tan	Alan Harries

Contents

Executive Summary

This Energy Assessment has been prepared by Integration Consultancy Limited in support of the full planning application for the proposed development at 89 Holmes Road in the London Borough of Camden. The project includes a second floor rear extension; and two storey roof extension behind retained parapet, comprising 8 HMO room addition.

CARBON PERFORMANCE

The London Plan has an overarching zero-carbon target with a minimum onsite contribution of 35% below Part L for major scheme. As a minor extension, the performance of the proposed scheme has been guided by these targets.

The results below show that the proposed new build extension achieves:

- 28% total onsite improvement in carbon dioxide (CO_2) emissions over the Target Emission Rate (TER) outlined in the national Building Regulations Part L2 2021

The proposed design achieves this via the uses of high-performance building fabric, passive low energy design and low energy building services systems such as LED lighting.

Dedicated centralised domestic hot water will be provided by air source heat pumps. There will also be a dedicated centralised space heating system based on air source heat pumps.

The scheme has a low temperature, centralised space heating and hot water system, as recommended by GLA guidance in order to help facilitate a potential connection to a heat network in the future if viable.

The tables below show the total regulated and unregulated energy use and overall carbon savings compared to the Building Regulation (2021) benchmark notional building.

Carbon dioxide emissions (Tonnes CO2 per annum)

	Regulated	**Unregulated**
Baseline: Part L 2021 (Building Regulations) Compliance	0.92	0.4
Proposed development	0.67	0.4

Table 1: Summary of carbon emissions for the development

Regulated carbon dioxide emissions (Tonnes CO2 per annum)

	(Tonnes CO_2 per annum)	**(%)**
Total cumulative on-site savings	0.25	28%

Table 2: Regulated CO2 emissions savings for the development

1 Introduction

This Energy Assessment has been prepared by Integration Consultancy Limited in support of the full planning application for the proposed development at 89 Holmes Road in the London Borough of Camden. 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.

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.

1.1 THE DEVELOPMENT SITE

The site is located above The George IV at 89 Holmes Road, London, NW5 3AU

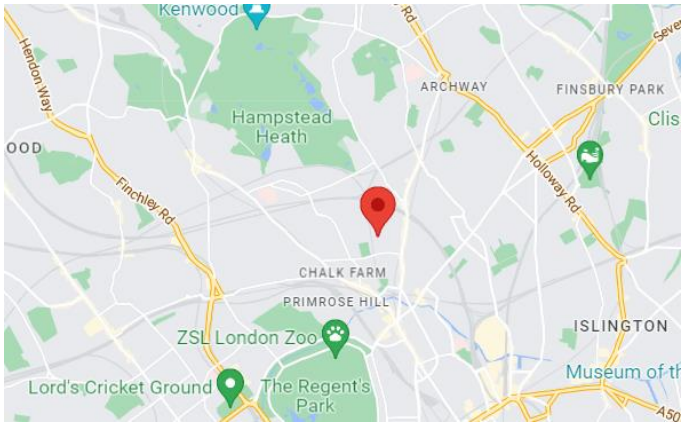

Figure 1: Site Location

Figure 2: Aerial view of the Geroge IV with green ground floor walls

1.2 PROPOSED DEVELOPMENT OVERVIEW

The project includes a second floor rear extension; and two storey roof extension behind retained parapet, comprising 8 HMO room addition.

