21-23 Bedford Place

Energy Assessment Strategy Report

Issue for Planning

Issue P06 – 05 April 2024

21-23 BEDFORD PLACE

ENERGY ASSESSMENT STRATEGY REPORT

ISSUE FOR PLANNING

Quality Assurance Page

Issue	Date	Prepared By	Checked By	Approved By	Remarks
P01	27/10/2023	Mr. W. Newall	Mr R. Denteh	Mr R. Denteh	Draft Issue
P02	03/11/2023	Mr. R. Mercer	Mr R. Denteh	Mr R. Denteh	Final Draft
P03	10/11/2023	Mr. R. Mercer	Mr R. Denteh	Mr R. Denteh	Issue for Planning
P04	10/11/2023	Mr. R. Mercer	Mr R. Denteh	Mr R. Denteh	Issue for Planning
P05	13/11/2023	Mr. R. Mercer	Mr R. Denteh	Mr R. Denteh	Issue for Planning
P06	05/04/2024	Mr. N. Smith	Mr R. Denteh	Mr R. Denteh	Issue for Planning

Figure 1: View of Front of the Existing Development.

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EXECUTIVE SUMMARY

This report describes the energy strategy for the proposed development at 21-23 Bedford Place, WC1B 5JJ, on behalf of Firmdale Hotels.

The Development is a Grade II listed heritage asset consisting of three Georgian town houses originally built in 1815 on the West side of Bedford Place, close to the Northern junction of Russel Square now within the designated Bloomsbury Conservation Area. The development is proposed to undergo refurbishment to reinstate much of the original Georgian plan form of the property while providing an efficient 42 key hotel layout. The renovations comprise of the sensitive remodelling and retention of the heritage building fabric including fireplaces, lath and plaster ceilings, cornicing, decorative plasterwork, and mouldings.

Energy and sustainable design are an integral part of the proposed redevelopment's design, and this report demonstrates how the development satisfies national, regional, and local planning guidance in relation to sustainability and climate change mitigation/adaption.

Figure 2: View of the Existing Building

1.1 Energy Strategy Overview

1.1.1 Carbon Reduction Policy and Targets

Camden Local Plan (2017)

Camden Council's Local Plan requires that major non-residential development meets the carbon reduction requirements set out in the London Plan. Although the development does not trigger Camden planning requirements for an energy statement this report has been produced by Meinhardt UK to show best endeavour that all reasonable practices have been followed to minimize the impact of the developments restoration and provide longevity for the development through structured efficient design.

National Planning Policy Framework (NPPF)

In June 2019 the UK Government made a commitment to bring all greenhouse gas emissions to net zero by 2050. This has been followed by further commitments in December 2020, April 2021 and September 2023, to reducing economywide greenhouse gas emissions by at least 68% by 2030 and by 78% by 2035, compared to 1990 levels.

Building Regulations

An updated Building Regulations Part L Conservation of Fuel and Power and a new Part O Overheating were introduced in June 2022. The updated Part L is expected to deliver a 30% reduction in carbon emissions for domestic buildings and a 27% reduction for non-domestic.

Further consultation is expected on the new Future Homes Standard and Future Buildings Standard which are intended to be introduced in 2025.

London Plan (2021)

Major development should be net zero-carbon, with a minimum on-site reduction of at least 35 per cent beyond Building Regulations Part L 2021 requirements.

Residential developments should achieve a 10% reduction and non-residential developments should achieve a 15% reduction through energy efficiency measures alone.

Where the zero-carbon target cannot be fully achieved on-site, any shortfall should be provided, 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.

Carbon emissions from any other part of the development i.e., unregulated emissions have been calculated and minimised.

1.1.2 Carbon Reduction Strategy

The energy strategy for the detailed application follows the London Plan's updated energy hierarchy approach of 'Be Lean', 'Be Clean', 'Be Green', and 'Be Seen' as detailed in policy SI2.

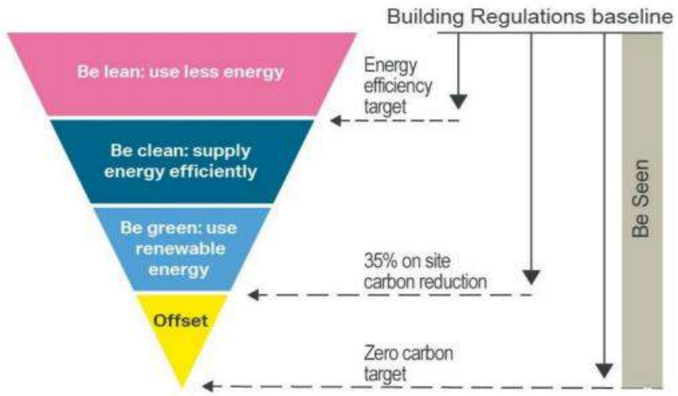


Figure 3: The energy hierarchy and associated targets

The proposed development has been assessed using IES VE dynamic thermal modelling software and the latest Simplified Building Energy Modelling methodology to demonstrate compliance with Part L 2021.

The Part L 2021 TER baseline has been calculated using the notional specification for existing buildings in Appendix 3 of the GLA Energy Assessment Guidance. The expected carbon dioxide emissions at each stage of the hierarchy are shown in the graph below for the whole development.

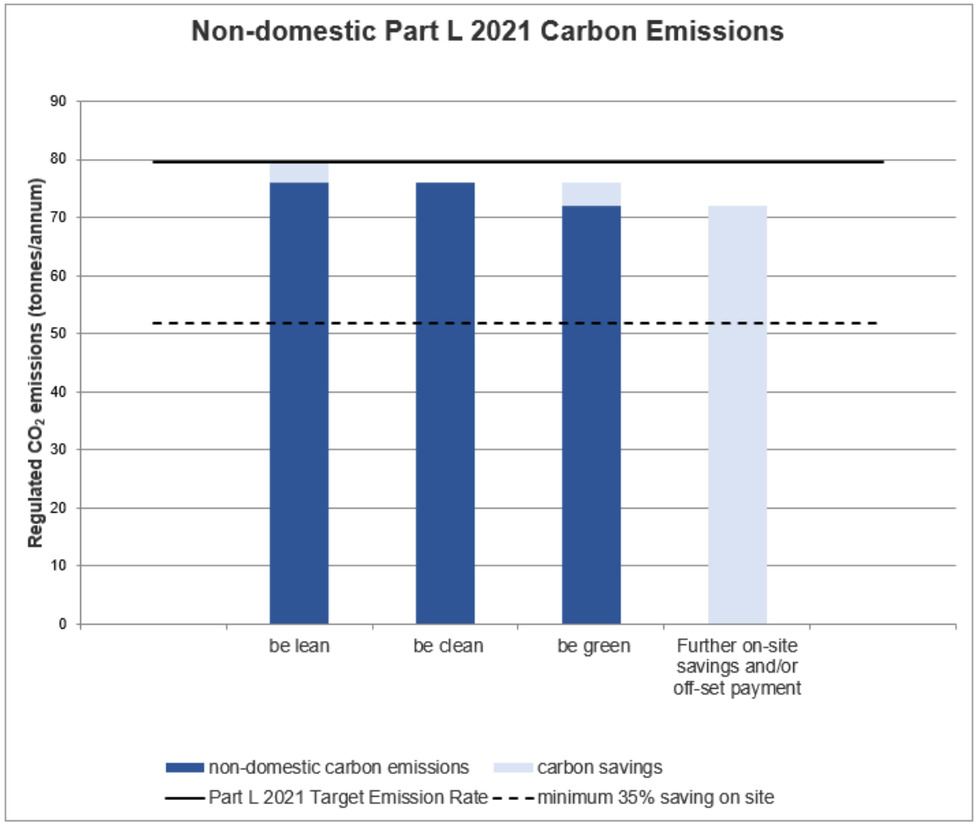


Figure 4: Energy Hierarchy and Targets for Development (SAP 10 Carbon Emission Factors)

The graph above demonstrates that the proposed refurbishment achieving an overall reduction of 10% in regulated carbon dioxide emissions over Part L 2021 using SAP 10 emissions factors.

Heritage Limitations

With the proposed redevelopment being on a Grade II listed building, this places a number of heritage limitations on the building with regard to improving building fabric and the installation of renewable energy generation systems. These limitations are as follows:

- **External Walls:** Building is listed as Designated Heritage Asset and alterations to the walls would cause harm to the listed building through concealment of the historic fabric of the existing walls and subsequent alterations to the appreciation of the historic form of the space. Adding insulation would also have a risk of condensation. Therefore, the u-value of the external walls cannot be improved.
- **Floor:** Basement floor is concrete, and the upper floors are timber. No insulation to either, these cannot be improved upon due to heritage limitations.
- **Roof:** Roof is a timber framed pitched roof with slate tiles. There are only isolated pockets of insulation at joist level (mostly no insulation). Minor improvement may be achievable, approximately 100mm of rockwool insulation between joists could be installed.
- **Glazing:** Heritage restrictions require the proposed development to have single glazed timber sash windows. New acoustic glass is being fitted which will provide a minor improvement in terms of heat loss.
- **Solar PV:** Alterations to the roof space would also cause some harm to the listed building through intervention to fabric and alteration of appearance, as well as the character of the conservation area.

These limitations have therefore restricted the carbon savings at both the be lean and be green stages of the energy hierarchy. For further information please refer to the associated Heritage Statement.

Carbon Emissions and Savings

The tables below detail the carbon dioxide emissions and savings expected at each stage of the energy hierarchy for the development; -

	Regulated Carbon dioxide emissions (Tonnes CO_2 per annum)
Baseline: Part L 2021 Compliant	79.6
After energy demand reduction	76.1
After heat network	76.1
After renewable energy	71.9

Table 1: Carbon dioxide emissions after each stage of the Energy Hierarchy

	Regulated non-domestic carbon dioxide savings	
	Tonnes CO_2 per annum	%
Be lean: Savings from energy demand reduction	3.6	4%
Be clean: Savings from heat network	0.0	0%
Be green: Savings from renewable energy	4.1	5%
Cumulative on-site savings	7.7	10%

Table 2: Regulated carbon dioxide savings from each stage of the Energy Hierarchy (SAP 10)

Demand Reduction (Be Lean)

As aforementioned there are heritage limitations on the proposed development which have restricted the carbon reduction of the proposed redevelopment at the Be Lean and Be Green stage. Energy demand cannot be reduced beyond Part L requirements for the development, restricting carbon emission savings over Part L 2021 through passive design and energy efficiency measures alone.

As the existing building was built in 1815 it is not practically possible to achieve a reduction in savings as required under Part L for new build buildings, However, all avenues have been explored and incorporated to achieve the maximum reductions under the 'Be Lean' stage, interventions include:

The reduction will be achieved by a combination of measures, which shall include the following.

- Improved fabric 'U' values wherever possible
- Communal heating system to the building
- High efficiency ventilation systems
- Minimising heat loss from hot water systems
- Low energy lighting
- Controls systems to monitor and operate the plant and equipment as efficiently as possible.
- Smart meters.

Heating Infrastructure (Be Clean)

Investigations have confirmed that there are no existing district heat networks in the vicinity of the proposed development, as shown in the below extract from London Heat Map (figure 5). Figure 5 highlights that the nearest proposed heat network is 857m away.

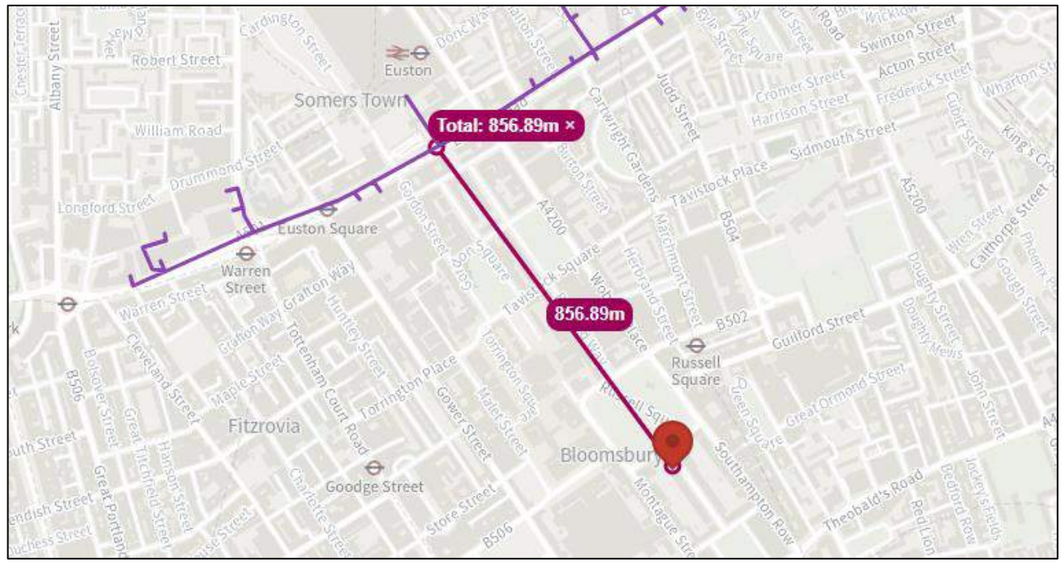


Figure 5: Extract from London Heat Map showing site location.

It is therefore proposed to install dedicated air source heat pumps to provide the space heating to the development.

A high level of insulation (in excess of British Standards) will be provided to all parts of the system, to minimise heat losses.

The carbon reductions generated by the heat pumps are included at the Be Green stage of the hierarchy.

Renewable Energy Systems (Be Green)

As stated above, heat pumps are proposed as the main heat source for the development and the carbon savings generated will be reported under the Be Green stage of the hierarchy.

An assessment of the feasibility of including any further on-site renewable energy has been carried out and the results are shown in Section 7.

