Stage 4 Energy Report

115 – 119 Camden High Street, London

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EXECUTIVE SUMMARY

This report has been prepared by PSH on behalf of 'Demar Holdings Ltd', to demonstrate that the Stage 4 Design Development of the proposed '115 – 119 Camden High Street' development, meets the compliance targets related to energy and carbon dioxide (CO_2) emissions.

This report identifies the national and regional planning policy that are applicable to the proposed scheme's energy strategy. The following sections detail the design approach that the Developed Design has taken to comply with the policy requirements.

The strategic approach to the design of the development has been to follow the Energy Hierarchy. The strategy aims to reduce energy demand in the first instance prior to the consideration of integrating low and zero carbon energy sources, since controlling demand is the most effective way of reducing energy consumption and carbon dioxide emissions. This has been reported through the 'be lean, clean and green' stages of design, summarised further below.

Passive Design Measures

The following passive design measures have been incorporated into the scheme:

- Optimised fabric efficiency beyond acceptable limits, and the U-values initially targeted at Stage 2.

Energy Efficient Measures

The following passive design measures have been incorporated into the scheme:

- Energy efficient services for domestic hot water, lighting and ventilation
- LED efficient lighting and occupancy sensing controls
- Metering of energy consuming systems in accordance with Part L2A.

Low and Zero Carbon Technologies

The hotel development has maximised on-site renewable energy generation in two ways:

1. High efficiency ASHP technology is being used to pre-heat the domestic hot water (DHW). The ASHP will pre-heat 60% of the annual DHW demand to 45°C.
2. High efficiency ASHP will be integrated into a high efficiency VRF systems to provide space heating and cooling to the occupied spaces.

ASHPs are no longer included in the Domestic residences, as initially proposed at Stage 2.

Table 1 demonstrates that the following compliance targets have been met or exceeded by the developed design of 115 – 119 Camden High Street.

TABLE 1. OVERALL CARBON EMISSION REDUCTION RESULTS FOR DEVELOPED DESIGN OF 115 – 119 CAMDEN HIGH STREET.

Element	Baseline Scenario Regulated CO_2 Emissions (tonnes/yr)	Stage 4 Developed Design Regulated CO_2 Emissions (tonnes/yr)	Regulated Savings (tonnes CO_2 /yr)	Regulated Savings of CO_2 (%)
Domestic	1.691	1.309	0.381	22.6%
Non-Domestic	121.710	65.381	56.329	46.3%
Site-wide Development	123.401	66.488	56.710	46.1%

Site-wide:

- 46.1% carbon reduction beyond Building Regulations Part L (2013). This exceeds the target of 35% required by London Plan (2016).

Domestic:

- Minimum compliance with Part L1A (2013), as per Building Regulations
- 22.6% CO_2 reduction below Part L 2013 Building Regulations. This exceeds the 19% target required by Item 8.8 in the Camden Local Plan (2017)

As the residential units are less than 10 units, they are not considered a 'major housing development' under London Plan and are therefore not required to achieve to the net zero carbon target detailed in the Energy Assessment Guidance 2018. However, it has been demonstrated that the Domestic units have reduced their CO_2 emissions by 22.6%.

As the residential units are less than 4 units, they are not required to achieve a 20% reduction in carbon dioxide emissions from on-site renewable energy generation, as per Item 8.11 in the Camden Local Plan (2017). However, a 22.6% CO_2 emission reduction for the domestic units has been achieved purely through 'be lean' passive design and energy efficient systems, as shown in Table 2.

TABLE 2. DOMESTIC CARBON EMISSION RESULTS FOR ENERGY HIERARCHY BREAKDOWN.

Element	Regulated CO_2 Emissions (tonnes/yr)	Regulated Savings (tonnes CO_2 /yr)	Regulated Savings of CO_2 (%)
Baseline Scenario	1.691	-	-
'Be Lean'	1.309	0.382	22.6%
'Be Clean'	1.309	0	0%
'Be Green'	1.309	0	0%
Total Cumulative Savings	-	0.382	22.6%

Non-domestic:

- Minimum compliance with Part L2A (2013), as per Building Regulations
- 46.3% carbon reduction beyond Building Regulations Part L2A 2013. This exceeds the 35% target required by London Plan (2016).
- 38.1% reduction in carbon dioxide emissions from on-site renewable energy generation. This exceeds the 20% target required by Item 8.11 in the Camden Local Plan

Table 3 confirms the breakdown of energy emissions from the Energy Hierarchy from the non-domestic elements. It is confirmed that the implementation of ASHPs which contribute to the 'be green' onsite renewable energy generation have resulted CO_2 emissions reduction of 38.1%. This exceeds the Camden Council target of 20%.

TABLE 3. NON-DOMESTIC CARBON EMISSION RESULTS FOR ENERGY HIERARCHY BREAKDOWN.

Element	Regulated CO_2 Emissions (tonnes/yr)	Regulated Savings (tonnes CO_2 /yr)	Regulated Savings of CO_2 (%)
Baseline Scenario	121.710	-	-
'Be Lean'	111.797	9.913	8.14%
'Be Clean'	111.797	0	0
'Be Green'	65.381	46.416	38.14%
Total Cumulative Savings	-	56.329	46.3%

The appropriate GLA calculation methodology has been applied to demonstrate compliance and the energy calculations have been carried out by an accredited Energy Assessor.

The scheme achieves a BREEAM Ene 01 EPR of 0.696, which achieves 6 credits and the minimum standards for BREEAM 'Excellent' in the Ene 01 issue.

Through a combination of the passive design measures, energy efficient system design and the inclusion of air source heat pumps, the site-wide scheme achieves an 46.1% carbon emission reduction against the Part L target emissions rate.

DOCUMENT CONTROL

Issue	Date	Status	PSH Prepared (Date/Initials)	PSH Checked (Date/Initials)	PSH Authorised (Date/Initials)
01	04.12.2019	Final revision for Stage 4 submission	02.11.2019/ND 02.11.2019/JP	04.12.2019/DJ	04.12.2019/DJ
02	08.06.2021	Updated for Camden Proforma and change in glazing U-value	08.06.2021/JP + ND	08.06.2021/DJ	08.06.2021/DJ

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1. INTRODUCTION

This report has been prepared by PSH on behalf of 'Demar Holdings Ltd', to demonstrate that the Stage 4 Design Development of the proposed '115 – 119 Camden High Street' development, meets the compliance targets related to energy and carbon dioxide (CO_2) emissions.