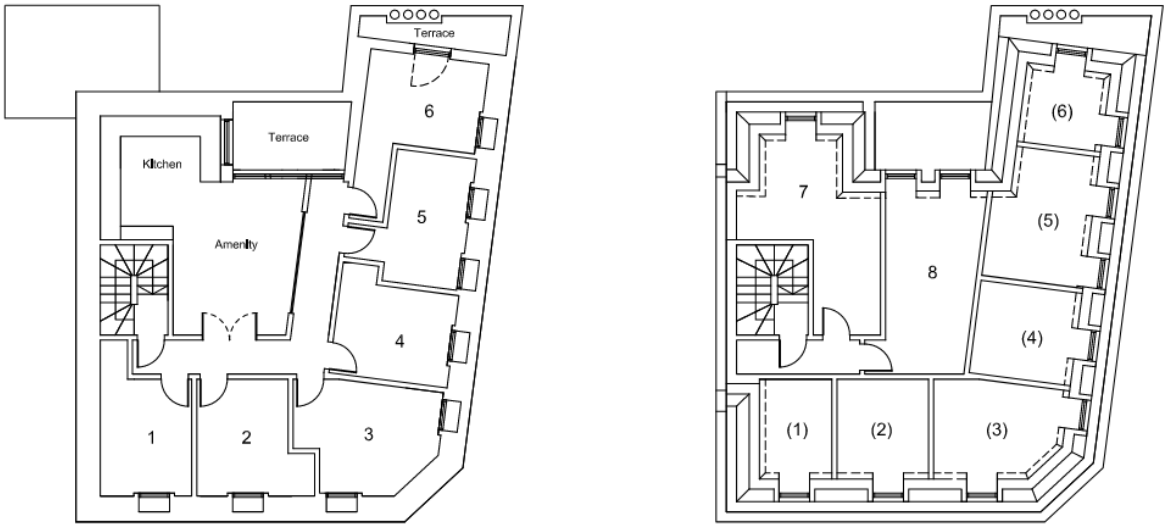

Figure 3: Proposed development scheme - third floor (left) and fourth floor (right)

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:*

a. *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;*

b. *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*

c. *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."

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.

Chapter 9 (Sustainable Infrastructure) of 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. Some of the key aspects to note are summarised below:

- Zero carbon residential and commercial. 100% below part L for 'major' development (>1000m^2 or 10 units +) with minimum onsite contribution of 35% below Part L.
- Energy efficiency ('Be lean') of residential areas to achieve 10% below Part L and commercial to achieve 15% below Part L
- Overheating studies TM59 (residential and TM52 (commercial) compulsory for 'major' schemes
- 'Be Seen' energy monitor requirement for 5 years via the GLA online portal

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

- Carbon tax increased to £95/tCO2 (from £60tCO2)
- Energy cost considerations.
- Future strategy. Details of how the scheme will achieve zero-carbon on-site emissions onsite by 2050.
- Demand-Side Response proposals for carbon reduction via demand side response.
- Communal low-temperature heating. 'Major' schemes within Heat Network Priority Areas should have low temperature central systems.
- Lifecycle Carbon Assessment. LCA required for "referable" schemes (150 residential units or more / over 30 metres tall)

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:*
   - *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. *Mayor 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 GREATER LONDON AUTHORITY GUIDANCE ON PREPARING ENERGY ASSESSMENTS AS PART OF PLANNING APPLICATIONS (JUNE 2022)

The Energy Assessment Guidance from the GLA was updated in June 2022 to explain how London Plan policies apply to Part L and Part O 2021 which came into effect on 15th June 2022. The guidance state that there is a requirement to:

- *Meet a minimum onsite carbon reduction 35% below part L (2021) for all major developments, with net zero carbon (100% below Part L) achieved through offset payment where required.*
- *Refer to an additional benchmark target of 50% below Part L 2021 for major residential developments.*
- *In mixed use scheme, ensure both residential and commercial developments meet targets separately.*
- *Meet 10% below Part L 2021 for residential Be Lean*
- *Meet 15% below Part L 2021 for non-domestic Be Lean*
- *Use the GLA reporting spreadsheet and submit in excel format.*
- *Report the Energy Use Intensity (EUI) and Space Heating Demand (SHD) using the GLA spreadsheet.*
- *Fully comply with Policies SI 2 to SI 4 inclusive of the London Plan.*
- *Demonstrate connection to existing or planned heat networks has been prioritized and provide correspondence to support this.*
- *Minimise the number of energy centers and provide a single point of connection to a district heat network.*
- *Demonstrate the cooling hierarchy has been followed and provide TM59/52 studies.*
- *Maximise renewables (including the potential for storage) on site.*
- *Report on flexibility / demand side response initiatives and energy storage capacity.*
- *Referable Applications (e.g. 150 units + / >30m in height) to calculate and reduce whole life-cycle carbon emissions.*

2.4 THE LONDON BOROUGH OF CAMDEN

Applicable local borough policy for the proposed development comes from the Camden Local Plan 2017 supported by the Energy efficiency and adaptation CPG 2021.