The assessment shows that Photovoltaics are not appropriate, alterations to the roof space would also cause some harm to the listed building through intervention to fabric and alteration of appearance, as well as the character of the conservation area.

The heat pumps are expected to provide a 5% improvement over Part L 2021. High efficiency Variable Refrigerant Volume/Flow (VRV/VRF) equipment will operate as the main communal heating and cooling system for the building.

An assessment has been carried out to determine how unregulated energy and carbon dioxide emissions can be reduced using energy efficient appliances and equipment, controls, good management practice and maintenance schedules.

Overheating and Cooling

The proposed refurbishment will be assessed in accordance with the cooling hierarchy detailed in policy SI4 of the London Plan and the latest Energy Assessment Guidance, in order to reduce overheating and minimise the use of air conditioning.

The assessment of the risk of overheating has been made against the three criteria outlined in CIBSE TM52.

Environmental Standards

Camden Council require a BREEAM assessment to be carried out on the proposed redevelopment. The assessment should demonstrate a rating of Excellent, unless it is demonstrated that it is not technically feasible or viable to do so, in which case proposals should demonstrate a high ‘Excellent’ rating.

A BREEAM pre-assessment has been carried out is provided in appendix A.4, where a rating of 74.07% has been shown to be achievable.

2. Introduction

2.1 This Application

This Energy Strategy report has been prepared by Meinhardt on behalf of Firmdale Hotels (“the Client”) to accompany a Planning Application submitted to Camden Council (Local Planning Authority) for the repurposing of 21-23 Bedford Place (the “Site”).

2.2 This Energy Strategy Report

The purpose of this Energy Strategy is to demonstrate that the redesign of 21-23 Bedford Place has been developed and will continue to develop in accordance with the relevant local, regional, and national planning policies in terms of energy and sustainability and retained heritage.

2.3 Other Documents

This report should be read in conjunction with the other documents related to the application, including; -

- Design and Access Statement
- Heritage Statement
- Acoustic and Vibration Assessment

2.4 Project Team

Applicant:	Firmdale Hotels
Architect:	SPPARC
Energy and Sustainability:	Meinhardt (UK) Ltd
Acoustics:	Clarke Saunders
Building Services:	Meinhardt (UK) Ltd
Townscape & Heritage Impact:	The Heritage Practice

3. Scheme Overview

3.1 Site and Surroundings

21-23 Bedford Place was originally constructed in 1815, noted as a fine example of Georgian town planning updated in extensions 1921 while occupied by the Penn Club (Class C1) for the century up until 2021. The development consists of three Georgian town houses on the west side of Bedford Place, close to the northern junction of Russel Square within the Bloomsbury Conservation Area with access to multiple modes of public bus and London underground services. The rear of the development faces onto Montague Street Gardens with neighbouring properties featuring outdoor terraces providing a precedent for including amenity spaces for the Hotel.

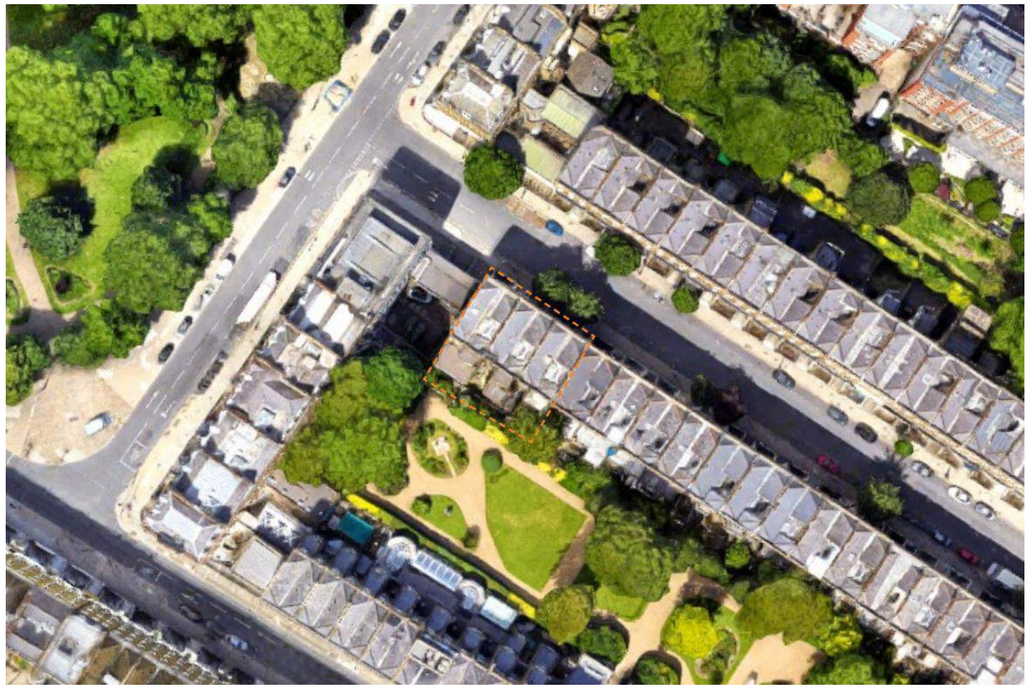


Figure 6: Site location plan

Figure 7: View of the existing Building

3.2 Proposed Redevelopment

The development is proposed to undergo refurbishment to reinstate much of the original Georgian plan form of the property while providing an efficient 42 key hotel layout. The renovations include the retention of the heritage building fabric proposed to have minimal intervention but with the removal of the non-original windows on both the front and rear facades to be replaced with six-over-six and three-over-three sash windows that will enhance the existing building by restoring the development to an accurate representation of the original 1815 form.

Extensive renovations are proposed for the interior of the building include restoring fireplaces, lath and plaster ceilings, cornicing, decorative plasterwork, and mouldings while accommodating the rear expansion of the property and space optimization through the demolition and removal of the internal partitions. Introducing dropped ceilings aimed to enhance the remaining historical features and enhancing the provision of building services throughout the development.

4. Planning Policy

4.1 National

4.1.1 National Planning Policy Framework (2023)

The National Planning Policy Framework (NPPF) set out the Government's planning policies for England and how these are expected to be applied. It provides a framework within which locally prepared plans for housing and other development can be produced. Identify suitable mitigation and adaptation measures in the planning process to address the impacts of climate change. National planning Practice Guidance provides comprehensive coverage of all required policies.

4.1.2 Building Regulations

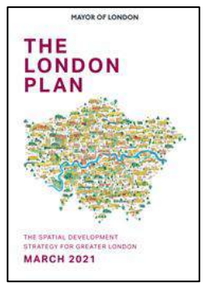
The Building Regulations set out the statutory standards that developments are to meet. Part L covers energy efficiency requirements.

An updated Building Regulations Part L was published in December 2021 that will deliver a 30% reduction in carbon emissions for domestic buildings and a 27% reduction for non-domestic, when introduced in June 2022.

Further consultation is expected on the new Future Homes Standard and Future Buildings Standard which are intended to be introduced in 2025.

4.2 Regional

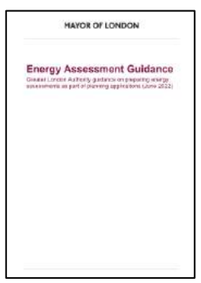
4.2.1 The London Plan (2021)



The London Plan 2021 is the Spatial Development Strategy for Greater London. It sets out a framework for how London will develop over the next 20-25 years and the Mayor's vision for Good Growth.

The Plan Is part of the statutory development plan for London, meaning that the policies in the Plan should inform decisions on planning applications across the capital. Borough's Local Plans must be in 'general conformity' with the London Plan, ensuring that the planning system for London operates in a joined-up way and reflects the overall strategy for how London can develop sustainably.

4.2.2 Energy Assessment Guidance (2022)



This guidance document explains how to prepare an energy assessment to accompany strategic planning applications referred to the Mayor.

The purpose of an energy assessment is to demonstrate that the proposed climate change mitigation measures comply with London Plan energy policies, including the energy hierarchy.

An updated version has recently been published (in June 2022) which explains how London Plan policies apply now that Part L 2021 has taken effect.

4.2.3 Carbon Offset Funds

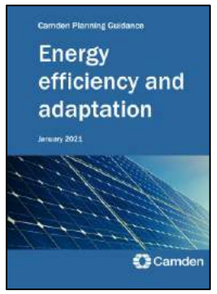
This guidance document provides further detail for London's LPAs on setting up carbon offset funds and identifying suitable projects to utilise that funding.

4.3 Local

4.3.1 The Camden Local Plan (2017)

The Local Plan was adopted by Council on 3 July 2017. It replaced the Core Strategy and Camden Development Policies as the basis for planning decisions and future development in Camden.

4.3.2 Heritage SPD (2021)



This guidance provides information on key energy and resource issues within the borough and supports Local Plan Policies CC1 Climate change mitigation and CC2 Adapting to climate change. Other relevant policies in the Local Plan include: C1 Health and wellbeing, A1 Open space, A2 Biodiversity, D1 Design, D2 Heritage, CC3 Water and flooding, CC4 Air quality, CC5 Waste.

5. Establishing Energy Demand and Emissions

5.1 Carbon Reduction Targets

5.1.1 Camden Local Plan (2017)

Camden Council's Local Plan requires that major non-residential development meets the carbon reduction requirements set out in the London Plan.

5.1.2 National Policy

In June 2019 the UK Government made a commitment to bring all greenhouse gas emissions to net zero by 2050. This has been followed by further commitments in December 2020, April 2021 and September 2023, to reducing economy-wide greenhouse gas emissions by at least 68% by 2030 and by 78% by 2035, compared to 1990 levels.

5.1.3 Building Regulations

An updated Building Regulations Part L Conservation of Fuel and Power and a new Part O Overheating were introduced in June 2022. The updated Part L is expected to deliver a 30% reduction in carbon emissions for domestic buildings and a 27% reduction for non-domestic.

Further consultation is expected on the new Future Homes Standard and Future Buildings Standard which are intended to be introduced in 2025.

5.1.4 London Plan (2021)

Major development should be net zero-carbon, with a minimum on-site reduction of at least 35 per cent beyond Building Regulations Part L 2021 requirements.

Non-residential development should achieve 15 per cent reduction through energy efficiency measures.

Where the zero-carbon target cannot be fully achieved on-site, any shortfall should be provided, 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.

Carbon emissions from any other part of the development i.e. unregulated emissions, should be calculated and minimised.

5.1.5 Energy Assessment Guidance (October 2022)

Updated planning guidance has recently been published by the GLA (in June 2022) which explains how London Plan policies apply now that Part L 2021 has taken effect.

5.1.6 Non-residential Modelling

The proposed development have been assessed using IES VE dynamic thermal modelling software and the latest Simplified Building Energy Modelling methodology to demonstrate compliance with Part L 2021.

The Part L 2021 TER baseline has been calculated using the notional specification for existing buildings in Appendix 3 of the GLA Energy Assessment Guidance. The expected carbon dioxide emissions at each stage of the hierarchy are shown in the graph below for the whole development; -

The BRUKL output sheets are provided in Appendix A.1 for the 'BE Lean Baseline' and 'Be Green Improved' stages of the hierarchy.

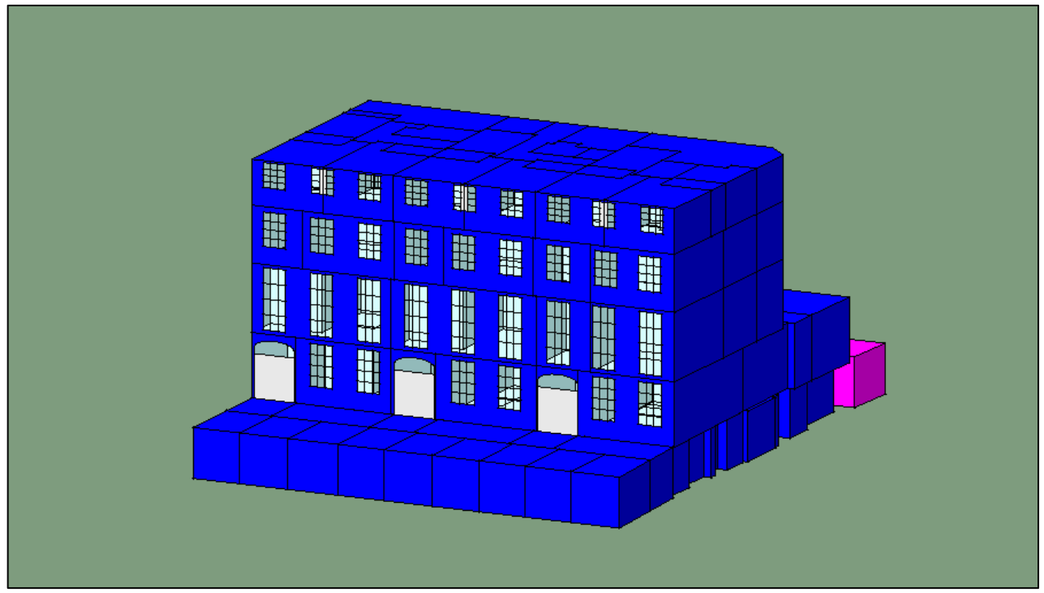


Figure 8: Image of IES thermal model

6. Demand Reduction (Be Lean)

The proposed redevelopment is a grade II listed building with a variety of heritage limitations on the existing building. This therefore has severely limited fabric improvements which can be made on the building. Limitations on the building fabric are summarised below, for further information please refer to associated Heritage Statement.