The proposed scheme consists of demolition of the existing building and erection of a part 4, part 5 storey building comprising retail floorspace (Class A1), hotel (Class C1) and 3 affordable residential units (Class C3) and associated works. Figure 1 includes a render of the proposed design.

The Site is located at 115 – 119 Camden High Street, London, NW1 7JS, within the London Borough of Camden.

This report identifies the national and regional planning policy that are applicable to the proposed scheme's energy strategy. The following sections detail the design approach that the Developed Design has taken to comply with the policy requirements.

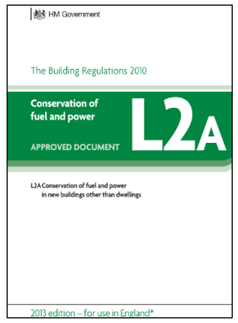
FIGURE 1. RENDER OF THE PROPOSED DESIGN FOR 115-119 CAMDEN HIGH STREET (SOURCE: D&S STATEMENT, JUNE 2019).

2. REGULATORY AND PLANNING POLICY

There are national and regional policy requirements that are set across the UK with the intent to regulate the amount of energy consumption of new developments and therefore minimise the subsequent carbon dioxide emissions. It is anticipated that the scheme will be required to comply with the following policies; which relate to any proposed development at 115 – 119 Camden High Street, London.

2.1 National Legislation

UK Building Regulations Approved Document Part L (2013)

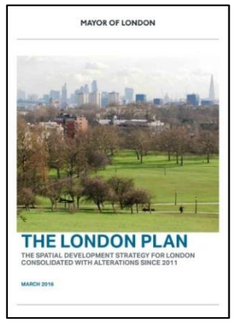


Part L2A of the UK Building Regulations is the mechanism by which government is driving reductions in the regulated CO_2 emissions from new buildings. It consists of 5 criteria (listed below).

- Criterion 1 – Achieving the Target CO2 Emission Rate (TER);
- Criterion 2 – Limits on design flexibility;
- Criterion 3 – Limiting the effects of solar gain in summer;
- Criterion 4 – Building performance consistent with BER;
- Criterion 5 – Providing information.

2.2 Regional Policy

The London Plan (2016)



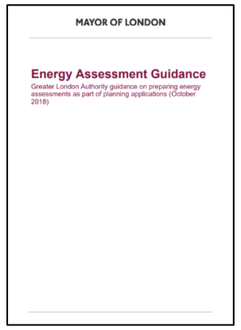
The London Plan sets out the overall strategic plan for London, setting out integrated economic, environmental and social framework for the development of London over the next 20-25 years. Chapter Five sets out a comprehensive range of policies to underpin London's response to climate change. One of the main objectives of the London Plan is to tackle climate change by reducing CO_2 emissions and heat loss from new developments and increasing renewable energy. London Plan strategies include:

- Encourage the connection to district heating networks where possible and CHP is to be used where feasible.
- Major Domestic areas: achieve a 35% carbon reduction beyond Building Regulations Part L1A 2013 and demonstrate proposals for making up the shortfall to achieve zero carbon
- Major Non-Domestic areas: achieve a 35% carbon reduction beyond Building Regulations Part L2A 2013

Draft New London Plan, (Dec 2017 & Minor Suggested Changes, Aug 2018)

At the time of writing, the current 2016 Plan (The London Plan consolidated with alterations since 2011) is still the adopted Development Plan, but consultation on the Draft New London Plan has recently concluded. The Draft London Plan may be a material consideration in planning decisions and the significance given to it is a matter for the decision maker.

Energy Assessment Guidance (2018)

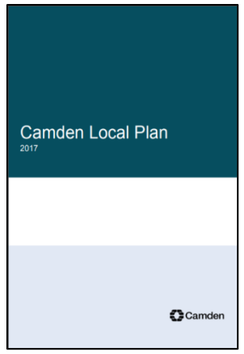


The methodology for calculating regulated and unregulated carbon emission improvements for the preparation of Energy Statements is detailed in the Greater London Authority (GLA) Energy Assessment Guidance. The guide ensures that energy conservation remains an integral part of the development's design and evolution. In October 2018, the mayor of London released an updated version of this guidance.

The main change from previous versions consists of updated carbon emission factors for fuel consumption, ahead of an update to Building Regulations Part L 2013. From January 2019, schemes are expected to use updated SAP 10 carbon emission factors. The Energy Statement previously prepared for the Planning Application of the scheme was set out as per the requirements of the Energy Assessment Guidance (2018). The energy calculations in this Stage 4 report also use the SAP 10 carbon emission factors to demonstrate compliance with London Plan and Camden Council Policies.

2.3 Local Policy

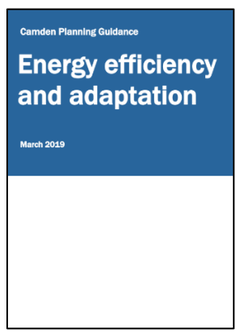
Camden Council Local Plan (2017)



The Camden Local Plan sets out the Council's planning policies, set to ensure development in Camden continues to respond to local priorities, changing circumstances and the borough's unique characteristics.

Chapter 8 details how the council aims to tackle the causes of climate change and pollution and resource management in the borough. Policy CC1 Climate Change Mitigation requires all development to minimise the effects of climate change and encourages all developments to meet the highest feasible environmental standards that are financially viable during construction and occupation.

- Item 8.8 in the Local Plan requires all new residential development to demonstrate a 19% CO_2 reduction below Part L 2013 Building Regulations.
- Item 8.11 in the Local Plan expects developments of five or more dwellings and/or more than 500 m^2 of any gross internal floorspace to achieve a 20% reduction in carbon dioxide emissions from on-site renewable energy generation (which can include sources of site related decentralised renewable energy), unless it can be demonstrated that such provision is not feasible.