2.4.1 Policy CC1 Climate change mitigation

The Council will require all development to minimise the effects of climate change and encourage all developments to meet the highest feasible environmental standards that are financially viable during construction and occupation.

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;

f. expect all developments to optimise resource efficiency.

For decentralised energy networks, we will promote decentralised energy by:

g. working with local organisations and developers to implement decentralised energy networks in the parts of Camden most likely to support them;

h. protecting existing decentralised energy networks (e.g. at Gower Street, Bloomsbury, King's Cross, Gospel Oak and Somers Town) and safeguarding potential network routes; and

i. requiring all major developments to assess the feasibility of connecting to an existing decentralised energy network, or where this is not possible establishing a new network.

To ensure that the Council can monitor the effectiveness of renewable and low carbon technologies, major developments will be required to install appropriate monitoring equipment

2.4.2 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 run-off 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.

Sustainable design and construction measures The Council will promote and measure sustainable design and construction by:

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.

2.4.3 Pre-application Advice Issued

Pre-application Advice Issued was issued on 25/05/2022 (Application ref: 2022/1054/PRE) and provided guidance on energy and sustainability:

> *The Council requires all* ***development to minimise the effects of climate change*** *and encourage all developments to meet the highest feasible environmental standards that are financially viable during construction and occupation.* ***Policy CC1 requires all development to reduce carbon dioxide emissions*** *by following the steps in the energy hierarchy; supports and encourages* ***sensitive energy efficiency improvements to existing buildings; and expects all developments to optimise resource efficiency****.*
>
> *Policy CC2 requires all development to 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.

No details of energy or sustainability measures have been provided as part of the pre-application document. Retrofitting the building with more energy efficient measures to minimise energy consumption (draught-proofing, thermally efficient windows and insulation etc) should be considered as part of any refurbishment works.

3 Design Approach - Energy

3.1 CLIMATE ANALYSIS

The London climate is heating dominated, hence the key passive measure to be implemented are high 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.

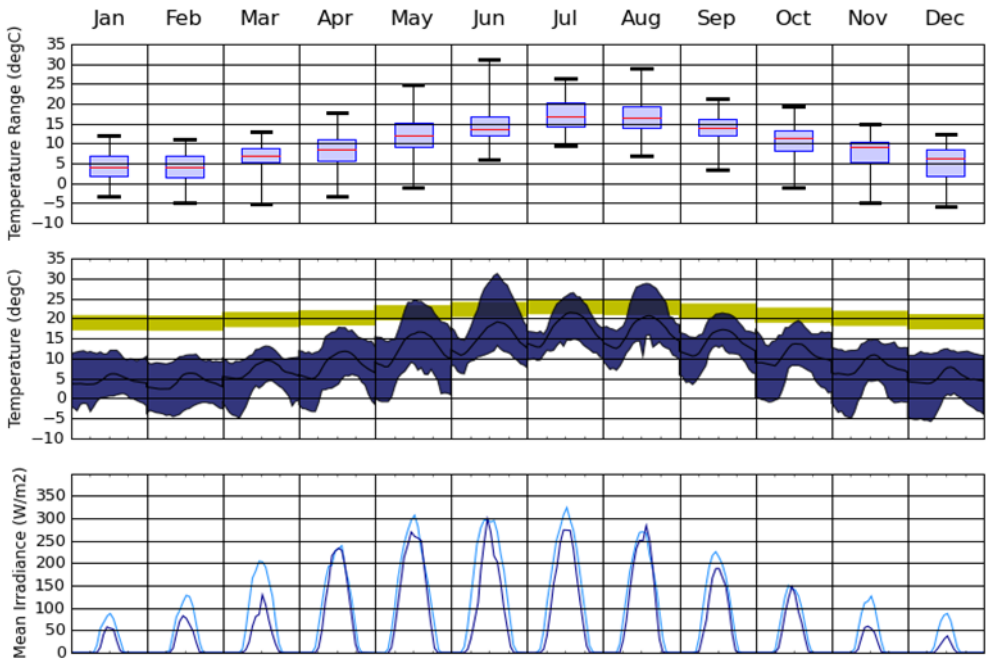

Figure 4: Average historic climate data for London

3.2 BUILDING FABRIC PERFORMANCE & INSULATION

High levels of insulation are proposed as summarised later in this section. The thermal performance of all exposed elements equals or exceeds the minimum requirements for Building Regulations. This 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 glazing will also improve occupant comfort by reducing radiant temperature asymmetry which can be a comfort issue especially during the winter months.