With the proposed redevelopment being on a grade II listed building, this places a number of heritage limitations on the building with regard to improving building fabric. These limitations are as follows:

- **External Walls:** Building is listed as Designated Heritage Asset and alterations to the walls would cause harm to the listed building through concealment of the historic fabric of the existing walls and subsequent alterations to the appreciation of the historic form of the space. Adding insulation would also have a risk of condensation. Therefore, the u-value of the external walls cannot be improved.
- **Floor:** Basement floor is concrete and the upper floors are timber. No insulation to either, these cannot be improved upon due to heritage limitations.
- **Roof:**. Roof is a timber framed pitched roof with slate tiles. There are only isolated pockets of insulation at joist level (mostly no insulation). Minor improvement may be achievable, approximately 100mm of rockwool insulation between joists could be installed.
- **Glazing:** Heritage restrictions require the proposed development to have single glazed timber sash windows. New acoustic glass is being fitted which will provide a minor improvement in terms of heat loss.

6.1 Building Fabric Insulation

The thermal performance of the building fabric of the existing building is not known, and therefore assumptions for the proposed development have been taken from the Appendix 3 of the GLA's energy assessment guidance 'Non-residential notional specification for existing buildings,' in line with GLA Energy assessment guidance.

Due to the heritage limitations no improvements over the GLA's notional values are achievable.

Retained Fabric Element	Notional Refurbishment Baseline GLA 'U-Value' (W/m² K)	New Fabric Element 'U-Value' (W/m² K)
External Walls	0.55	0.15
Floor	0.22	0.22
Roof (pitched)	0.16	0.16
Roof (flat)	0.18	0.18
Glazing	1.4	1.4

Table 3: Assumed u-values for the proposed development.

6.2 Cold Bridging

Cold bridging will be minimised to prevent the loss of heat and to prevent the development of cold spots which can lead to mould.

6.3 Air Tightness

The air permeability of the redevelopment has been set at 25 $m^3/(h\ m^2)$ at 50 Pa as per the GLA guidance on existing buildings built before 1995.

6.4 Solar Gain

The glazing has been optimised using the dynamic thermal modelling and SBEM calculations, which has resulted in the g-value of the non-residential glazing being assumed to be 0.4, in line with the notional specification for existing buildings.

6.5 Pipework Insulation

A high level of insulation (in excess of British Standards) will be provided to all parts of the pipework systems to reduce heat losses/gains.

6.6 Heating and Cooling

The renewable energy assessment shows that air source heat pumps (ASHP) are appropriate for the development. High efficiency Variable Refrigerant Volume/Flow (VRV/VRF) equipment will operate as the main communal heating (and cooling) system for the building.

The carbon emission savings generated using these systems are included in the 'Be Green' stage of the hierarchy.

For the non-residential element 'notional' efficiencies for the space heating as mentioned in section 5.2.1, are used in line with GLA energy assessment guidance, and cooling is provided by VRF/VRF systems (with an EER of 6.84). The carbon emission savings generated using the actual systems efficiency are included in the 'Be Green' stage of the hierarchy.

6.7 Domestic Hot Water

A dedicated natural gas hot water boiler specifically designed to operate at high temperatures, will provide domestic hot water to the development.

6.8 Ventilation Systems

Mechanical ventilation to the building will be provided with high efficiency systems and reduce fan energy where possible.

The units are expected to achieve a maximum Specific Fan Power of 1.9 W/(l/s) in accordance with GLA guidance via the approved document L2.

6.9 Lighting

Energy efficient LED lighting will be used throughout the proposed redevelopment. Occupancy and daylight sensors will be used where appropriate.

6.10 Smart Controls / Metering

A central Building Management System (BMS) will be provided to operate the 'Landlord' plant and systems in the most energy efficient manner The BMS will also monitor energy and water meters throughout the building.

The proposed VRF heating and cooling systems will be provided with an individual, programmable, zoned control system.

6.11 Appliances

Where appliances are provided by the developer, they will be of an energy efficient type, which generally generate less heat and can help minimise the build-up of heat within the buildings. Where appliances are not provided by the developer, tenants will be encouraged to supply energy efficient equipment.

7. Heating Infrastructure (Be Clean)

7.1 Area Wide Network

Investigations have confirmed that there are no existing district heat networks in the vicinity of the proposed development, as shown in the below extract from London Heat Map. Figure 9 highlights that the nearest proposed heat network is 857m away.

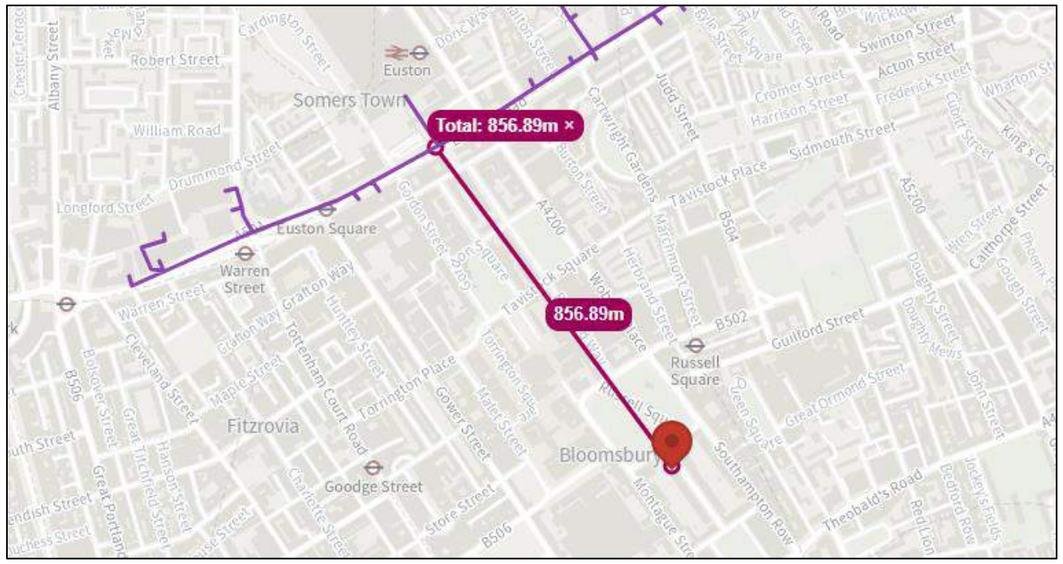


Figure 9: Extract from London Heat Map showing site location.

It is therefore proposed to install dedicated air source heat pumps to provide the space heating to the development.

A high level of insulation (in excess of British Standards) will be provided to all parts of the system, to minimise heat losses.

The carbon reductions generated by the heat pumps are included at the Be Green stage of the hierarchy.

8. Renewable Energy (Be Green)

An appraisal of potential on-site renewable energy systems has been undertaken for the development with the following technologies considered:

- Biomass boilers
- Photovoltaics (PVs)
- Solar thermal
- Ground source heat pumps
- Air source heat pumps
- Solar assisted heat pumps
- Wind Turbines

Each of these systems is presented in Appendix A.2, with the summary of the assessment below.

8.1 Biomass Boilers

Biomass boilers could provide a proportion of the space heating and hot water load but would compete with the proposed heat pumps for the base heat load.

Biomass boilers are better operating as the lead heat source with top-up from other technologies as they are not suited to operating with variable load.

Biomass boilers would also adversely impact on local air quality due to their emissions, and vehicular delivery of fuel would be required resulting in increased traffic movements.

Biomass boilers are therefore not proposed for the redevelopment.

8.2 Photovoltaics (PVs)

Alterations to the roof space would also cause some harm to the listed building through intervention to fabric and alteration of appearance, as well as the character of the conservation area at the front.

Photovoltaics are therefore not proposed for the redevelopment.

8.3 Solar Thermal

Air source heat pumps are the most appropriate renewable technology for the development, and as the existing building is in a Conservation area it is not proposed to install solar thermal panels on the roof.

Solar thermal is therefore not proposed for the redevelopment.

8.4 Ground Source Heat Pumps

The site area is very small and thereby prevents suitable separation of boreholes to allow the use of open loop connected ground source heat pumps. The small site area also restricts the available capacity of a closed loop connected system.

There is also a poor balance between heating and cooling demand over the year, which would adversely impact on the potential yield from any ground source system.

Ground source heat pumps are therefore not proposed for the redevelopment.

8.5 Air Source Heat Pumps

The assessment shows that air source heat pumps (ASHP) are appropriate for the development.

High efficiency Variable Refrigerant Volume/Flow (VRV/VRF) equipment will operate as the main communal heating (and cooling).

The VRF equipment will be specified to exceed the minimum performance standards as set out in the Enhanced Capital Allowances (ECA) product criteria for “Air Heat Pumps, Split, Multi-split and VRF”.

Based on manufacturer supplied data, the VRV/VRF system will be based on a Seasonal Coefficient of Performance (SCOP) of 3.98 in heating mode and Energy Efficiency ratio (EER) of 6.84 in cooling mode.

The DHW system will be provided by a dedicated air source heat pump.

Air source heat pumps are therefore proposed for the redevelopment.

9. Overheating and Cooling

The proposed redevelopment has been assessed in accordance with the cooling hierarchy detailed in policy S14 of the London Plan, in order to reduce overheating and minimise the use of air conditioning.

The assessment includes dynamic thermal modelling using IES modelling software, to assess the risk of overheating.

9.1 Overheating Risk Assessment Methodology

The non-domestic overheating risk assessment has been made against the three criteria outlined in CIBSE TM52. A room or building that fails any two of the three criteria is classed as overheating.

- The first criterion sets a limit for the number of hours that the operative temperature can exceed the threshold comfort temperature (upper limit of the range of comfort temperature) by 1 K or more during the occupied hours of a typical non-heating season (1 May to 30 September).
- The second criterion deals with the severity of overheating within any one day, which can be as important as its frequency, the level of which is a function of both temperature rise and its duration. This criterion sets a daily limit for acceptability.
- The third criterion sets an absolute maximum daily temperature for a room, beyond which the level of overheating is unacceptable.

9.2 Weather Data

The weather file used for the assessment is as per TM52: DSY1 (Design Summer Year) for the site location, for the 2020s, high emissions, 50% percentile scenario.

The London Weather Centre weather data set has been used which is the most representative for the site location.

9.3 Summary of Overheating Modelling Results

The results of the dynamic modelling overheating assessment are provided in Appendix A.3, and summarised below;-

The CIBSE TM52 compliance criteria can not be met using natural or mechanical ventilation, and therefore active cooling is proposed due the retained fabric elements due to the heritage of the building.

9.4 Cooling Hierarchy

The assessment of the proposed redevelopment against the cooling hierarchy is as detailed below;-

9.4.1 Minimise internal heat generation through energy efficient design

Internal heat generation will be minimised by a combination of measures including the following;-

- Minimising cold bridging
- Minimising heat loss from heating and hot water systems
- Low energy lighting
- Energy efficient desktop PCs, laptops, screens
- Energy efficient appliances

9.4.2 Reduce the amount of heat entering a building in summer through orientation, shading, albedo, fenestration, insulation and green roofs and walls

The heat entering the building will be reduced by a combination of measures including the following;-

- Improved fabric ‘U’ values wherever possible
- Optimisation of glazing g-value
- Optimisation of glazing area
- Internal blinds

9.4.3 Manage the heat within the building through exposed thermal mass and high ceilings

Floor to floor heights have been maximised in the proposed redevelopment.

As demonstrated by the dynamic modelling assessment, overheating cannot be prevented through the use of natural ventilation.

9.4.4 Mechanical ventilation

Mechanical ventilation with high efficiency will provide fresh air and extract moisture/pollutants in accordance with Building Regulations Part F 2021.

9.4.5 Active Cooling Systems

It is proposed that VRF systems will be provided for cooling. These systems use highly efficient air source heat pumps and are expected to achieve a seasonal cooling efficiency of at least 5.36.

10. BREEAM Certification

10.1.1 BREEAM Pre Assessment

Camden Council require a BREEAM assessment to be carried out on the proposed redevelopment. The assessment should demonstrate a rating of Excellent, unless it is demonstrated that it is not technically feasible or viable to do so, in which case proposals should demonstrate a high ‘Excellent rating.

A BREEAM pre-assessment has been carried out is provided in Appendix A.4, where an ‘Excellent’ rating of 74.07% has been shown to be achievable.