Camden Policy Guidance (CPG) Energy Efficiency and Adaption (2019)

The Energy Efficiency and Adaption CPG has been prepared by Camden Council to support the policies in the Local Plan. The guidance forms a Supplementary Planning Document (SPD) which is an additional "material consideration" in planning decisions.

The CPG covers key energy and resources issues in the borough and supports the Local Plan Policy CC1. This document was adopted in March 2019 and replaces CPG3 Sustainability July 2015, last updated March 2018.

This Energy Statement addresses Chapters 2-7 of this CPG, which requires:

- Chapter 2 – All development is expected to reduced carbon dioxide emissions following the Energy Hierarchy.
- Chapter 3 – Natural passive measures should be prioritised over active measures to reduce energy, including:
  - making the most of sunlight and daylight
  - preventing overheating
  - natural cooling
  - thermal performance
  - energy efficient services
- Chapter 4 – All new major developments in Camden are expected to assess the feasibility of decentralised energy network growth.
- Chapter 5 – Developments are to target a 20% reduction in carbon dioxide emissions from on-site renewable energy technologies.
- Chapter 6 – Energy statements are required for all developments ≥500 m^2 (GIA) to demonstrate how the development has been designed in accordance with the Energy Hierarchy and that the energy reductions are in accordance with those set out in Chapter 7.
- Chapter 7:
  - All new developments are to demonstrate compliance with London Plan targets for Carbon emissions (outlined in Section 0).
  - Where the London Plan carbon dioxide targets cannot be met on-site, Camden may accept the provision of carbon reduction measures elsewhere in the borough, or secure a S106 financial contribution to Camden's Carbon Offset fund, which aligns the price per tonne of carbon with the GLA's pricing strategy (which is currently £1,800 per tonne of carbon (covers 30 years)).

Additionally, the hotel development is required to achieve a BREEAM rating of 'Excellent' upon completion. To meet the minimum standards for Ene 01 Energy Performance and Reduction of CO_2 measures, the hotel Building Regulations UK Part L output document (BRUKL) is required to be assessed to determine compliance with the BREEAM credits. This is done through an approved BRE website where the inp. file of the final building model is submitted, and the number of credits is ascertained. The minimum number of credits required for an 'Excellent' rating under Ene 01 is 4 credits. Therefore, the scheme's BRUKL must achieve 4 credits or more to be compliant.

2.4 Energy Targets – Summary

From the national, regional and local policies discussed in this section, the compliance targets for the scheme are summarised below:

Domestic:

- Minimum compliance with Part L1A (2013), as per Building Regulations
- 19% CO2 reduction below Part L 2013 Building Regulations, as per Item 8.8 in the Camden Local Plan (2017)

As the residential units are less than 10 units, they are not considered a 'major housing development' under London Plan and are therefore not required to achieve to the net zero carbon target detailed in the Energy Assessment Guidance 2018.

As the residential units are less than 4 units, they are not required to achieve a 20% reduction in carbon dioxide emissions from on-site renewable energy generation, as per Item 8.11 in the Camden Local Plan (2017).

Non-domestic:

- Minimum compliance with Part L2A (2013), as per Building Regulations
- 35% carbon reduction beyond Building Regulations Part L2A 2013, as per London Plan (2016).
- 20% reduction in carbon dioxide emissions from on-site renewable energy generation, as per Item 8.11 in the Camden Local Plan
- 4 credits under the BREEAM New Construction 2018 Ene 01 calculation

Site-wide:

- 35% carbon reduction beyond Building Regulations Part L (2013), as per London Plan (2016).

3. ASSESSMENT METHODOLOGY

The Stage 4 design has been developed with a view to reducing the regulated energy consumption and associated CO_2 emissions of the Proposed Development in order to ensure compliance with the Building Regulations, London Plan and Camden Council Planning Conditions relating to:

- 'Be Lean' – Passive design and energy efficiency;
- 'Be Clean' – Energy efficient and low carbon supply of services;
- 'Be Green' – On-site renewable energy technologies.

Generally, the strategy is undertaken on the following manner:

- Calculation of the Part L 2013 compliant regulated baseline energy demand and associated CO_2 emissions;
- Determination of the most appropriate energy efficiency and passive design measures.
- Feasibility of connection to, or establishment of district heating networks.
- Identification of the most applicable 'Be Green' renewable energy technologies to further reduce the CO_2 emissions of the development through on-site renewable sources.

The regulated energy consumption and associated CO_2 emissions of the Proposed Development have been estimated using:

- Non-domestic areas: Dynamic Simulation Modelling (DSM) IES VE 2018 compliance software; and
- Domestic areas: Elmhurst Energy Standard Assessment Procedure (SAP) 2012 calculator.

GLA – SAP 10

As discussed in Section 2.2, once the carbon emissions have been established through the Part L assessment methodology, they must then be converted from SAP 2012 to SAP 10 carbon emission factors, to determine the overall percentage improvement in accordance with the GLA Energy Assessment Guidance (2018). The changes to these carbon factors are shown in Table 4. The energy calculations and carbon emissions reported in this Stage 4 Energy Report have been converted by the SAP 10 carbon emission factors using the GLA spreadsheet reporting tool to review compliance with the relevant policies. See Appendix G – GLA Energy Assessment Reporting Spreadsheet.

TABLE 4. SAP 2012 AND SAP 10 CARBON EMISSION FACTORS COMPARISON.

Fuel Type	SAP 2012	SAP 10
Natural Gas	0.216	0.210
Grid Electricity	0.519	0.233
Bespoke Carbon Factor	0.3207	0.2249

The bespoke carbon factor shown in Table 4 is the carbon factor for the hotel domestic hot water system which is heater through a bivalent system of gas-fired water heaters and air source heat pumps. The carbon emission factor for this system has been calculated by the IES VE 2018 modelling software based on the system arrangement discussed in Appendix A – Building Services Data.

3.1 Baseline Energy Assessment

A Baseline energy assessment sets the emission level by which Energy Hierarchy improvements are measured against.

In line with the GLA Energy Assessment Guidance, the Baseline scenario should have an emission rate of regulated CO_2 emissions that is compliant with 2013 Building Regulations Part LA. This Baseline Energy Assessment is then used to further calculate the additional carbon emission savings required by London Plan and Camden Council.