3.3 AIR TIGHTNESS, INFILTRATION AND THERMAL BRIDGING

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

Minimising thermal bridging is an important aspect of the design. The approach to limiting thermal bridging is to implement a standard comparative to Accredited Details[2] where feasible.

[2] www.planningportal.co.uk/info/200135/approved_documents/74/part_l_-_conservation_of_fuel_and_power/6

3.4 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 thermal mass, natural ventilation will reduce the impact of 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.

3.5 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 excellent access to natural daylight and solar energy, as there are no surrounding buildings that overshadow during the main solar hours.

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.

3.6 ACTIVE BUILDING SERVICES SYSTEMS

Space heating for the units will be provided via a centralised air-source heat pump system. Suitable controls will be used e.g. to minimise the delivery temperature and maximise the efficiency of the heat pump units.

Hot water will also be provided by centralised source heat pumps. The energy use associated with domestic hot water will be minimised by the use of water efficient fittings.

Ventilation will be provided by local extract and trickle ventilation. Lights will be comprised of high efficiency LED fittings throughout.

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

4 Carbon Emissions

4.1 BASELINE

Energy demand and annual carbon emissions are calculated using BRE accredited energy compliance software SBEM as HMO / 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 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 exceeds the minimum requirements for compliance with Part L of the Building Regulations as summarised in the table below.

4.2 PROPOSED BUILDING EMISSIONS

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

A low carbon and renewable energy feasibility exercise has been carried out in order to determine the most viable option(s) for the development (see Appendix A). The viable technology option, air source heat pumps, has been selected. Air source heat pumps (ASHP) extract heat energy from the air which is naturally replenished by renewable solar energy. An ASHP can create around 3kW of renewable energy for every 1kW of electrical power it consumes, which makes it one of the lowest carbon reliable heating technologies available. Centralised air source heat pumps will provide space heating and hot water for the whole building including the proposed two storey extension.

Element	Proposed Specifications	Building Regulations Notional Value (Part L2 2021)
External walls U value	0.2 W/m^{2}K	0.26 W/m^{2}K
Roof U value	0.18 W/m^{2}K	0.18 W/m^{2}K
Windows U value	1.6 W/m^{2}K	1.6 W/m^{2}K
Air tightness	5.0 m^3/m^2/h @50Pa	3.0 m^3/m^2/h @50Pa
Ventilation type	Extract with trickle ventilation – SFP 0.5 in Unit, 0.9 Kitchen	SPF units 0.5, Kitchen 1.0
Heating	Air-source heat pumps SCOP 3	Air-source heat pumps SCOP 2.64
Hot Water	Air-source heat pumps SCOP 3	Air-source heat pumps SCOP 2.86
Cooling (SEER/SSEER)	None	None
Lighting	95 lm/W	95 lm/W

Table 3: Energy related building specification and comparison with notional values for Part L2 2021

4.2.1 Total Carbon Emissions

The CO_2 emissions associated with regulated energy consumption (Building Emissions Rate - BER) are given below in relation to the baseline TER (Target Emission Rate). The modelling follows the GLA guidance on preparing energy assessments (June 2022) which states: "*under Part L 2021 for a non-residential building proposing heat pumps, the TER for the Part L 2021 baseline would include heat pumps with notional performance values of 2.86 seasonal generator efficiency for hot water and 2.64 seasonal system coefficient of performance for space heating.*"

Area (m^2)	TER (kg.CO_2/m^2/yr.)	BER (kg.CO_2/m^2/yr.)
196	4.71	3.48

Table 4: Be Lean non-domestic regulated emissions

4.2.2 Future Connection to Third Party Heat Networks

Heat networks are encouraged by the London Plan. As a minor scheme, it is unlikely to be cost effective to connect to a heat network. However, the scheme will use centralised, low-temperature space heating and hot water systems which are recommended by the GLA to support heat network compatibility in the future.