Appendix A.1 - BRUKL Reports

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

Bedford Place Baseline

As designed

Date: Fri Apr 05 17:23:52 2024

Administrative information

Building Details

Address: 21-23 Bedford Place, London, WC1B 5JJ

Certifier details

Name: Meinhardt UK LTD

Telephone number: 020 7831 7969

Address: 10 Aldersgate Street, London, EC1A 4HJ

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.23

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.23

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

Foundation area [m²]: 280.25

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

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

Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	54.28	
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	56.83	
Target primary energy rate (TPER), $kWh_{PE}/m^2.annum$	311.56	
Building primary energy rate (BPER), $kWh_{PE}/m^2.annum$	320.96	
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	0.51	0.55	BS000001:Surf[13]
Floors	0.18	0.22	0.22	BS000001:Surf[0]
Pitched roofs	0.16	-	-	No pitched roofs in building
Flat roofs	0.18	0.18	0.18	BS000002:Surf[1]
Windows** and roof windows	1.6	1.4	1.4	BS000001:Surf[1]
Rooflights***	2.2	-	-	No roof lights in building
Personnel doors^	1.6	2.2	2.2	GF000010:Surf[1]
Vehicle access & similar large doors	1.3	-	-	No vehicle access doors in building
High usage entrance doors	3	-	-	No high usage entrance doors in building

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

$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m²K)]

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

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

^ For fire doors, limiting U-value is 1.8 W/m²K

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

Air permeability	Limiting standard	This building
m³/(h.m²) at 50 Pa	8	25

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- Baseline - VRF

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.5	5	0	2	-
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- Baseline - Gas Boiler HW Only

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	0.91	-
Standard value	0.91	N/A

"No zones in project where local mechanical ventilation, exhaust, or terminal unit is applicable"

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
Rm 01 Bedroom	120	-	-
Rm 02 Bathroom	120	-	-
Rm 02 Bedroom	120	-	-
Basement- Kitchen	120	-	-
Basement Cupboard	120	-	-
Rm 04 Bathroom	120	-	-
Rm 03 Bedroom	120	-	-
Rm 03 Bathroom	120	-	-
Basement- Cold Room	120	-	-
Basement- WC	120	-	-
Basement- WC	120	-	-
Basement- Female WC	120	-	-
Basement- Male WC	120	-	-
Basement- Male WC	120	-	-
Basement- Staff Room	120	-	-
Basement- Staff WC	120	-	-
Basement- H/Keeper	120	-	-
Basement- Comms	120	-	-
Rm 01 Bathroom	120	-	-
Basement- Store	120	-	-
Basement- Hot Water Tank Room	120	-	-
Basement- Hot Water Tank Room	120	-	-
Basement- Blocked Vault	120	-	-

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- Booster	120	-	-
Basement- Cold Water Pump Room	120	-	-
Basement- Cold Water Pump Room	120	-	-
Basement- Refuse Store	120	-	-
Basement- Refuse Store	120	-	-
Rm 06 Bathroom	120	-	-
Rm 05 Bedroom	120	-	-
Rm 06 Bedroom	120	-	-
Rm 07 Bathroom	120	-	-
Rm 07 Bedroom	120	-	-
Rm 08 Bedroom	120	-	-
GF- Loung/ Dining	120	-	-
Rm 11 Bathroom	120	-	-
GF- Bar	120	-	-
GF- Reading Room	120	-	-
GF- Main Entrance	120	-	-
RM 12 Bedroom	120	-	-
Rm 13 Bedroom	120	-	-
Rm 13 Bathroom	120	-	-
Rm 19 Bathroom	120	-	-
Rm 19 Bedroom	120	-	-
Rm 20 Bathroom	120	-	-
Rm 20 Bedroom	120	-	-
Rm 15 Bedroom	120	-	-
Rm 15 Bathroom	120	-	-
Rm 14 Bathroom	120	-	-
Rm 14 Bedroom	120	-	-
Rm 16 Bedroom	120	-	-
Rm 18 Bathroom	120	-	-
Rm 17 Bedroom	120	-	-
Rm 17 Bathroom	120	-	-
Rm 25 Bedroom	120	-	-
Rm 25 Bathroom	120	-	-
Rm 26 Bathroom	120	-	-
Rm 26 Bedroom	120	-	-
Rm 27 Bedroom	120	-	-
Rm 27 Bathroom	120	-	-
Rm 29 Bathroom	120	-	-
Rm 29 Bedroom	120	-	-
Rm 31 Bathroom	120	-	-
Rm 31 Bedroom	120	-	-
Rm 28 Bathroom	120	-	-
Rm 30 Bathroom	120	-	-

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
Rm 30 Bedroom	120	-	-
Rm 35 Bedroom	120	-	-
Rm 35 Bedroom	120	-	-
Rm 34 Bathroom	120	-	-
Rm 34 Bedroom	120	-	-
Rm 36 Bathroom	120	-	-
Rm 37 Bathroom	120	-	-
Rm 37 Bedroom	120	-	-
Rm 36 Bedroom	120	-	-
Rm 10 Bedroom	120	-	-
Rm 11 Bedroom	120	-	-
Rm 04 Bedroom	120	-	-
Rm 24 Bedroom	120	-	-
Rm 24 Bathroom	120	-	-
Rm 10 Bathroom	120	-	-
Rm 18 Bedroom	120	-	-
RM 12 Bedroom	120	-	-
Rm 08 Bathroom	120	-	-
Rm 09 Bedroom	120	-	-
Rm 09 Bathroom	120	-	-
Rm 21 Bathroom	120	-	-
Rm 21 Bedroom	120	-	-
Rm 33 Bathroom	120	-	-
Rm 33 Bedroom	120	-	-
Rm 32 Bathroom	120	-	-
Rm 32 Bedroom	120	-	-
Rm 28 Bedroom	120	-	-
Rm 42 Bedroom	120	-	-
Rm 42 Bedroom	120	-	-
Rm 41 Bathroom	120	-	-
Rm 41 Bedroom	120	-	-
Rm 40 Bathroom	120	-	-
Rm 40 Bedroom	120	-	-
Rm 39 Bathroom	120	-	-
Rm 39 Bedroom	120	-	-
Rm 38 Bathroom	120	-	-
Rm 38 Bedroom	120	-	-
GF- Reception Circulation	120	-	-
Rm 23 Bathroom	120	-	-
Rm 22 Bedroom	120	-	-
Rm 22 Bathroom	120	-	-
Rm 23 Bedroom	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?
Rm 01 Bedroom	NO (-15%)	NO
Rm 02 Bathroom	YES (+17.6%)	NO
Rm 02 Bedroom	NO (-64.3%)	NO
Basement- Kitchen	N/A	N/A
Basement Cupboard	N/A	N/A
Rm 04 Bathroom	N/A	N/A
Rm 03 Bedroom	NO (-64.4%)	NO
Rm 03 Bathroom	YES (+7.8%)	NO
Basement- Cold Room	N/A	N/A
Basement- WC	N/A	N/A
Basement- WC	N/A	N/A
Basement- Female WC	N/A	N/A
Basement- Male WC	N/A	N/A
Basement- Male WC	N/A	N/A
Basement- Staff Room	N/A	N/A
Basement- Staff WC	N/A	N/A
Basement- H/Keeper	N/A	N/A
Basement- Comms	N/A	N/A
Rm 01 Bathroom	N/A	N/A
Basement- Store	N/A	N/A
Basement- Hot Water Tank Room	N/A	N/A
Basement- Hot Water Tank Room	N/A	N/A
Basement- Blocked Vault	N/A	N/A
Basement- Booster	N/A	N/A
Basement- Cold Water Pump Room	N/A	N/A
Basement- Cold Water Pump Room	N/A	N/A
Basement- Refuse Store	N/A	N/A
Basement- Refuse Store	N/A	N/A
Rm 06 Bathroom	N/A	N/A
Rm 05 Bedroom	N/A	N/A
Rm 06 Bedroom	N/A	N/A
Rm 07 Bathroom	N/A	N/A
Rm 07 Bedroom	N/A	N/A
Rm 08 Bedroom	NO (-70.9%)	NO
GF- Loung/ Dining	NO (-51.5%)	NO
Rm 11 Bathroom	N/A	N/A
GF- Bar	N/A	N/A
GF- Reading Room	NO (-35.3%)	NO
GF- Main Entrance	NO (-61.9%)	NO
RM 12 Bedroom	N/A	N/A
Rm 13 Bedroom	NO (-32.3%)	NO
Rm 13 Bathroom	N/A	N/A
Rm 19 Bathroom	N/A	N/A
Rm 19 Bedroom	NO (-57.7%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Rm 20 Bathroom	N/A	N/A
Rm 20 Bedroom	NO (-48.9%)	NO
Rm 15 Bedroom	NO (-31%)	NO
Rm 15 Bathroom	N/A	N/A
Rm 14 Bathroom	N/A	N/A
Rm 14 Bedroom	NO (-73.4%)	NO
Rm 16 Bedroom	NO (-73.5%)	NO
Rm 18 Bathroom	N/A	N/A
Rm 17 Bedroom	NO (-66.6%)	NO
Rm 17 Bathroom	N/A	N/A
Rm 25 Bedroom	NO (-28.8%)	NO
Rm 25 Bathroom	N/A	N/A
Rm 26 Bathroom	N/A	N/A
Rm 26 Bedroom	NO (-75.1%)	NO
Rm 27 Bedroom	NO (-30.2%)	NO
Rm 27 Bathroom	N/A	N/A
Rm 29 Bathroom	N/A	N/A
Rm 29 Bedroom	NO (-67%)	NO
Rm 31 Bathroom	N/A	N/A
Rm 31 Bedroom	NO (-54.3%)	NO
Rm 28 Bathroom	N/A	N/A
Rm 30 Bathroom	N/A	N/A
Rm 30 Bedroom	NO (-71.8%)	NO
Rm 35 Bedroom	NO (-56.5%)	NO
Rm 35 Bedroom	N/A	N/A
Rm 34 Bathroom	N/A	N/A
Rm 34 Bedroom	NO (-63.2%)	NO
Rm 36 Bathroom	N/A	N/A
Rm 37 Bathroom	N/A	N/A
Rm 37 Bedroom	NO (-82.9%)	NO
Rm 36 Bedroom	NO (-75.8%)	NO
Rm 10 Bedroom	NO (-60.2%)	NO
Rm 11 Bedroom	NO (-64.1%)	NO
Rm 04 Bedroom	NO (-70.6%)	NO
Rm 24 Bedroom	NO (-76.7%)	NO
Rm 24 Bathroom	N/A	N/A
Rm 10 Bathroom	N/A	N/A
Rm 18 Bedroom	NO (-72.1%)	NO
RM 12 Bedroom	NO (-40%)	NO
Rm 08 Bathroom	N/A	N/A
Rm 09 Bedroom	NO (-78.3%)	NO
Rm 09 Bathroom	N/A	N/A
Rm 21 Bathroom	N/A	N/A
Rm 21 Bedroom	NO (-14.4%)	NO
Rm 33 Bathroom	NO (-48.3%)	NO
Rm 33 Bedroom	NO (-43.9%)	NO
Rm 32 Bathroom	NO (-46.4%)	NO
Rm 32 Bedroom	NO (-42.5%)	NO
Rm 28 Bedroom	NO (-76.6%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Rm 42 Bedroom	N/A	N/A
Rm 42 Bedroom	NO (-65%)	NO
Rm 41 Bathroom	N/A	N/A
Rm 41 Bedroom	NO (-64.5%)	NO
Rm 40 Bathroom	N/A	N/A
Rm 40 Bedroom	NO (-65.4%)	NO
Rm 39 Bathroom	N/A	N/A
Rm 39 Bedroom	NO (-65.1%)	NO
Rm 38 Bathroom	N/A	N/A
Rm 38 Bedroom	NO (-63.8%)	NO
GF- Reception Circulation	NO (-42.4%)	NO
Rm 23 Bathroom	N/A	N/A
Rm 22 Bedroom	NO (-1.2%)	NO
Rm 22 Bathroom	N/A	N/A
Rm 23 Bedroom	NO (-1.9%)	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 [m²]	1401.3	1401.3
External area [m²]	1866.3	2430.1
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	25	3
Average conductance [W/K]	875.77	891.91
Average U-value [W/m²K]	0.47	0.37
Alpha value* [%]	10.13	10

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

Building Use

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

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	31.15	22.86
Cooling	1.83	2.56
Auxiliary	13.78	16.91
Lighting	5.43	7.46
Hot water	225.76	218.58
Equipment*	36.71	36.71
TOTAL**	**277.94**	**268.36**

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

Energy Production by Technology [kWh/m²]

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

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	314.86	151.78
Primary energy [kWh_{PE}/m^2]	320.96	311.56
Total emissions [kg/m²]	56.83	54.28

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

Bedford Place Improved

As designed

Date: Fri Apr 05 18:19:39 2024

Administrative information

Building Details

Address: 21-23 Bedford Place, London, WC1B 5JJ

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.23

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.23

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

Certifier details

Name: Meinhardt UK LTD

Telephone number: 020 7831 7969

Address: 10 Aldersgate Street, London, EC1A 4HJ

Foundation area [m²]: 280.25

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

Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	54.28	
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	51.33	
Target primary energy rate (TPER), $kWh_{PE}/m^2.annum$	311.56	
Building primary energy rate (BPER), $kWh_{PE}/m^2.annum$	290.53	
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	0.51	0.55	BS000001:Surf[13]
Floors	0.18	0.22	0.22	BS000001:Surf[0]
Pitched roofs	0.16	-	-	No pitched roofs in building
Flat roofs	0.18	0.18	0.18	BS000002:Surf[1]
Windows** and roof windows	1.6	1.4	1.4	BS000001:Surf[1]
Rooflights***	2.2	-	-	No roof lights in building
Personnel doors^	1.6	2.2	2.2	GF000010:Surf[1]
Vehicle access & similar large doors	1.3	-	-	No vehicle access doors in building
High usage entrance doors	3	-	-	No high usage entrance doors in building

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

$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m²K)]

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

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

^ For fire doors, limiting U-value is 1.8 W/m²K

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

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

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- Improved - VRF

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.98	6.84	0	1.9	-
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- Improved - Gas Boiler HW Only

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	0.97	-
Standard value	0.91	N/A

"No zones in project where local mechanical ventilation, exhaust, or terminal unit is applicable"

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
Rm 01 Bedroom	120	-	-
Rm 02 Bathroom	120	-	-
Rm 02 Bedroom	120	-	-
Basement- Kitchen	120	-	-
Basement Cupboard	120	-	-
Rm 04 Bathroom	120	-	-
Rm 03 Bedroom	120	-	-
Rm 03 Bathroom	120	-	-
Basement- Cold Room	120	-	-
Basement- WC	120	-	-
Basement- WC	120	-	-
Basement- Female WC	120	-	-
Basement- Male WC	120	-	-
Basement- Male WC	120	-	-
Basement- Staff Room	120	-	-
Basement- Staff WC	120	-	-
Basement- H/Keeper	120	-	-
Basement- Comms	120	-	-
Rm 01 Bathroom	120	-	-
Basement- Store	120	-	-
Basement- Hot Water Tank Room	120	-	-
Basement- Hot Water Tank Room	120	-	-
Basement- Blocked Vault	120	-	-