The Baseline building would have fabric U-values and an air permeability as detailed in the National Calculation Modelling (NCM) guide. The notional/baseline building geometry is identical to the actual proposed design, except for the amount of glazing, which is limited to 40% of the façade if a space is expected to be day-lit.

The building services are to be specified to meet the system efficiencies outlined in the Non-domestic Building Services Compliance Guide, on the basis that heating is provided by gas boilers and that any active cooling and ventilation is provided by electrically powered equipment.

Results

The energy modelling of the development with the baseline specification defined above results in a Target Emissions Rate (TER) of 123.401 tonnes of CO_2 per year for the entire site (shown in Table 5). This forms the baseline against which the further stages of the energy hierarchy will be compared to.

TABLE 5. BASELINE CARBON EMISSIONS, PART L 2013 COMPLIANT.

Element	Regulated CO_2 Emissions (tonnes/yr)
Domestic	1.691
Non-Domestic	121.710
Site-wide Development	123.401

3.2 Energy Hierarchy

Once the Baseline emissions level has been established, carbon saving measures are considered and implemented in accordance with the Mayor of London's Energy Hierarchy (shown in Figure 2).

FIGURE 2. MAYOR OF LONDON'S ENERGY HIERARCHY.

The development must achieve reductions in carbon dioxide emissions through the use of thermal improvements to fabric (a 'fabric first' approach), to reduce heating demand, and to reduce internal gains and solar gains (to reduce the requirement for cooling). This is then followed by other clean energy solutions (energy efficiency improvements, consideration of district heating etc.) and finally, the use of renewable energy technologies, where practical. This hierarchy complements the integrated approach to the sustainable energy objectives of the London Plan and Camden Council Local Plan and reflects the aspirations of the regional and national policies.

The following sections detail the 'be lean', 'be clean' and 'be green' measures that have been incorporated into the Developed Design. The Results section then demonstrates the CO_2 reduction that have been achieved with the inclusion of the Energy Hierarchy elements, to calculate the total CO_2 reductions against the Baseline Scenario.

4. 'BE LEAN'

The following section outlines the 'Be Lean' passive design and energy efficiency measures that have been implemented into the Developed Design of 115 – 119 Camden High Street.

4.1 Passive Design Measures

Passive design measures are those which reduce the demand for energy within buildings, without consuming energy in the process. These are the most effective and robust measures for reducing CO_2 emissions as the performance of the solutions, for example greater wall insulation, is unlikely to deteriorate significantly with time, or be subject to change by future property owners. In this sense, we can be confident that the benefits of the measures will continue at a similar level for the duration of their installation.

When designing in accordance with Part LA 2013, there are minimum backstop fabric performance targets that must be achieved to comply with the regulations. Additionally, to achieve a Building Emission Rate (BER) that meets or exceeds the Target Emission Rate (TER) as required by Part L, the fabric performance must be equal to or better than the Notional / Baseline building. Table 6 illustrates the limiting and enhanced fabric performance values of Part L (2013).

TABLE 6. PART L (2013) LIMITING AND NOTIONAL U-VALUES.

Parameter	Part L 2013 Limiting Values	Notional / Baseline Building
External Wall U-value (W/m^2.K)	0.35	0.26
Roof U-value (W/m^2.K)	0.25	0.18
Ground Floor U-value (W/m^2.K)	0.25	0.22
Window U-value (W/m^2.K)	2.20	1.60
Entrance Door U-value (W/m^2.K)	2.20	1.60
Air Permeability (m^3/h.m^2 at 50Pa)	10	5

In order to meet the carbon emission reduction targets for the project, the fabric specification of the Developed Design includes for high-performance u-values that are an enhancement on those used by the Notional / Baseline scenario. The Devolved Design Fabric Performance is detailed in Table 7 and Table 8.

Glazed Elements – Hotel & Residential

TABLE 7. MODELLING INPUTS FOR GLAZING SPECIFICATION

Element	U-value incl. Frame (W/m^{2}K)	G-value	Light transmittance	Frame percentage (%)
Windows	1.20	0.40	0.65	10
Rooflight	1.20	0.40	0.65	10
Glazed pedestrian doors	1.20	0.4	0.65	10

Opaque Building Fabric – Hotel & Residential

TABLE 8. MODELLING INPUTS FOR FABRIC PERFORMANCE

Element	Description	U-value incl. Frame (W/m^{2}K)
Roof		0.10
Pedestrian doors	Non-glazed	2.20
Ground slab	Ground contact floors	0.15
Basement wall	Walls below ground	0.15
External wall		0.15

Air Permeability

The worst acceptable air permeability is 10 m^3/h.m^2 at 50 Pa, however the Developed Design is targeting air permeability 4 m^3/h.m^2 at 50 Pa, which is a 60% improvement over limiting value for Building Regulations.

4.2 Energy Efficient Measures

Energy efficiency measures are those which seek to service the demand for energy (i.e. the remaining demand after implementation of passive design measures) in the most efficient way. All building services installed within the scheme will be required to comply with the 2013 version of the Non-domestic Building Services Compliance Guide.

This document details items such as minimum heating/cooling plant seasonal efficiencies, maximum ventilation specific fan powers, zoning and controls requirements etc. It is the responsibility of both the design team and contractor to ensure that the works proposed for the building are in compliance with this document.

The next section describes the HVAC strategy and efficient systems that have been included in the Design Development of the proposed scheme. Further detail regarding the system efficiencies has been provided in Appendix A – Building Services Data.

Hotel Services

Heating & Cooling
The hotel space heating and cooling is to be provided through a mixture of mechanical systems:

- The hotel guest rooms will be heated and cooled via zonal fan-coil units (FCUs) in each room. The FCUs will be connected as a variable refrigerant flow (VRF) system, with roof mounted high efficiency air source heat pumps (ASHPs). This system may recover heat or coolth from connected area to minimise energy consumption.
- An additional variable refrigerant flow (VRF) system has been specified to heat and cool some of the hotel amenity spaces such as the Restaurant, Reception, Back of House areas etc. FCUs in each space will supply air from the VRF system which is connected to roof mounted high efficiency ASHPs.
- Electric panel heaters are provisionally allowed for in the circulation areas, stairwells and public WCs in the hotel.
- A number of DX split systems will serve the cooling to the Comms Rooms.