5 Summary

5.1 DEVELOPMENT CARBON EMISSIONS SUMMARY

The predicted total annual CO_2 emissions of the proposed extension is summarised below. The BRUKL datasheet is appended to the report for reference (Appendix B).

The London Plan has an overarching zero-carbon target with a minimum onsite contribution of 35% below Part L for major scheme. As a minor extension, the performance of the proposed scheme has been guided by these targets.

The results below show that the proposed development achieves:

- 28% total onsite improvement in carbon dioxide (CO_2) emissions over the Target Emission Rate (TER) outlined in the national Building Regulations 2021

The tables below show the total regulated and unregulated energy use and overall carbon savings compared to the Building Regulation (2021) benchmark notional building.

Carbon dioxide emissions (Tonnes CO2 per annum)

	Regulated	**Unregulated**
Baseline: Part L 2021 (Building Regulations) Compliance	0.92	0.4
Proposed development	0.67	0.4

Table 5: Summary of carbon emissions for the development

Regulated carbon dioxide emissions (Tonnes CO2 per annum)

	(Tonnes CO_2 per annum)	**(%)**
Total cumulative on-site savings	0.25	28%

Table 6: Regulated CO2 emissions savings for the development

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 on site 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 where required **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 heat pump would result is a complex system. Therefore, solar PV is generally 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 some potential for solar PV. However, plant requirement will limit the potential of this technology. CONCLUSION: NOT 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 there will be significant daytime energy use on site relative to the amount of solar PV deployment 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: SBEM Datasheets

This appendix contains the SBEM BRUKL document for reference.

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

89 Holmes Road

As designed

Date: Tue Sep 06 10:28:37 2022

Administrative information

Building Details

Address: 89 Holmes Road, London, NW5 3AU

Certifier details

Name: Integration

Telephone number: Phone

Address: 52-54 Rosebury Avenue, London, EC1R 4RP

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.b.0

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: v7.0.15

BRUKL compliance check version: v6.1.b.0

Foundation area [m^2]: 116.67

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

Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	4.71	
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	3.48	
Target primary energy rate (TPER), $kWh/m^2.annum$	49.76	
Building primary energy rate (BPER), $kWh/m^2.annum$	36.76	
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	0.2	0.2	21000000_W4
Floors	0.18	-	-	No heat loss floors
Pitched roofs	0.16	-	-	No heat loss pitched roofs
Flat roofs	0.18	0.18	0.18	21000000_C
Windows** and roof windows	1.6	1.6	1.6	21000000_W6_O0
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

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	Limiting standard	This building
$m^3/(h.m^2)$ at 50 Pa	8	5

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 system

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	2.81	-	-	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

2- DHW System

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	3.05	-	-	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

1- SYST0001-DHW

	Water heating efficiency	**Storage loss factor [kWh/litre per day]**
This building	Hot water provided by HVAC system	-
Standard value	N/A	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**
7	-	-	0.5	-	-	-	-	-	-	-	N/A
8	-	-	0.5	-	-	-	-	-	-	-	N/A
6	-	-	0.5	-	-	-	-	-	-	-	N/A
5	-	-	0.5	-	-	-	-	-	-	-	N/A
4	-	-	0.5	-	-	-	-	-	-	-	N/A
3	-	-	0.5	-	-	-	-	-	-	-	N/A
2	-	-	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	2.3	2	0.5	0.5	0.4	1	Zone	Standard
1	-	-	0.5	-	-	-	-	-	-	-	N/A
8 E	-	-	0.5	-	-	-	-	-	-	-	N/A
7 E	-	-	0.5	-	-	-	-	-	-	-	N/A
1	-	-	0.5	-	-	-	-	-	-	-	N/A
1 E	-	-	0.5	-	-	-	-	-	-	-	N/A
2	-	-	0.5	-	-	-	-	-	-	-	N/A
2 E	-	-	0.5	-	-	-	-	-	-	-	N/A
3 E	-	-	0.5	-	-	-	-	-	-	-	N/A
3	-	-	0.5	-	-	-	-	-	-	-	N/A
4	-	-	0.5	-	-	-	-	-	-	-	N/A
4 E	-	-	0.5	-	-	-	-	-	-	-	N/A
5	-	-	0.5	-	-	-	-	-	-	-	N/A
5 E	-	-	0.5	-	-	-	-	-	-	-	N/A
6	-	-	0.5	-	-	-	-	-	-	-	N/A
6 E	-	-	0.5	-	-	-	-	-	-	-	N/A
KITCHEN	-	-	-	-	-	-	-	-	0.9	-	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
7	95	-	-
8	95	-	-
6	95	-	-
5	95	-	-
4	95	-	-
3	95	-	-
2	95	-	-
1	95	-	-
STAIRS	95	-	-
CORRIDOR	95	-	-
8 E	95	-	-
7 E	95	-	-
1	95	-	-
1 E	95	-	-
2	95	-	-
2 E	95	-	-
3 E	95	-	-
3	95	-	-
4	95	-	-
4 E	95	-	-
5	95	-	-
5 E	95	-	-
6	95	-	-