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- Booster	120	-	-
Basement- Cold Water Pump Room	120	-	-
Basement- Cold Water Pump Room	120	-	-
Basement- Refuse Store	120	-	-
Basement- Refuse Store	120	-	-
Rm 06 Bathroom	120	-	-
Rm 05 Bedroom	120	-	-
Rm 06 Bedroom	120	-	-
Rm 07 Bathroom	120	-	-
Rm 07 Bedroom	120	-	-
Rm 08 Bedroom	120	-	-
GF- Loung/ Dining	120	-	-
Rm 11 Bathroom	120	-	-
GF- Bar	120	-	-
GF- Reading Room	120	-	-
GF- Main Entrance	120	-	-
RM 12 Bedroom	120	-	-
Rm 13 Bedroom	120	-	-
Rm 13 Bathroom	120	-	-
Rm 19 Bathroom	120	-	-
Rm 19 Bedroom	120	-	-
Rm 20 Bathroom	120	-	-
Rm 20 Bedroom	120	-	-
Rm 15 Bedroom	120	-	-
Rm 15 Bathroom	120	-	-
Rm 14 Bathroom	120	-	-
Rm 14 Bedroom	120	-	-
Rm 16 Bedroom	120	-	-
Rm 18 Bathroom	120	-	-
Rm 17 Bedroom	120	-	-
Rm 17 Bathroom	120	-	-
Rm 25 Bedroom	120	-	-
Rm 25 Bathroom	120	-	-
Rm 26 Bathroom	120	-	-
Rm 26 Bedroom	120	-	-
Rm 27 Bedroom	120	-	-
Rm 27 Bathroom	120	-	-
Rm 29 Bathroom	120	-	-
Rm 29 Bedroom	120	-	-
Rm 31 Bathroom	120	-	-
Rm 31 Bedroom	120	-	-
Rm 28 Bathroom	120	-	-
Rm 30 Bathroom	120	-	-

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
Rm 30 Bedroom	120	-	-
Rm 35 Bedroom	120	-	-
Rm 35 Bedroom	120	-	-
Rm 34 Bathroom	120	-	-
Rm 34 Bedroom	120	-	-
Rm 36 Bathroom	120	-	-
Rm 37 Bathroom	120	-	-
Rm 37 Bedroom	120	-	-
Rm 36 Bedroom	120	-	-
Rm 10 Bedroom	120	-	-
Rm 11 Bedroom	120	-	-
Rm 04 Bedroom	120	-	-
Rm 24 Bedroom	120	-	-
Rm 24 Bathroom	120	-	-
Rm 10 Bathroom	120	-	-
Rm 18 Bedroom	120	-	-
RM 12 Bedroom	120	-	-
Rm 08 Bathroom	120	-	-
Rm 09 Bedroom	120	-	-
Rm 09 Bathroom	120	-	-
Rm 21 Bathroom	120	-	-
Rm 21 Bedroom	120	-	-
Rm 33 Bathroom	120	-	-
Rm 33 Bedroom	120	-	-
Rm 32 Bathroom	120	-	-
Rm 32 Bedroom	120	-	-
Rm 28 Bedroom	120	-	-
Rm 42 Bedroom	120	-	-
Rm 42 Bedroom	120	-	-
Rm 41 Bathroom	120	-	-
Rm 41 Bedroom	120	-	-
Rm 40 Bathroom	120	-	-
Rm 40 Bedroom	120	-	-
Rm 39 Bathroom	120	-	-
Rm 39 Bedroom	120	-	-
Rm 38 Bathroom	120	-	-
Rm 38 Bedroom	120	-	-
GF- Reception Circulation	120	-	-
Rm 23 Bathroom	120	-	-
Rm 22 Bedroom	120	-	-
Rm 22 Bathroom	120	-	-
Rm 23 Bedroom	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?
Rm 01 Bedroom	NO (-15%)	NO
Rm 02 Bathroom	YES (+17.6%)	NO
Rm 02 Bedroom	NO (-64.3%)	NO
Basement- Kitchen	N/A	N/A
Basement Cupboard	N/A	N/A
Rm 04 Bathroom	N/A	N/A
Rm 03 Bedroom	NO (-64.4%)	NO
Rm 03 Bathroom	YES (+7.8%)	NO
Basement- Cold Room	N/A	N/A
Basement- WC	N/A	N/A
Basement- WC	N/A	N/A
Basement- Female WC	N/A	N/A
Basement- Male WC	N/A	N/A
Basement- Male WC	N/A	N/A
Basement- Staff Room	N/A	N/A
Basement- Staff WC	N/A	N/A
Basement- H/Keeper	N/A	N/A
Basement- Comms	N/A	N/A
Rm 01 Bathroom	N/A	N/A
Basement- Store	N/A	N/A
Basement- Hot Water Tank Room	N/A	N/A
Basement- Hot Water Tank Room	N/A	N/A
Basement- Blocked Vault	N/A	N/A
Basement- Booster	N/A	N/A
Basement- Cold Water Pump Room	N/A	N/A
Basement- Cold Water Pump Room	N/A	N/A
Basement- Refuse Store	N/A	N/A
Basement- Refuse Store	N/A	N/A
Rm 06 Bathroom	N/A	N/A
Rm 05 Bedroom	N/A	N/A
Rm 06 Bedroom	N/A	N/A
Rm 07 Bathroom	N/A	N/A
Rm 07 Bedroom	N/A	N/A
Rm 08 Bedroom	NO (-70.9%)	NO
GF- Loung/ Dining	NO (-51.5%)	NO
Rm 11 Bathroom	N/A	N/A
GF- Bar	N/A	N/A
GF- Reading Room	NO (-35.3%)	NO
GF- Main Entrance	NO (-61.9%)	NO
RM 12 Bedroom	N/A	N/A
Rm 13 Bedroom	NO (-32.3%)	NO
Rm 13 Bathroom	N/A	N/A
Rm 19 Bathroom	N/A	N/A
Rm 19 Bedroom	NO (-57.7%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Rm 20 Bathroom	N/A	N/A
Rm 20 Bedroom	NO (-48.9%)	NO
Rm 15 Bedroom	NO (-31%)	NO
Rm 15 Bathroom	N/A	N/A
Rm 14 Bathroom	N/A	N/A
Rm 14 Bedroom	NO (-73.4%)	NO
Rm 16 Bedroom	NO (-73.5%)	NO
Rm 18 Bathroom	N/A	N/A
Rm 17 Bedroom	NO (-66.6%)	NO
Rm 17 Bathroom	N/A	N/A
Rm 25 Bedroom	NO (-28.8%)	NO
Rm 25 Bathroom	N/A	N/A
Rm 26 Bathroom	N/A	N/A
Rm 26 Bedroom	NO (-75.1%)	NO
Rm 27 Bedroom	NO (-30.2%)	NO
Rm 27 Bathroom	N/A	N/A
Rm 29 Bathroom	N/A	N/A
Rm 29 Bedroom	NO (-67%)	NO
Rm 31 Bathroom	N/A	N/A
Rm 31 Bedroom	NO (-54.3%)	NO
Rm 28 Bathroom	N/A	N/A
Rm 30 Bathroom	N/A	N/A
Rm 30 Bedroom	NO (-71.8%)	NO
Rm 35 Bedroom	NO (-56.5%)	NO
Rm 35 Bedroom	N/A	N/A
Rm 34 Bathroom	N/A	N/A
Rm 34 Bedroom	NO (-63.2%)	NO
Rm 36 Bathroom	N/A	N/A
Rm 37 Bathroom	N/A	N/A
Rm 37 Bedroom	NO (-82.9%)	NO
Rm 36 Bedroom	NO (-75.8%)	NO
Rm 10 Bedroom	NO (-60.2%)	NO
Rm 11 Bedroom	NO (-64.1%)	NO
Rm 04 Bedroom	NO (-70.6%)	NO
Rm 24 Bedroom	NO (-76.7%)	NO
Rm 24 Bathroom	N/A	N/A
Rm 10 Bathroom	N/A	N/A
Rm 18 Bedroom	NO (-72.1%)	NO
RM 12 Bedroom	NO (-40%)	NO
Rm 08 Bathroom	N/A	N/A
Rm 09 Bedroom	NO (-78.3%)	NO
Rm 09 Bathroom	N/A	N/A
Rm 21 Bathroom	N/A	N/A
Rm 21 Bedroom	NO (-14.4%)	NO
Rm 33 Bathroom	NO (-48.3%)	NO
Rm 33 Bedroom	NO (-43.9%)	NO
Rm 32 Bathroom	NO (-46.4%)	NO
Rm 32 Bedroom	NO (-42.5%)	NO
Rm 28 Bedroom	NO (-76.6%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Rm 42 Bedroom	N/A	N/A
Rm 42 Bedroom	NO (-65%)	NO
Rm 41 Bathroom	N/A	N/A
Rm 41 Bedroom	NO (-64.5%)	NO
Rm 40 Bathroom	N/A	N/A
Rm 40 Bedroom	NO (-65.4%)	NO
Rm 39 Bathroom	N/A	N/A
Rm 39 Bedroom	NO (-65.1%)	NO
Rm 38 Bathroom	N/A	N/A
Rm 38 Bedroom	NO (-63.8%)	NO
GF- Reception Circulation	NO (-42.4%)	NO
Rm 23 Bathroom	N/A	N/A
Rm 22 Bedroom	NO (-1.2%)	NO
Rm 22 Bathroom	N/A	N/A
Rm 23 Bedroom	NO (-1.9%)	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 [m²]	1401.3	1401.3
External area [m²]	1866.3	2430.1
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	25	3
Average conductance [W/K]	875.77	891.91
Average U-value [W/m²K]	0.47	0.37
Alpha value* [%]	10.13	10

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

Building Use

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

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	19.65	22.86
Cooling	1.33	2.56
Auxiliary	13.09	16.91
Lighting	5.43	7.46
Hot water	211.8	218.58
Equipment*	36.71	36.71
TOTAL**	**251.29**	**268.36**

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

Energy Production by Technology [kWh/m²]

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

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	314.86	151.78
Primary energy [kWh_{PE}/m²]	290.53	311.56
Total emissions [kg/m²]	51.33	54.28

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] Variable refrigerant flow, [HS] ASHP, [HFT] Natural Gas, [CFT] Electricity										
	Actual	292.5	22.4	19.6	1.3	13.1	4.13	4.68	3.98	6.84
	Notional	109.1	42.6	22.9	2.6	16.1	1.33	4.63	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----

Key to terms

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

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] Variable refrigerant flow, [HS] ASHP, [HFT] Natural Gas, [CFT] Electricity										
	Actual	292.5	22.4	31.2	1.8	13.8	2.61	3.41	2.5	5
	Notional	109.1	42.6	22.9	2.6	16.1	1.33	4.63	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----

Key to terms

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

Appendix A.2 – Renewables Assessment

A.2.1 Biomass Boilers

Description

As with all biomass heat provision, wood chips or wood pellets are responsible for CO_2 emissions at the point of combustion. When burnt, levels of emissions are almost double that of natural gas. However, as wood has captured CO_2 during its growth process, the overall CO_2 balance of wood chips or wood pellets is equivalent to that of a very low carbon fuel.

Types

Wood chips are a medium-sized solid material made by cutting, or chipping, larger pieces of wood. Pellets are ma de from clean wood waste or clean forest-sources such as saw mills, joinery factories and well-managed woodland thinning. They are designed specifically to compete with fossil fuels on convenience and performance.

Pellets offer a number of advantages for small scale installations, including:

- Quality: they are drier and homogeneous in size and shape;
- Storage: they are denser and require less storage;
- Operation and Maintenance: they are easier to ignite, more compatible with automated feed mechanisms and lower in ash content.

Key Features

Unlike natural gas, wood fuel is delivered and has to be stored. Recent advances in boiler designs and controls mean that most modern boilers are highly automated. The key human interventions can be limited to loading the store periodically, de-ashing every six months and cleaning the flue.

Storage needs to be considered and provided carefully as it is a critical component of automated biomass boiler systems, which tend to be based on either vacuum suction- or screw-auger-based systems. Wood pellets can be delivered in reduced quantities (e.g.10 kg bags) but are generally supplied in much larger volumes (e.g. 1 ton). Low intervention systems require large fuel stores.

It is recommended to select high quality equipment present on the exempted heating appliance list (mandatory in some ‘smoke control’ zones) and potentially to fit a catalytic converter to reduce local emissions and improve efficiency.

Efficiency

The efficiency of the boiler is an important consideration but the carbon content of the fuel is equally important.

Although wood pellets can generally be distributed economically within a radius of 80 to 250 miles, it is important to ensure that an efficient supply is accessible and that the carbon content of the fuel is verified beforehand.

Cost Benchmarks

Prices of an automatically fed pellet boiler vary depending on the size. The price of a 200 kW boiler (including feeding mechanism) is estimated to be approximately £120,000.

Financial Incentives

Biomass systems are eligible for the Renewable Heat Incentive (RHIs), with a tariff of between 0.76 p/kWh and 5.24 p/kWh from 1 July 2018 for commercial systems, and 6.74 p/kWh for domestic.

Maintenance

Medium / High

The boiler fuel feed mechanism will require attention

Typical Lifetime

15-20 years

Embodied Carbon

Low to medium

Key Advantages

Very low carbon fuel

A.2.2 Photovoltaics

Description

Photovoltaic cells, also known as solar PVs, generate electricity from sunlight. An inverter turns the Direct Current (DC) generated into Alternative Current (AC) which can be used in the building, with any surplus sent to the grid.

PV modules are made of a number of photovoltaic cells, a semiconductor device usually made of silicon wafers.

They can generate some electricity even when they are not in direct sunlight as the light is diffused by the cloud cover.

PV modules are wired together to create arrays of several kWp.