Domestic Hot Water
Large volumes of domestic hot water are required in a hotel which must be generated and stored for delivery at peak conditions. The notional/basline domestic hot water system (DHW) uses condensing gas-fired boilers with insulated storage vessels.

For the developed scheme, an ASHP shall be provided to pre-heat the domestic hot water to 45°C. The air source heat pump system shall be sized to pre-heat 60% of the domestic hot water demand (to 45°C) via plate heat exchangers and a buffer vessel. The pre-heated domestic hot water shall then be fed to the gas-fired hot water heaters to heat the domestic hot water to 60°C. 2,000 litres of hot water storage will be provided.

Ventilation

- Perimeter hotel guest rooms will be served by individual, localised, high efficiency mechanical ventilation heat recovery (MVHR) units in each guest room. The exception to this is rooms 210-216 which shall be served by the central AHU due to structural constraints.
- Internal hotel guest rooms and all linen rooms (without windows) will be served by an air handling unit (AHU) with high efficiency heat recovery. The system will serve all areas with a specific fan power (SFP) of no more than 1.6 W/l/s and a heat recovery effectiveness of at least 80%.
- Two separate MVHR units will serve the Basement and Ground Floor, with an SFP no greater than 1.8 W/l/s and a minimum HR efficiency of 80%.

Lighting

All general lighting will be using LED luminaires at minimum efficacy of 100 lm/w. Any display lighting in the hotel will target an efficiency of 35 lm/W.

Metering & Controls

Energy metering of all major plant equipment and will be provided to satisfy the requirements of Approved Document Part L2A and allow the monitoring of key energy and utility consumers within the building.

A central Building Management System will be provided meter energy consumption across the development.

Residential Services

Heating

- Space heating will be provided through dedicated high efficiency gas-fired condensing boilers to serve each apartment. LTHW underfloor heating shall be provided to each habitable space within the apartments, with electric heating provided to all wet rooms.
- Electric heater panels will be provided in the Landlord's areas including the Ground Floor lobby and circulation spaces.
- No space cooling will be provided to the residential areas.

Cooling

The Energy Statement produced for Planning Application at RIBA Stage 2 included fan-coil units (FCUs) in connected as a variable refrigerant flow (VRF) system, with roof mounted high efficiency air source heat pumps providing cooling to the residential units. Later in Developed Design stage, the Planning Consultant, Gerald Eve advised that this air conditioning system would not be suitable for the affordable residential properties (RPs) and PSH were asked to the remove mechanical cooling from the scheme.
The active cooling has been removed within the Stage 4 energy calculations in this report, however, calculations have been carried out to confirm that the residential units still achieve compliance with CIBSE TM59 without the active cooling. This is in accordance with the GLA Cooling Hierarchy.

Domestic Hot Water

DHW will be provided to the apartments through high efficiency gas-fired condensing boilers.

Ventilation

Local mechanical ventilation heat recovery (MVHR) units will be provided within each apartment.

Lighting

All general lighting will be using LED luminaires at minimum efficacy of 100 lm/w.

Metering & Controls

Energy metering of all major plant equipment and will be provided to satisfy the requirements of Approved Document Part L1A and allow the monitoring of key energy and utility consumers within the building.

5. 'BE CLEAN'

The GLA's energy policy reaffirms the view that energy generated by centralised power stations and transmitted through the national grid is highly inefficient and wasteful. One of GLA's top priorities for reducing London's CO_2 emissions is to reduce the capital's reliance on centralised power stations. This means increasing the use of local, low-carbon energy supplies through decentralised energy systems.

London Plan requires all major developments to assess the feasibility of connecting to an existing decentralised energy network. The Energy Statement submitted to Camden Council for Planning Approval demonstrated that the scheme was not within a sufficient proximity to any existing district energy networks.

The closet potential district heating network is known as 'Euston Road' (shown in Figure 3), with the closest point being 1km away on Pancras Road. Due to the scale of infrastructure required to connect to this network and the practical heat loss incurred over such distance, it is not deemed practical to provide a connection to this potential network. Therefore, the scheme will not provide any physical pipework or equipment for future connection to any district heat networks at this time.

To summarise, no carbon reduction can be attributed to a connection to a district heating system and therefore, the 'Be Clean' scenario.

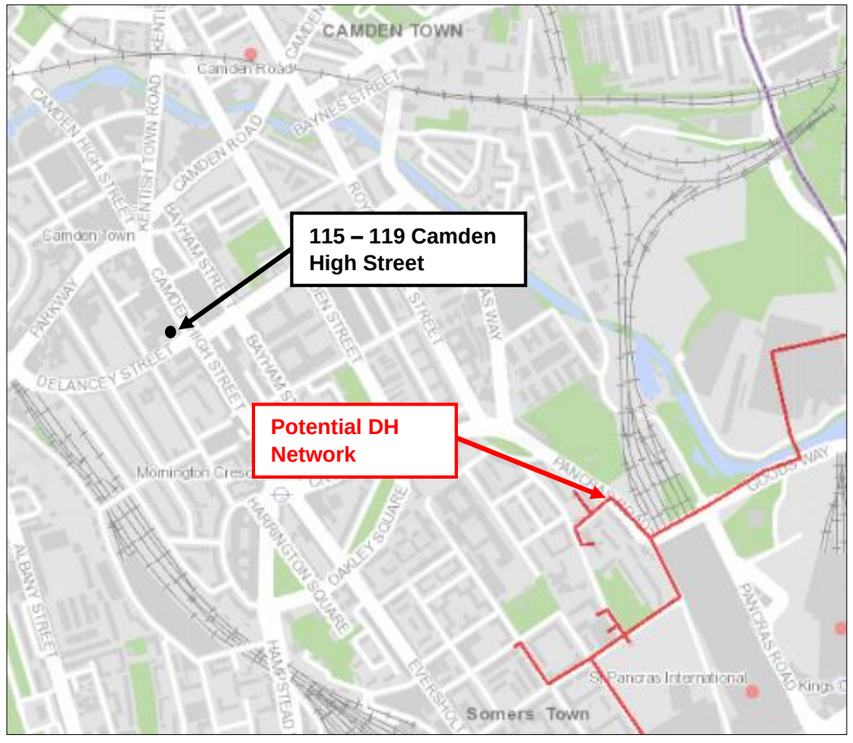


FIGURE 3. LONDON HEAT MAP: 1KM RADIUS – NW1 7JR

6. ‘BE GREEN’

Domestic

The Energy Statement produced for Planning Application at RIBA Stage 2 included fan-coil units (FCUs) in connected as a variable refrigerant flow (VRF) system, with roof mounted high efficiency air source heat pumps providing cooling to the residential units. This contributed to savings in the ‘be green’ stage of the Energy Hierarchy.