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
6 E	95	-	-
KITCHEN	95	-	-
STAIRS	95	-	-
CORRIDOR	95	-	-

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?
7	NO (-83.2%)	NO
8	NO (-3.9%)	NO
6	NO (-67.9%)	NO
5	NO (-18.2%)	NO
4	NO (-41.9%)	NO
3	NO (-59.6%)	NO
2	NO (-59.4%)	NO
1	NO (-81.1%)	NO
1	NO (-78.8%)	NO
2	NO (-66.6%)	NO
3	NO (-66.6%)	NO
4	NO (-52.4%)	NO
5	NO (-25.4%)	NO
6	NO (-53.3%)	NO
KITCHEN	NO (-71.8%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	196	196
External area [m^2]	366.8	366.8
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	5	3
Average conductance [W/K]	117.32	184.56
Average U-value [W/m^2K]	0.32	0.5
Alpha value* [%]	33.75	27.93

* 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
100	**Residential Spaces**
	Non-residential Institutions: Community/Day Centre
	Non-residential Institutions: Libraries, Museums, and Galleries
	Non-residential Institutions: Education
	Non-residential Institutions: Primary Health Care Building
	Non-residential Institutions: Crown and County Courts
	General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger Terminals
	Others: Emergency Services
	Others: Miscellaneous 24hr Activities
	Others: Car Parks 24 hrs
	Others: Stand Alone Utility Block

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

	Actual	Notional
Heating	8.83	11.9
Cooling	0	0
Auxiliary	4.43	7.61
Lighting	6.29	5.54
Hot water	4.32	8.12
Equipment*	16.48	16.48
TOTAL**	**23.87**	**33.17**

* 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]	139.1	191.61
Primary energy [kWh/m^2]	36.76	49.76
Total emissions [kg/m^2]	3.48	4.71

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] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	83.9	55.2	8.8	0	4.4	2.64	0	2.81	0
	Notional	113.1	78.5	11.9	0	3.2	2.64	0	----	----

Key to terms

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

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

89 Holmes Road - Be Green

As designed

Date: Tue Sep 06 10:36:07 2022

Administrative information

Building Details

Address: 89 Holmes Road, London, NW5 3AU

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.b.0

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: v7.0.15

BRUKL compliance check version: v6.1.b.0

Certifier details

Name: Integration

Telephone number: Phone

Address: 52-54 Rosebury Avenue, London, EC1R 4RP

Foundation area [m^2]: 116.67

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

Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	4.71	
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	3.41	
Target primary energy rate (TPER), $kWh/m^2.annum$	49.76	
Building primary energy rate (BPER), $kWh/m^2.annum$	35.98	
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	0.2	0.2	21000000_W4
Floors	0.18	-	-	No heat loss floors
Pitched roofs	0.16	-	-	No heat loss pitched roofs
Flat roofs	0.18	0.18	0.18	21000000_C
Windows** and roof windows	1.6	1.6	1.6	21000000_W6_O0
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

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	Limiting standard	This building
$m^3/(h.m^2)$ at 50 Pa	8	5

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 system

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	3	-	-	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

2- DHW System

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	3	-	-	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