Types

Monocrystalline - Slices of a single grown crystal of pure silicon

Polycrystalline - Slices of multiple crystals of pure silicon

Thin film - Amorphous silicon, CdTe or CIS/CIGS

Hybrid - Crystalline and amorphous silicon

Key Features

PVs are generally mounted on the roof in an unshaded location, oriented towards the best possible view of the sun's path.

They can be fixed with bolts or clips on prefabricated rails or mounting brackets (both of which are fixed through the roof and roofing material) or on angled metal frames weighed down with concrete ballasts.

Efficiency

The amount of electricity generated by a PV module depends typically on the type of PV cells, on the orientation/incline of the module, on the location and on the inverter's efficiency. Therefore, PV modules are generally described by quoting their peak output in kilowatts peak (kWp).

Generally, in terms of efficiency, the following can be assumed:

Monocrystalline	14 to 22%
Polycrystalline	13 to 15%
Thin film	8 to 12%
Hybrid	> 14%

Cost Benchmarks

Prices of PVs are coming down fast, but are typically between £200 and £400 / sqm depending on the product.

Financial Incentives

PVs are eligible for Feed-in-Tariffs (FiTs). The tariff from 1July 2018 to 20 September 2018 ranges from 0.25 p/kWh for an installation over 1MW to 3.93 p/kWh for an installation up to 10kW.

Maintenance

Very low – occasional cleaning

Typical Lifetime

25 years for the panels - 10 years for the inverter

Embodied Carbon

Medium

Key Advantages

Requires no fuel to operate

Has no moving parts

Can provide an income through FiTs.

A.2.3 Solar Thermal

Description

Heating water with solar energy is the most common use of solar thermal technology. The main elements of a solar water heating system are a solar collector, a pump, a hot water tank and a controller. In the UK, a solar water heating system can generally cover up to 50% of the annual hot water needs.

Types

Flat-plate collectors consist of a black absorber (usually copper or metal) with a glazed layer in front and insulation around the edges and at the back.

Evacuated tubes are collectors that have had the air evacuated out of them to prevent heat-loss through convection. The tubes generally contain sealed copper pipes.

The thermal fluid used in both cases is the same: a non-toxic glycol alcohol-based antifreeze. It circulates in the absorber in the case of flat plate collectors and in the copper pipes in evacuated tubes.

Key Features

A temperature sensor placed near the outlet pipe of the collector relays temperature information to the controller unit, which activates/de-activates a pump depending on the difference between the measured temperature leaving the collector and the temperature in the hot water tank.

The hot water tank should have a volume of approximately 60-80 litres per sqm of solar collector.

Efficiency

The amount of hot water generated by a solar thermal collector depends typically on the type of collector, on the orientation/incline of the module, on the location and on the size of the hot water tank.

Evacuated tubes are generally the most efficient, particularly on cold sunny days.

Generally, in terms of efficiency, the following can be assumed:

Flat plate	40%
Evacuated tubes	40 to 50%

Cost Benchmarks

Prices of a typical solar thermal installation are approximately £500 to £700/sqm excl. VAT. Evacuated tubes are more expensive but more efficient than flat-plate collectors.

Financial Incentives

Solar thermal systems are eligible for the Renewable Heat Incentive (RHIs), with a tariff of 10.75 p/kWh from 22 May 2018 for commercial systems less than 200kW, and 20.66 p/kWh for domestic.

Maintenance

Very low – annual inspection

Typical Lifetime

20-25 years (except pumps)

Embodied Carbon

Low

Key Advantages

Can be used to complement other technologies efficiently (e.g. heat pumps)

Can be building-integrated

Essentially ‘free’ heat

A.2.4 Heat Pumps

Description

The purpose of heat pumps is to absorb dispersed low-grade heat, upgrade it to a higher quality and deliver it to the spaces that need heating. Low-grade heat is considered by many as both renewable and essentially free. It is present in the ground, the air or a body of water (e.g. aquifer). Electricity is required to run the system.

Types

Ground source (horizontal)

Ground source (vertical)

Ground source (aquafer)

Air source

Key Features

The three key components of a heat pump system are:

- the heat sink (e.g. ground loop, aquifer, outside air, exhaust air);
- the heat pump system and associated hot water storage;
- the distribution system.

The heat sink can be based on a horizontal or vertical, open-loop or closed-loop design and its installation (e.g. depth) will vary depending on the heat exchange and the ground conditions. In the case of air source heat pumps, it is the outside air which serves as the heat sink.

The heat pump contains a refrigerant which boils and condenses at different temperatures and pressures, absorbing and releasing heat in the process.

Underfloor heating and low surface temperature radiators are ideally suited to heat pump systems: they provide the most efficient delivery of the kind of consistent lower temperature heat produced by the heat pump.

Efficiency

Heat pump efficiencies are often described in terms of the coefficient of performance (COP), which describes how many units of energy are delivered for every unit used. Typical seasonal efficiencies are given below and compared to a standard direct electric heater.

Ground source heat pump	250 to 600%
Air source heat pump	200 to 350%
Standard electric heater	100%

Cost Benchmarks

Prices of heat pumps depend significantly on the type but generally a vertical ground source heat pump system would cost approximately £1,400 / kW.

Financial Incentives

Heat pumps are eligible for the Renewable Heat Incentive (RHIs), with a tariff of 9.36 p/kWh from 22 May 2018 for Tier 1 ground source commercial systems, and 20.46 p/kWh for domestic.

The tariff for air source systems is 2.69 p/kWh from 22 May 2018 for commercial and 10.49 p/kWh for domestic.

Maintenance

Medium/High – Pumps and refrigerant circuit critical

Typical Lifetime

15 years

Embodied Carbon

Medium

Key Advantages

Heat pumps can be reversible and can provide cooling.

A.2.5 Wind Turbines

Description

Wind power can be used to generate electricity, either in parallel with mains supplies, gear or for stand-alone applications with battery back-up.

Types

Horizontal axis

Vertical axis

Key Features

In order to generate worthwhile quantities of electricity, average wind speeds of more than 5–6 m/s are typically required.

The best locations for wind turbines are away from obstructions which affect air flow, including any features of buildings which may have an effect on airflow. Wind speed increases with height, and so turbines often require masts or towers to take advantage of higher wind speeds and to avoid turbulence caused by the building structure. Ideal geographical locations include near hill tops and the coast.

Wind characteristics are specific to each location, and initial evaluations of the feasibility of wind power at any particular site will require details of historic meteorological data. A more detailed local assessment will normally be required to establish the effects of local topology, obstructions, etc.

Efficiency

The theoretical maximum power efficiency of any design of wind turbine is 0.59 (i.e. no more than 59% of the energy carried by the wind can be extracted by a wind turbine).

Once the inefficiencies of a complete wind turbine system (e.g. generator, bearings, power transmission etc.) are included, around 10-30% of the power of the wind is actually converted into usable electricity.

The power output of wind turbines depends on two key factors: the swept area of the rotor and the wind speed.

Horizontal axis wind turbines generally have higher power efficiencies than vertical axis, however wind direction is not as important for a vertical axis type.

Cost Benchmarks

Prices of wind turbines depend significantly on the type but generally a 6kW pole mounted system would cost approximately £30,000.

Financial Incentives

Wind turbines are eligible for Feed-in-Tariffs (FiTs). The tariff from 1July 2018 to 20 September 2018 ranges from 0.59 p/kWh for an installation over 1.5MW to 8.39 p/kWh for an installation up to 50kW.

Maintenance

Low

Typical Lifetime

20 years (except inverter)

Embodied Carbon

Low

Key Advantages

Essentially ‘free’ electricity

Can provide an income through FiTs.

Appendix A.3 - Overheating Assessment

A.3 Overheating Assessment

The proposed redevelopment has been assessed in accordance with the cooling hierarchy detailed in policy S14 of the London Plan, in order to reduce overheating and minimise the use of air conditioning.

The assessment includes dynamic thermal modelling of the redevelopment, using IES modelling software, to assess the risk of overheating.

All areas of the building were modelled and assessed.

A.3.1 Overheating Risk Assessment Methodology

The non-domestic overheating risk assessment has been made against the three criteria outlined in CIBSE TM52. A room or building that fails any two of the three criteria is classed as overheating.

- The first criterion sets a limit for the number of hours that the operative temperature can exceed the threshold comfort temperature (upper limit of the range of comfort temperature) by 1 K or more during the occupied hours of a typical non-heating season (1 May to 30 September).
- The second criterion deals with the severity of overheating within any one day, which can be as important as its frequency, the level of which is a function of both temperature rise and its duration. This criterion sets a daily limit for acceptability.
- The third criterion sets an absolute maximum daily temperature for a room, beyond which the level of overheating is unacceptable.

A.3.1.1 Weather Data

The weather file used for the assessment is as per TM52: DSY1 (Design Summer Year) for the site location, for the 2020s, high emissions, 50% percentile scenario.

The DSY1 2020 London Weather Centre data set has been used which is the most representative for the site location.

It is expected that the CIBSE compliance criteria are met for the DSY1 weather scenario.

A.3.2 Input Data

This section summarises the input assumptions that have been used in the dynamic thermal modelling.

A.3.2.1 Fabric Performance

Refer to Section 5.1.

A.3.2.2 Solar Gain

The g-value of the glazing has been set at 0.4.

A.3.2.3 Blinds and Shading Devices

Internal blinds have not been included.

A.3.2.4 Mechanical Ventilation

In the assessment below with mechanical ventilation is has been assumed that the MVHR units will operate in boost mode, providing up to 3 air changes per hour.

Ventilation to provide fresh air and extract moisture/pollutants in accordance with Building Regulations Part F will be via mechanical ventilation (either local or central) due to the existing external background noise levels.

The continuous air volumes required by Building Regulations Part F are low (generally less than 0.5 air changes per hour), which is insufficient to prevent overheating by mechanical ventilation.

The appropriately sized ductwork, fans, etc to deliver these significantly increased mechanical ventilation rates would have a significant impact on the building design and viability.

A.3.2.5 Natural Ventilation

The proposed redevelopment space has opening windows to allow natural ventilation when where noise limits surrounding the scheme allow for their operation.

A.3.2.6 Infiltration

The target air permeability for the retained element is 25 $m^3/hr.m^2$@50Pa.

An average infiltration air change of 0.45ACH has been assumed in the dynamic thermal modelling in accordance with Table 4.24 in CIBSE Guide A.

A.3.3 Overheating Modelling Result

A.3.3.1 Guest Room Overheating Results Assessment 1

TM52 DSY1 2020 Overheating				
Apartment Reference	Criteria 1	Criteria 2	Criteria 3	Overall Compliance
	% Hours of Exceedance	Maximum Daily Weighted Exceedance	Maximum Delta T	
Target	3	6	4	
Basement- Kitchen	9.4	68	5	Fail
Basement- Staff Room	50.7	102	5	Fail
GF- Lounge/ Dining	9.9	77	6	Fail
GF- Bar	11.3	75	6	Fail
GF- Reading Room	38.4	124	6	Fail
GF- Reception	43.6	142	8	Fail
Rm 01 Bedroom	1.7	19	4	Pass
Rm 02 Bedroom	1.2	17	4	Pass
Rm 03 Bedroom	1.2	18	3	Pass
Rm 04 Bedroom	1.2	18	3	Pass
Rm 05 Bedroom	1.7	15	2	Fail
Rm 06 Bedroom	3.6	27	3	Fail
Rm 07 Bedroom	3.9	24	3	Pass
Rm 08 Bedroom	3.9	29	5	Fail
Rm 09 Bedroom	4.5	33	5	Fail
Rm 10 Bedroom	4.2	30	5	Fail
Rm 11 Bedroom	4.1	30	5	Fail
RM 12 Bedroom	3.2	30	4	Fail
Rm 13 Bedroom	3.1	29	4	Fail
Rm 14 Bedroom	4	29	5	Fail
Rm 15 Bedroom	3	26	4	Fail
Rm 16 Bedroom	4.7	32	5	Fail
Rm 17 Bedroom	4.2	34	5	Fail
Rm 18 Bedroom	4.4	30	5	Fail
Rm 19 Bedroom	4.5	31	5	Fail
Rm 20 Bedroom	2.5	28	4	Pass
Rm 21 Bedroom	2.6	31	4	Fail
Rm 22 Bedroom	4.1	33	4	Fail
Rm 23 Bedroom	3	26	4	Fail
Rm 24 Bedroom	3.7	29	5	Fail
Rm 25 Bedroom	3.7	28	5	Fail
Rm 26 Bedroom	4.1	30	5	Fail
Rm 27 Bedroom	3.1	27	4	Fail
Rm 28 Bedroom	3.8	29	5	Fail
Rm 29 Bedroom	4.1	29	5	Fail
Rm 30 Bedroom	1.7	20	3	Pass
Rm 31 Bedroom	1.9	24	3	Pass
Rm 32 Bedroom	2.6	28	3	Pass
Rm 33 Bedroom	2.7	27	3	Fail
Rm 34 Bedroom	3.4	27	4	Pass
Rm 35 Bedroom	2.9	26	4	Pass
Rm 36 Bedroom	2.8	26	4	Pass
Rm 37 Bedroom	1.5	19	3	Pass
Rm 38 Bedroom	1.7	20	3	Pass
Rm 39 Bedroom	1.8	20	3	Pass
Rm 40 Bedroom	1.8	21	3	Pass
Rm 41 Bedroom	1.8	20	3	Pass
Rm 42 Bedroom	1.8	21	3	Pass
Note:	This report assesses occupied periods only. Please be aware that TM52 should be conducted for occupied and/or "available hours". Use of educational NCM profiles may be seen as inappropriate due to prolonged unoccupied periods during summer months. See Section 6.1.2 (a) of TM52 for further information.			