Later in Developed Design stage, the Planning Consultant, Gerald Eve advised that this air conditioning system would not be suitable for the affordable residential properties (RPs) and PSH were asked to the remove mechanical cooling from the scheme.

The active cooling provided by ASHPs has been removed within the Stage 4 energy calculations in this report, therefore removing the carbon savings associated with the ‘be green’ stage for the domestic units. Furthermore, calculations have been carried out to confirm that the residential units still achieve compliance with CIBSE TM59 without the active cooling. This is in accordance with the GLA Cooling Hierarchy.

Non - Domestic

As discussed in Section 4.2, Energy Efficiency Measures, air source heat pumps (ASHPs) will be utilised to provide the hotel’s space heating and cooling, and to pre-heat 60% of the hotel domestic hot water load.

ASHPs are an extremely efficient way of providing both heating and cooling to an internal building environment. Low-temperature heat, which occurs naturally in the air, is converted to high-grade heat by using an electrically driven pump. With a reverse-cycle heat pump system, the unit can be run in reverse to provide cooling, with the possibility of having simultaneous heating and cooling with a Variable Refrigerant Flow (VRF) system.

The principle of operation revolves around the refrigerant (with a very low boiling point) being heated by the outside air through an evaporator heat exchanger and pumped by a compressor to the indoor heat exchanger whereby it cools and condenses back to a liquid whilst expelling heat into the space. The system is therefore dependent on outside air temperature and requires a defrost cycle (reverse operation but without cooling the building) to be implemented in extreme winter conditions to prevent ice build-up on the evaporator.

VRF systems allow for heat recovery when providing heating and cooling simultaneously, applying the heat extracted from the areas requiring cooling into the areas require heating. This results in extraordinarily high seasonal efficiencies for both heating and cooling.

High efficiency air source heat pumps also offer opportunity to reduce carbon emissions associated with domestic hot water generation. Rejected heat from the cooling process can be used to pre-heat the water being heated by the gas-fired water heaters. Such technology also significantly reduces the need to burn natural gas on site and thus reduces the impact on air quality locally when compared to a standalone natural gas fired boiler system.

Large volumes of domestic hot water are required in a hotel which must be generated and stored for delivery at peak conditions. The notional domestic hot water system (DHW) uses condensing gas-fired boilers with insulated storage vessels.

For the developed scheme, an ASHP shall be provided to pre-heat the hotel’s domestic hot water to 45°C. The air source heat pump system shall be sized to pre-heat 60% of the domestic hot water demand (to 45°C) via plate heat exchangers and a buffer vessel. The pre-heated domestic hot water shall then be fed to the gas-fired hot water heaters to heat the domestic hot water to 60°C. 2,000 litres of hot water storage will be provided.

It is proposed that an ASHP can pre-heat the domestic hot water load. Separate high efficiency ASHP units will be required for the VRF space heating and cooling. The efficiencies for the proposed ASHPs have been included in Appendix A – Building Services Data.

7. RESULTS

This section reviews the results of the thermal modelling calculations against the Part L and Planning Policies, using the SAP 10 carbon emissions factors and the GLA emission reporting calculation methodology.

Site-wide:

The energy modelling results shows in Table 9 of the Developed Design demonstrate that the site has reduced its overall carbon emissions by 46.1% from the Part L compliant baseline scenario. This exceeds the 35% percentage reduction beyond Part L required by London Plan (2016).

TABLE 9. OVERALL CARBON EMISSION REDUCTION RESULTS FOR DEVELOPED DESIGN.

Element	Baseline Scenario Regulated CO_2 Emissions (tonnes/yr)	Stage 4 Developed Design Regulated CO_2 Emissions (tonnes/yr)	Regulated Savings (tonnes CO_2 /yr)	Regulated Savings of CO_2 (%)
Domestic	1.691	1.309	0.381	22.6%
Non-Domestic	121.710	65.381	56.329	46.3%
Site-wide Development	123.401	66.488	56.710	46.1%

In accordance with the Energy Targets detailed in Section 2.4, the results in Table 9 confirm that the following compliance targets have been met:

Domestic:

- Minimum compliance with Part L1A (2013), as per Building Regulations
- 22.6% CO_2 reduction below Part L 2013 Building Regulations. This exceeds the 19% target required by Item 8.8 in the Camden Local Plan (2017)

As the residential units are less than 10 units, they are not considered a ‘major housing development’ under London Plan and are therefore not required to achieve to the net zero carbon target detailed in the Energy Assessment Guidance 2018. However, it has been demonstrated that the Domestic units have reduced their CO_2 emissions by 22.6%.

As the residential units are less than 4 units, they are not required to achieve a 20% reduction in carbon dioxide emissions from on-site renewable energy generation, as per Item 8.11 in the Camden Local Plan (2017). However, a 22.6% CO_2 emission reduction for the domestic units has been achieved purely through ‘be lean’ passive design and energy efficient systems, as shown in Table 10.

TABLE 10. DOMESTIC CARBON EMISSION RESULTS FOR ENERGY HIERARCHY BREAKDOWN.