1- SYST0001-DHW

	Water heating efficiency	**Storage loss factor [kWh/litre per day]**
This building	Hot water provided by HVAC system	-
Standard value	N/A	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**
7	-	-	0.5	-	-	-	-	-	-	-	N/A
8	-	-	0.5	-	-	-	-	-	-	-	N/A
6	-	-	0.5	-	-	-	-	-	-	-	N/A
5	-	-	0.5	-	-	-	-	-	-	-	N/A
4	-	-	0.5	-	-	-	-	-	-	-	N/A
3	-	-	0.5	-	-	-	-	-	-	-	N/A
2	-	-	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	2.3	2	0.5	0.5	0.4	1	Zone	Standard
1	-	-	0.5	-	-	-	-	-	-	-	N/A
8 E	-	-	0.5	-	-	-	-	-	-	-	N/A
7 E	-	-	0.5	-	-	-	-	-	-	-	N/A
1	-	-	0.5	-	-	-	-	-	-	-	N/A
1 E	-	-	0.5	-	-	-	-	-	-	-	N/A
2	-	-	0.5	-	-	-	-	-	-	-	N/A
2 E	-	-	0.5	-	-	-	-	-	-	-	N/A
3 E	-	-	0.5	-	-	-	-	-	-	-	N/A
3	-	-	0.5	-	-	-	-	-	-	-	N/A
4	-	-	0.5	-	-	-	-	-	-	-	N/A
4 E	-	-	0.5	-	-	-	-	-	-	-	N/A
5	-	-	0.5	-	-	-	-	-	-	-	N/A
5 E	-	-	0.5	-	-	-	-	-	-	-	N/A
6	-	-	0.5	-	-	-	-	-	-	-	N/A
6 E	-	-	0.5	-	-	-	-	-	-	-	N/A
KITCHEN	-	-	-	-	-	-	-	-	0.9	-	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
7	95	-	-
8	95	-	-
6	95	-	-
5	95	-	-
4	95	-	-
3	95	-	-
2	95	-	-
1	95	-	-
STAIRS	95	-	-
CORRIDOR	95	-	-
8 E	95	-	-
7 E	95	-	-
1	95	-	-
1 E	95	-	-
2	95	-	-
2 E	95	-	-
3 E	95	-	-
3	95	-	-
4	95	-	-
4 E	95	-	-
5	95	-	-
5 E	95	-	-
6	95	-	-

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
6 E	95	-	-
KITCHEN	95	-	-
STAIRS	95	-	-
CORRIDOR	95	-	-

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?
7	NO (-83.2%)	NO
8	NO (-3.9%)	NO
6	NO (-67.9%)	NO
5	NO (-18.2%)	NO
4	NO (-41.9%)	NO
3	NO (-59.6%)	NO
2	NO (-59.4%)	NO
1	NO (-81.1%)	NO
1	NO (-78.8%)	NO
2	NO (-66.6%)	NO
3	NO (-66.6%)	NO
4	NO (-52.4%)	NO
5	NO (-25.4%)	NO
6	NO (-53.3%)	NO
KITCHEN	NO (-71.8%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	196	196
External area [m^2]	366.8	366.8
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	5	3
Average conductance [W/K]	117.32	184.56
Average U-value [W/m^2K]	0.32	0.5
Alpha value* [%]	33.75	27.93

* 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
100	**Residential Spaces**
	Non-residential Institutions: Community/Day Centre
	Non-residential Institutions: Libraries, Museums, and Galleries
	Non-residential Institutions: Education
	Non-residential Institutions: Primary Health Care Building
	Non-residential Institutions: Crown and County Courts
	General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger Terminals
	Others: Emergency Services
	Others: Miscellaneous 24hr Activities
	Others: Car Parks 24 hrs
	Others: Stand Alone Utility Block

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

	Actual	Notional
Heating	8.27	11.9
Cooling	0	0
Auxiliary	4.43	7.61
Lighting	6.29	5.54
Hot water	4.39	8.12
Equipment*	16.48	16.48
TOTAL**	**23.38**	**33.17**

* 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]	139.1	191.61
Primary energy [kWh/m^2]	35.98	49.76
Total emissions [kg/m^2]	3.41	4.71

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] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	83.9	55.2	8.3	0	4.4	2.82	0	3	0
	Notional	113.1	78.5	11.9	0	3.2	2.64	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