Figure 10 TM52 Overheating Assessment 1 DSY1 2020

A.3.3.2 Guest Room Overheating Results Assessment 2

TM52 DSY1 2020 Overheating				
Apartment Reference	Criteria 1	Criteria 2	Criteria 3	Overall Compliance
	% Hours of Exceedance	Maximum Daily Weighted Exceedance	Maximum Delta T	
Target	3	6	4	
Basement- Staff Room	0	0	0	Pass
GF- Loung/ Dining	0	0	0	Pass
GF- Bar	0	0	0	Pass
GF- Reading Room	0	0	0	Pass
GF- Reception	0	0	0	Pass
Rm 01 Bedroom	0	0	0	Pass
Rm 02 Bedroom	0	0	0	Pass
Rm 03 Bedroom	0	0	0	Pass
Rm 04 Bedroom	0	0	0	Pass
Rm 05 Bedroom	0	0	0	Pass
Rm 06 Bedroom	0	0	0	Pass
Rm 07 Bedroom	0	0	0	Pass
Rm 08 Bedroom	0	0	0	Pass
Rm 09 Bedroom	0	0	0	Pass
Rm 10 Bedroom	0	0	0	Pass
Rm 11 Bedroom	0	0	0	Pass
RM 12 Bedroom	0	0	0	Pass
Rm 13 Bedroom	0	0	0	Pass
Rm 14 Bedroom	0	0	0	Pass
Rm 15 Bedroom	0	0	0	Pass
Rm 16 Bedroom	0	0	0	Pass
Rm 17 Bedroom	0	0	0	Pass
Rm 18 Bedroom	0	0	0	Pass
Rm 19 Bedroom	0	0	0	Pass
Rm 20 Bedroom	0	0	0	Pass
Rm 21 Bedroom	0	0	0	Pass
Rm 22 Bedroom	0	0	0	Pass
Rm 23 Bedroom	0	0	0	Pass
Rm 24 Bedroom	0	0	0	Pass
Rm 25 Bedroom	0	0	0	Pass
Rm 26 Bedroom	0	0	0	Pass
Rm 27 Bedroom	0	0	0	Pass
Rm 28 Bedroom	0	0	0	Pass
Rm 29 Bedroom	0	0	0	Pass
Rm 30 Bedroom	0	0	0	Pass
Rm 31 Bedroom	0	0	0	Pass
Rm 32 Bedroom	0	0	0	Pass
Rm 33 Bedroom	0	0	0	Pass
Rm 34 Bedroom	0	0	0	Pass
Rm 35 Bedroom	0	0	0	Pass
Rm 36 Bedroom	0	0	0	Pass
Rm 37 Bedroom	0	0	0	Pass
Rm 38 Bedroom	0	0	0	Pass
Rm 39 Bedroom	0	0	0	Pass
Rm 40 Bedroom	0	0	0	Pass
Rm 41 Bedroom	0	0	0	Pass
Rm 42 Bedroom	0	0	0	Pass
Note:	This report assesses occupied periods only. Please be aware that TM52 should be conducted for occupied and/or "available hours". Use of educational NCM profiles may be seen as inappropriate due to prolonged unoccupied periods during summer months. See Section 6.1.2 (a) of TM52 for further information.			

Figure 11 TM52 Overheating Assessment 2 DSY1 2020 with Cooling

Appendix A.4 – BREEAM Pre-Assessment

BREEAM®

Code for a Sustainable Built Environment
www.breeam.com

BREEAM UK Refurbishment & Fit-out 2014

Bedford Place

Pre-assessment

27 October 2023 — Assessment report

PwC's BREEAM Outstanding rated One Embankment Place in London. Image: Hufton + Crow

bre

Assessment references

Registration number:	Bedford Place	**Date created:**	27/9/2023
Created by:	Will Newall		

Site details

Site name:	
Address:	
Town:	
County:	
Postcode:	
Country:	

Certificate details

The certificate will have the name of the architect (if entered above) and the name of the developer (from above).

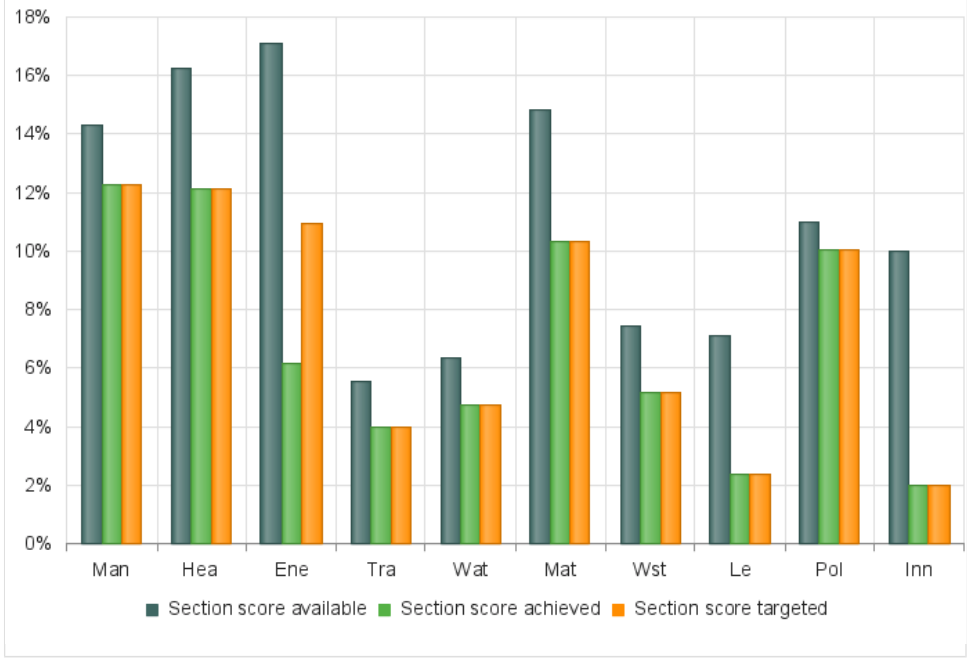
Any other names to appear on the certificate are listed below:

Name	Label

BREEAM Rating

	Credits available	Credits achieved	Credits targeted	% Credits achieved	Weighting	Category score	Target score
Man	21.0	18.0	18.0	85.71%	14.28%	12.24%	12.24%
Hea	20.0	15.0	15.0	75.00%	16.23%	12.17%	12.17%
Ene	25.0	9.0	16.0	36.00%	17.13%	6.16%	10.96%
Tra	7.0	5.0	5.0	71.43%	5.55%	3.96%	3.96%
Wat	8.0	6.0	6.0	75.00%	6.35%	4.76%	4.76%
Mat	13.0	9.0	9.0	69.23%	14.88%	10.30%	10.30%
Wst	10.0	7.0	7.0	70.00%	7.44%	5.20%	5.20%
Le	3.0	1.0	1.0	33.33%	7.14%	2.38%	2.38%
Pol	12.0	11.0	11.0	91.67%	10.99%	10.07%	10.07%
Inn	10.0	2.0	2.0	20.00%	10.00%	2.00%	2.00%
Total	129.0	83.0	90.0	64.34%	-	69.27%	74.07%
Rating	-	-	-	-	-	★★★☆☆ **Very Good**	Excelle

Performance by environmental category



Issue scores

Please Note: X means the exemplary credit for the relevant issue

Management

Man 01 Project Brief and design
4 / 4

Man 02 Life cycle cost and service life planning
1 / 4

Man 03 Responsible construction practices
6 / 6 X: 0 / 1

Man 04 Commissioning and handover
4 / 4

Man 05 Aftercare
3 / 3 X: 1 / 1

Health and Wellbeing

Hea 01 Visual comfort
4 / 7 X: 0 / 1

Hea 02 Indoor air quality
3 / 5 X: 1 / 2

Hea 03 Safe containment in laboratories
N/A

Hea 04 Thermal comfort
3 / 3

Hea 05 Acoustic performance
4 / 4

Hea 06 Safety and security
1 / 1

Energy

Ene 01 Reduction of energy use and carbon emissions
0 / 15 X: 0 / 5

Ene 02 Energy monitoring
1 / 1

Ene 03 External lighting
1 / 1

Ene 04 Low carbon design
2 / 3

Ene 05 Energy efficient cold storage
N/A

Ene 06 Energy efficient transportation systems
3 / 3

Ene 07 Energy efficient laboratory systems
N/A

Ene 08 Energy efficient equipment
2 / 2

Ene 09 Drying space
N/A

Transport

Tra 01 Sustainable transport solutions
3 / 3

Tra 02 Proximity to Amenities
1 / 1

Tra 03 Cyclist facilities
0 / 2

Tra 04 Maximum car parking capacity
N/A

Tra 05 Travel plan
1 / 1

Water

Wat 01 Water consumption
3 / 5 X: 0 / 1

Wat 02 Water monitoring
1 / 1

Wat 03 Water leak detection and prevention
2 / 2

Wat 04 Water efficient equipment
N/A

Materials

Mat 01 Life cycle impacts
3 / 6 X: 0 / 1

Mat 03 Responsible sourcing
3 / 4 X: 0 / 1

Mat 04 Insulation
1 / 1

Mat 05 Designing for durability and resilience
1 / 1

Mat 06 Material efficiency
1 / 1

Waste

Wst 01 Construction waste management
4 / 7 X: 0 / 1

Wst 02 Recycled aggregates
N/A

Wst 03 Operational waste
1 / 1

Wst 04 Speculative finishes
N/A

Wst 05 Adaptation to climate change
1 / 1 X: 0 / 1

Wst 06 Functional adaptability
1 / 1

Land use and ecology

Le 02 Protection of ecological features
N/A

Le 04 Enhancing site ecology
0 / 1

Le 05 Long term impact on biodiversity
1 / 2

Pollution

Pol 01 Impact of refrigerants
2 / 3

Pol 02 Nox Emissions
3 / 3

Pol 03 Flood risk management and reducing surface water run-off
5 / 5 X: 0 / 1

Pol 04 Reduction of Night Time Light Pollution
1 / 1

Pol 05 Noise attenuation
N/A

Innovation

Inn 01 Innovation
0 / 0 X: 0 / 10

Initial details

Part 1 : Fabric and structure : Yes

Part 2 : Core services : Yes

Part 3 : Local services : Yes

Part 4 : Interior design : Yes

Technical manual issue number : Issue 2.0

Project type : Major, whole building refurbishment

Client : Developer

Assessment stage : Design

Building type (main description) : Other: Residential Institution

Building type (sub-group) : Residential Institution - Hotel

Building floor area (NIFA) Net internal floor area : 2500

Building floor area (GIFA) Gross internal floor area : 2500

Refurbishment/Fit-out assessment area : 2500

What range does the projects value fall into? : < Â£2 million

New extension assessment area (if applicable within the scope of the assessment) :

Historic building (listed building or building in a conservation area) : Yes, building in a conservation area

Is commercial and/or industrial scale refrigeration or storage specified/present : No

Are building user transportation systems (lifts and/or escalators) specified/present? : Yes, newly specified transportation systems

Are there systems that significantly contribute towards unregulated energy demands? : Yes

For industrial buildings, are there office areas? : No

Where the scope of the refurbishment covers tenancy areas only, are sanitary fittings present in the tenanted areas? : N/A

Does the building have or mitigate any unregulated water demand? e.g. irrigation or soft-landscaped areas requiring no irrigation, car washing, other significant process related : No

Are there new or existing landscaping areas within the refurbishment or fit-out zone and within developer control? : No

Are there any external areas within the refurbishment or fit-out zone and within developer control that can feasibly be enhanced in line with LE 04 : Yes

Is there any local cooling present or within scope of refurbishment or fit-out works? : Yes

Is there any local heating or hot water present or within scope of refurbishment or fit-out works? : Yes

Is any externally mounted plant present or specified? : No

Is this a speculative refurbishment? : No

Is external lighting within scope of the refurbishment or fit-out zone? : Yes

Is this a simple building? : No

If undertaking a Part 4 assessment, is there any equipment specified that requires commissioning (see Man04 CN13) : Yes

Is any new insulation specified? : Yes

Is Wat01 within the scope of the assessment in accordance with Table 42? : Yes

Are high grade aggregates to be used in the refurbishment scheme? : No

Are there laboratories present and if so what % of total building area do they represent :

Laboratory containment area :

Category assessment
Management (Man)

Man 01 Project Brief and design

Assessment criteria	
Stakeholder consultation (project delivery) :	Yes
Stakeholder consultation (third party) :	Yes
Sustainability champion (design) :	Yes
Sustainability champion (monitoring progress) :	Yes

Credit scoring	
Credits scored :	4

Credits awarded : 4

Man 02 Life cycle cost and service life planning

Assessment criteria	
Elemental life cycle cost (LCC) :	No
Component level LCC plan :	No
Capital cost reporting :	Yes
Capital cost of the project :	1000000

Credit scoring	
Credits scored :	1

Credits awarded : 1

Man 03 Responsible construction practices

Assessment criteria	
Is all timber used in the project 'legally harvested and traded timber'? :	Yes
Environmental management :	Yes

Construction stage sustainability champion :	Yes
Considerate construction :	2
Has the project achieve the minimum standard for an Excellent or Outstanding rating? :	Minimum standard for Excellent rating
Monitoring of refurbishment or fit-out site impacts :	Yes
Utility consumption :	Yes
Transport of construction materials and waste :	Yes
Exemplary level criteria - considerate construction :	Yes

Key Performance Indicators: Construction site energy use	
Energy consumption (total) - site processes :	
Energy consumption (intensity) - site processes :	

Key Performance Indicators: Construction site greenhouse gas emissions	
Process greenhouse gas emissions (total) - site processes :	
Greenhouse gas emissions (intensity) - site processes :	

Key Performance Indicators: Construction site use of freshwater resources	
Use of freshwater resource (total) - site processes :	
Use of freshwater resource (intensity) - site processes :	