Element	Regulated CO_2 Emissions (tonnes/yr)	Regulated Savings (tonnes CO_2 /yr)	Regulated Savings of CO_2 (%)
Baseline Scenario	1.691	-	-
‘Be Lean’	1.309	0.382	22.6%
‘Be Clean’	1.309	0	0%
‘Be Green’	1.309	0	0%
Total Cumulative Savings	-	0.382	22.6%

Non-domestic:

- Minimum compliance with Part L2A (2013), as per Building Regulations
- 46.3% carbon reduction beyond Building Regulations Part L2A 2013. This exceeds the 35% target required by London Plan (2016).
- 38.1% reduction in carbon dioxide emissions from on-site renewable energy generation. This exceeds the 20% target required by Item 8.11 in the Camden Local Plan

Table 11 confirms the breakdown of energy emissions from the Energy Hierarchy from the non-domestic elements. It is confirmed that the implementation of ASHPs which contribute to the 'be green' onsite renewable energy generation have resulted CO_2 emissions reduction of 38.1%. This exceeds the Camden Council target of 20%.

TABLE 11. NON-DOMESTIC CARBON EMISSION RESULTS FOR ENERGY HIERARCHY BREAKDOWN.

Element	Regulated CO_2 Emissions (tonnes/yr)	Regulated Savings (tonnes CO_2 /yr)	Regulated Savings of CO_2 (%)
Baseline Scenario	121.710	-	-
'Be Lean'	111.797	9.913	8.14%
'Be Clean'	111.797	0	0
'Be Green'	65.381	46.416	38.14%
Total Cumulative Savings	-	56.329	46.3%

7.1 BREEAM Ene 01

The 'Be Green' BRUKL and inp. file have been submitted to the BRE and to be assessed under the 'alternative assessment methodology' for the BREEAM New Construction 2018 Design Stage Assessment. Figure 4 is the output Energy Performance Ratio calculation results taken as a screen shot from the BRE website on 27.05.2021.

Credits are awarded for the EPR score based on the benchmarks in Table 12. The scheme has achieved an EPR of 0.696 and therefore 6 credits can be awarded. This meets the minimum standards in Ene 01 for a BREEAM 'Outstanding' rating.

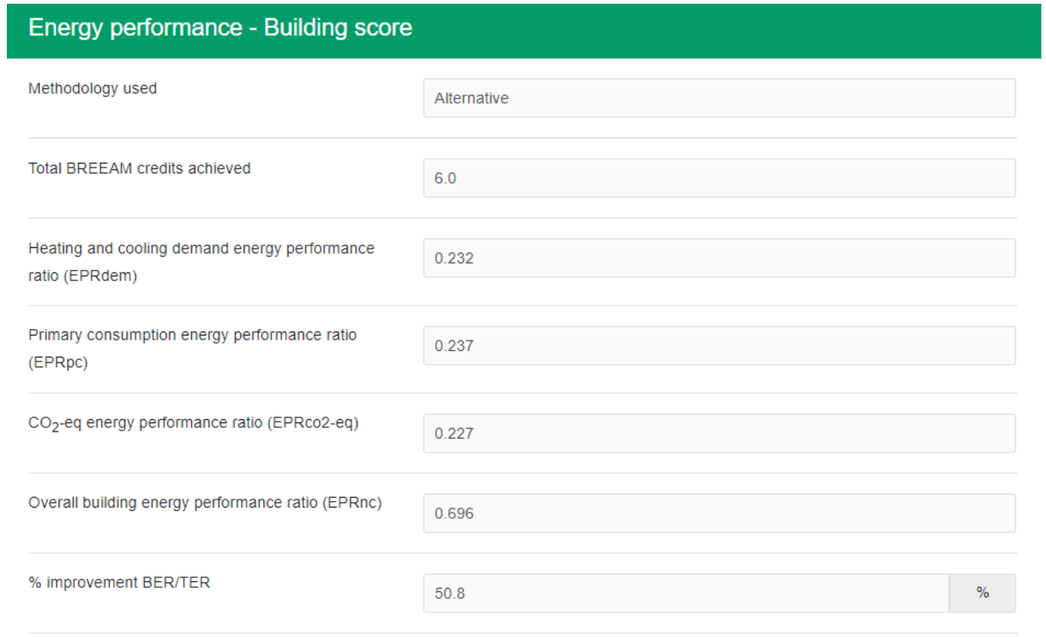


FIGURE 4. DEVELOPED DESIGN EPR RESULTS FROM BRE CALCULATION ON BREEAM PROJECTS.

TABLE 12. BREEAM NC 2018 ENE 01 EPR AND CREDIT BENCHMARKING.

BREEAM Credits	EPR	Minimum Standard Rating
1	0.1	
2	0.2	
3	0.3	
4	0.4	Excellent
5	0.5	
6	**0.6**	Outstanding
7	0.7	
8	0.8	
9	0.9 and net zero carbon	

Competent Energy Specialist

This report has been prepared by Jennifer Pugh, a Senior Sustainability Consultant who has 6 years' experience developing energy strategies and carrying out passive design and LZC assessments for buildings in the commercial sector and is a CIBSE Low Carbon Consultant. Jennifer is also a licensed BREEAM Assessor and BREEAM Advisory Professional.

To ascertain the regulated carbon emissions for this analysis, Part L thermal modelling calculations have been carried out using IESVE 2018 compliance software by Neville Duggan, an accredited Level 5 Energy Assessor.

Together, Jennifer and Neville meet the BREEAM definition of an 'energy specialist', e.g. individuals who have acquired substantial expertise or a recognised qualification for undertaking assessments, designs and installations of low carbon solutions in the commercial buildings sector and are not professionally connected to a single low or zero carbon technology or manufacturer.

7.2 Limitations

The appraisals within this statement are based on standard calculation methodology required for Part L using National Calculation Methodology (NCM) templates and should not be understood as a predictive assessment of future energy requirements or otherwise. Occupants will operate their systems differently whilst the weather will be different from the assumptions made by Part L approved calculation methods, leading to differing energy requirements.

8. CONCLUSION

Table 13 demonstrates that the following compliance targets have been met or exceeded by the developed design of 115 – 119 Camden High Street.