Credit scoring	
Credits scored :	6
Exemplary credits scored :	0

Credits awarded : 6

Man 04 Commissioning and handover

Assessment criteria	
Commissioning schedule and responsibilities :	Yes
Commissioning building services :	Yes

Commissioning building fabric :	Yes
Handover :	Yes
Has a Building User Guide been developed prior to handover? :	Yes

Credit scoring

Credits scored :	4

Credits awarded : 4

Man 05 Aftercare

Assessment criteria

Aftercare support :	Yes
Seasonal commissioning :	Yes
Post occupancy evaluation :	Yes
Exemplary level criteria :	Yes

Credit scoring

Credits scored :	3
Exemplary credits scored :	1

Credits awarded : 3
Exemplary credits awarded : 1

Health and Wellbeing (Hea)

Hea 01 Visual comfort

Assessment criteria

Glare control :	Yes
Daylighting :	Yes
View out :	Yes
Internal and external lighting levels, zoning and controls :	Yes
Exemplary level daylighting :	

Credit scoring

Credits scored :	4
Exemplary credits scored :	0

Credits awarded : 4

Hea 02 Indoor air quality

Assessment criteria

Min. sources of air pollution: indoor air quality plan :	Yes
Ventilation :	No
VOCs (products) :	Yes
VOCs (post construction) :	Yes
Adaptability - potential for natural ventilation :	No
Exemplary level VOCs (products) :	Yes

Key performance indicators: Indoor air quality

Concentration levels of formaldehyde :

Total volatile organic compound (TVOC) concentration :

Credit scoring

Credits scored :	3
Exemplary credits scored :	1

Credits awarded : 3
Exemplary credits awarded : 1

Hea 03 Safe containment in laboratories

Assessment criteria - N/A

Hea 04 Thermal comfort

Assessment criteria

Thermal modelling :	Yes
Criterion 4 - Impact of fit-out on thermal comfort :	Yes
Adaptability - for a projected climate change scenario :	Yes
Thermal zoning and control :	Yes

Key Performance Indicators: Thermal comfort

Predicted Mean Vote (PMV) :

Predicted Percentage Dissatisfied (PPD) :

Key Performance Indicators: Adaptability

Predicted Mean Vote (PMV) :

Predicted Percentage Dissatisfied (PPD) :

Credit scoring

Credits scored :	3
Exemplary credits scored :	0

Credits awarded : 3

Hea 05 Acoustic performance

Assessment criteria

Acoustic performance standards and testing requirements complied with : Yes

Credit scoring

Credits scored : 4

Credits awarded : 4

Hea 06 Safety and security

Assessment criteria

Security of site and building : Yes

Credit scoring

Credits scored : 1

Credits awarded : 1

Energy (Ene)

Ene 01 Reduction of energy use and carbon emissions

Assessment option

Which option is being followed :	Option 1: Whole building energy model

Building Score

Country :	England
Upload existing building '_epc.inp' file :	
Upload proposed building '_epc.inp' file :	
Credits :	
Actual (existing) building energy demand (DemEx) :	
Reference building energy demand (DemRef) :	
Actual (proposed) building energy demand (DemProp) :	
Actual (existing) building primary energy consumption (PEEx) :	
Reference building primary energy consumption (PERef) :	
Actual (proposed) building primary energy consumption (PEProp) :	
Actual (existing) building CO2 emissions (BEREx) :	
Reference building CO2 emissions (SER) :	
Actual (proposed) building CO2 emissions (BERProp) :	
Building energy demand individual parameter EPR (Energy performance Ratio) :	
Primary energy consumption individual parameter EPR (Energy performance Ratio) :	
Building CO2 emissions individual parameter EPR (Energy performance Ratio) :	
EPRNDR (Energy Performance Ratio Non Domestic Refurbishment) :	

Historic buildings

Historic buildings study compliant :	Yes

Historic building credits scored :	0

Exemplary Assessment Criteria

Zero regulated carbon :	
Equivalent % of the building's 'regulated' energy consumption generated by carbon neutral sources and used to meet energy demand from 'unregulated' building systems or processes? :	
Is the building designed to be carbon negative? :	
If the building is defined as 'carbon negative' what is the total (modelled) renewable/carbon neutral energy generated and exported? :	

Credit scoring

Exemplary credits scored :	0

Credits awarded : 0

Ene 02 Energy monitoring

Assessment criteria

Sub-metering of major energy consuming systems :	Yes

Credit scoring

Exemplary credits scored :	0
Credits scored :	1

Credits awarded : 1

Ene 03 External lighting

Assessment criteria

External lighting specification :	Yes

Credit scoring

Credits scored :	1
Exemplary credits scored :	0

Credits awarded : 1

Ene 04 Low carbon design

Assessment criteria

Passive design analysis :	Yes
Free cooling :	No
Low and zero carbon technologies :	Yes
Total on-site and/or near-site LZC energy generation :	

Credit scoring

Credits scored :	2
Exemplary credits scored :	0

Credits awarded : 2

Ene 05 Energy efficient cold storage

Assessment criteria - N/A

Ene 06 Energy efficient transportation systems

Assessment criteria

Energy consumption :	Yes
Energy efficient features :	Yes

Credit scoring

Credits scored :	3
Exemplary credits scored :	0

Credits awarded : 3

Ene 07 Energy efficient laboratory systems

Assessment criteria - N/A

Ene 08 Energy efficient equipment

Assessment criteria

Ref A Small power and plug in equipment present? :	
Ref B Swimming pool present? :	
Ref C Communal laundry present? :	
Ref D Data centre present? :	
Ref E IT-intensive operation areas present? :	
Ref F Residential areas present? :	
Ref G Healthcare present? :	
Ref H Kitchen and catering facilities present? :	
Ref I Display Lighting present? :	
Ref J Overhead warm air heaters present? :	
Significant majority contributors BREEAM compliant :	

Credit scoring

Credits scored :	2
Exemplary credits scored :	0

Credits awarded : 2

Ene 09 Drying space

Assessment criteria - N/A

Transport (Tra)

Tra 01 Sustainable transport solutions

Assessment criteria	
Building type category (for purposes of Tra01 assessment :	Multi-residential
Public transport accessibility index :	59.14
Ref A building dedicated bus services :	
Ref B enhanced cycle storage space provision :	
Ref C enhanced cyclist facilities :	
Ref D electric vehicle charging points :	
Ref E car sharing spaces :	
Ref F digital information points :	
Ref G onsite facilities to reduce the need to travel :	
Ref H improvement actions to enhance Accessibility Index :	

Credit scoring	
Credits scored :	3
Exemplary credits scored :	0

Credits awarded : 3

Tra 02 Proximity to Amenities

Assessment criteria	
Close proximity and accessibility to applicable amenities :	Yes

Credit scoring	
Credits scored :	1
Exemplary credits scored :	0

Credits awarded : 1

Tra 03 Cyclist facilities

Assessment criteria	
Building type category (for purpose of Tra03 issue assessment) :	Other building type 2
Number of compliant cycle storage spaces provided :	
Showers :	
Changing facilities :	
Lockers :	
Drying space :	
Cyclist facilities compliant :	
Cycle storage spaces compliant :	

Credit scoring	
Credits scored :	0
Exemplary credits scored :	0

Credits awarded : 0

Tra 04 Maximum car parking capacity

Assessment criteria - N/A

Tra 05 Travel plan

Assessment criteria	
Travel plan based on site specific travel survey/assessment :	Yes

Credit scoring	
Credits scored :	1
Exemplary credits scored :	0

Credits awarded : 1

Water (Wat)

Wat 01 Water consumption

Standard approach data

Water consumption :

Water demand met via greywater/rainwater sources :

Total net water consumption :

Improvement on baseline performance :

Key performance indicator

Total net water consumption :

Default building occupancy :

Alternative approach data

Overall level achieved :

Percentage of demand met from grey or rainwater :

Credit scoring

Credits scored :	3
Exemplary credits scored :	0

Credits awarded : 3

Wat 02 Water monitoring

Assessment criteria

Water meter on the mains water supply to the building(s) :	Yes

Metering/monitoring equipment on supply to plant/building areas :

Pulsed output or other open protocol communication output :

Existing BMS connection :

Credit scoring

Credits scored :	1

Exemplary credits scored :	0

Credits awarded : 1

Wat 03 Water leak detection and prevention

Assessment criteria

Leak detection on building's mains water supply :

Flow control device to each sanitary area/facility :

Credit scoring

Credits scored :	2
Exemplary credits scored :	0

Credits awarded : 2

Wat 04 Water efficient equipment

Assessment criteria - N/A

Materials (Mat)

Mat 01 Life cycle impacts

Assessment criteria

Exemplary level compliant :

Options :	Option 1

Option 1: Total Mat 01 points achieved :

Credit scoring

Credits scored :	3
Exemplary credits scored :	0

Credits awarded : 3

Mat 03 Responsible sourcing

Assessment criteria

All timber and timber based products are 'Legally harvested and traded timber' :	Yes
Is there a documented sustainable procurement plan :	Yes
Have at least three material types been responsibly sourced (criterion 1) :	Yes
% of available RSM points achieved :	37

Credit scoring

Credits scored :	3
Exemplary credits scored :	0

Credits awarded : 3

Mat 04 Insulation

Assessment criteria

Embodied impact - insulation index :

Credit scoring	
Credits scored :	1
Exemplary credits scored :	0
Credits awarded : 1	

Mat 05 Designing for durability and resilience

Assessment criteria	
Protecting vulnerable parts of the building from damage :	Yes
Protecting exposed parts of the building from material degradation :	

Credit scoring	
Credits scored :	1
Exemplary credits scored :	0
Credits awarded : 1	

Mat 06 Material efficiency

Assessment criteria	
Material optimisation measures investigated and implemented at relevant stages :	Yes

Credit scoring	
Credits scored :	1
Exemplary credits scored :	0
Credits awarded : 1	

Waste (Wst)

Wst 01 Construction waste management

Assessment criteria	
Pre-refurbishment audit :	No
Resource management plan :	Yes
% of points achieved for direct re-used or recycled (table 64) :	

Key performance indicator - construction waste	
Measure/units for the data being reported :	
Non-hazardous construction waste (excluding strip-out/demolition/excavation) :	
Exemplary level compliant - Resource efficiency and diversion of waste from landfill :	
Non-hazardous non-demolition construction waste diverted from landfill :	
Total non-hazardous demolition waste generated :	
Non-hazardous demolition waste diverted from landfill :	
Material for reuse :	
Material for recycling :	
Material for energy recovery :	
Hazardous waste to disposal :	

Credit scoring	
Credits scored :	4
Exemplary credits scored :	0
Credits awarded : 4	

Wst 02 Recycled aggregates

Assessment criteria - N/A

Wst 03 Operational waste

Assessment criteria

Segregation and storage of operational recyclable waste volumes :

Static waste compactor(s) or baler(s) :

Vessel(s) for composting suitable organic waste :

Credit scoring

Credits scored :	1
Exemplary credits scored :	0

Credits awarded : 1

Wst 04 Speculative finishes

Assessment criteria - N/A

Wst 05 Adaptation to climate change

Assessment criteria

Adaptation to climate change - structural and fabric resilience :

Exemplary level - responding to adaptation to climate change :

Credit scoring

Credits scored :	1
Exemplary credits scored :	0

Credits awarded : 1

Wst 06 Functional adaptability

Assessment criteria

Functional adaptability :	Yes

Credit scoring

Credits scored :	1
Exemplary credits scored :	0

Credits awarded : 1

Land use and ecology (Le)

Le 02 Protection of ecological features

Assessment criteria - N/A

Le 04 Enhancing site ecology

Assessment criteria

Suitably qualified ecologist appointment (SQE) :	Yes
Ecologist's report and recommendations :	Yes

Credit scoring

Credits scored :	0

Credits awarded : 0

Le 05 Long term impact on biodiversity

Assessment criteria

Suitably qualified ecologist appointment (SQE) :

Landscape and habitat management plan :

Number of applicable measures :

Number of applicable measures implemented :

Credit scoring

Credits scored :	1

Credits awarded : 1

Pollution (Pol)

Pol 01 Impact of refrigerants

Assessment criteria

Does the building require the use of refrigerants within its installed plant/systems? :
BS EN 378:2008 and IoR Ammonia Refrigeration System CoP (where applicable)? :
Global Warming Potential of the specified refrigerant(s) 10 or less? :

Total Direct Effect Life Cycle CO2eq. Emissions from the system :

Cooling/Heating capacity of the system :

BREEAM compliant refrigerant leak detection and containment :

Credit scoring

Credits scored :	2
Exemplary credits scored :	0

Credits awarded : 2

Pol 02 Nox Emissions

Assessment criteria

Nox emission level - space heating :

Nox emission level - cooling :

Nox emission level - water heating :

Does this building meet BREEAMs compliance note relating to the definition of a highly insulated building? :
Energy consumption: heating and hot water :

Credit scoring

Credits scored :	3
Exemplary credits scored :	0

Credits awarded : 3

Pol 03 Flood risk management and reducing surface water run-off

Assessment criteria

Annual probability of flooding :

Avoidance of flooding :

Flood resilience of resistance strategy :

Neutral impact on surface water :

Reducing run-off :

Minimising watercourse pollution :

Exemplary level compliant :

Credit scoring

Credits scored :	5
Exemplary credits scored :	0

Credits awarded : 5

Pol 04 Reduction of Night Time Light Pollution

Assessment criteria

External lighting specification :

Credit scoring

Credits scored :	1
Exemplary credits scored :	0

Credits awarded : 1

Pol 05 Noise attenuation

Assessment criteria - N/A

Innovation (Inn)

Inn 01 Innovation

Assessment criteria

Number of 'approved' innovation credits achieved? :	0

Credit scoring

Credits scored :	0
Exemplary credits scored :	0

Credits awarded : 0

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