Domestic:

- Minimum compliance with Part L1A (2013), as per Building Regulations
- 22.6% CO_2 reduction below Part L 2013 Building Regulations. This exceeds the 19% target required by Item 8.8 in the Camden Local Plan (2017)

Non-domestic:

- Minimum compliance with Part L2A (2013), as per Building Regulations
- 46.3% carbon reduction beyond Building Regulations Part L2A 2013. This exceeds the 35% target required by London Plan (2016).
- 38.1% reduction in carbon dioxide emissions from on-site renewable energy generation. This exceeds the 20% target required by Item 8.11 in the Camden Local Plan

Site-wide:

- 46.1% carbon reduction beyond Building Regulations Part L (2013). This exceeds the target of 35% required by London Plan (2016).

TABLE 13. OVERALL CARBON EMISSION REDUCTION RESULTS FOR DEVELOPED DESIGN OF 115 – 119 CAMDEN HIGH STREET.

Element	Baseline Scenario Regulated CO_2 Emissions (tonnes/yr)	Stage 4 Developed Design Regulated CO_2 Emissions (tonnes/yr)	Regulated Savings (tonnes CO_2 /yr)	Regulated Savings of CO_2 (%)
Domestic	1.691	1.309	0.381	22.6%
Non-Domestic	121.710	65.381	56.329	46.3%
Site-wide Development	123.401	66.488	56.710	46.1%

The appropriate GLA calculation methodology has been applied to demonstrate compliance and the energy calculations have been carried out by an accredited Energy Assessor.

The scheme achieves a BREEAM Ene 01 EPR of 0.696, which achieves the minimum standards for BREEAM 'Outstanding' in the Ene 01 issue.

Through a combination of the passive design measures, energy efficient system design and the inclusion of air source heat pumps, the site-wide scheme achieves an 46.1% carbon emission reduction against the Part L target emissions rate.

APPENDIX A – BUILDING SERVICES DATA

Hotel Services

Service Detail	Further Information / Comment
Heating	
System 1: VRF ASHP serving FCUs in Reception, Office, Restaurant, Team Room & Kitchen	COP/EER (nominal) in heating mode = 4.48/4.53
System 2: VRF ASHP servicing FCUs in guest bedrooms	• 1st floor COP/EER (nominal) in heating mode = 4.48/4.53 • 2nd floor COP/EER (nominal) in heating mode = 4.48/4.53 • 3rd floor COP/EER (nominal) in heating mode = 5.26/4.598 • 4th floor COP/EER (nominal) in heating mode = 4.48/4.53
System 3: Electric panel heaters – public WCs & circulation spaces	
Cooling	
System 1: VRF ASHP serving FCUs in Reception, Office, Restaurant, Team Room & Kitchen	COP/EER (nominal) in cooling mode=4.48/4.53
System 2: VRF ASHP servicing FCUs in guest bedrooms	• 1st floor COP/EER (nominal) in cooling mode = 4.48/4.53 • 2nd floor COP/EER (nominal) in cooling mode = 4.48/4.53 • 3rd floor COP/EER (nominal) in cooling mode = 5.26/4.598 • 4th floor COP/EER (nominal) in cooling mode = 4.48/4.53
System 3: DX Split systems serving Comms Room	• Basement Comms EER/SEER = 3.45/8.00 • 3rd Floor Comms EER/SEER = 4.61/9.00
Domestic Hot Water	
Central gas-fired water heaters with ASHP pre-heat	Gas-fired water heaters efficiency = 98% Standby loss PCM = 2 x 780 Mj/month = 1560 Mj/month 2000 litres hot water storage. Heat Loss (EN 12897) = 157.5W ASHP CoP of 3.19
Ventilation	
System 1 Ground Floor MVHR in communal areas	• Ground Floor SFP = 1.8 W/l.s. • Heat recovery efficiency = 80%
System 2 Basement MVHR HR in communal areas	• Basement SFP = 1.41 W/l.s. • Heat recovery efficiency = 80.5%
System 3 Internal guest rooms – AHU with HR	• SFP=1.546 W/l.s • Heat recovery efficiency = 84.8%
System 4 Perimeter guest rooms with MVHR	• SFP=0.57 W/l.s • Heat recovery efficiency = 85%
Lighting	
LED Lighting throughout	Building average: 100 luminaire lumens per circuit Watt.
Controls	
BMS	Time and temperature zone control

Residential Services

Service Detail	Further Information / Comment
Heating	
System 1: Dedicated gas-fired condensing boiler to serve each apartment	93% efficient
System 2 Electric panel heaters – landlord's area (ground floor lobby and circulation spaces	
Cooling	
Not Specified	
Domestic Hot Water	
Central gas-fired condensing boiler to serve each apartment	Gas-fired boiler efficiency = 89.10%
Ventilation	
MVHR in all apartments	• SFP = 0.5 W/l.s. • Heat recovery efficiency = 90%
Lighting	
LED Lighting throughout	Building average: 100 luminaire lumens per circuit Watt.
Controls	
BMS	Time and temperature zone control

APPENDIX B – BASELINE BRUKL

APPENDIX C – STAGE 4 ‘BE LEAN’ BRUKL

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

115 - 119 - Camden High Street - Lean

As designed

Date: Thu May 13 17:10:41 2021

Administrative information

Building Details

Address: Camden High Street, London,

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.13

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.13

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

Certifier details

Name: PSH

Telephone number:

Address: 167-169 Great Portland Street, London, W1W 5PF

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

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	58.8
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	58.8
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	50.7
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

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

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

Building fabric

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.15	0.15	1_000003:Surf[2]
Floor	0.25	0.15	0.15	1_000003:Surf[0]
Roof	0.25	0.1	0.1	1_000003:Surf[1]
Windows***, roof windows, and rooflights	2.2	1.2	1.2	1_000011:Surf[0]
Personnel doors	2.2	1.6	1.6	1_00000F:Surf[0]
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building

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

* There might be more than one surface where the maximum U-value occurs.
** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.
*** Display windows and similar glazing are excluded from the U-value check.
N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
$m^3/(h.m^2)$ at 50 Pa	10	4

Building services

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

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

1- Gas Fired LTHW Radiators

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	0.95	-	0.2	0	-
Standard value	0.91*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

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

2- LTHW and ASHP FC Units

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	0.95	3.5	0	1.6	0.75
Standard value	0.91*	3.2	N/A	1.6^	0.65
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

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

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

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

Local mechanical ventilation, exhaust, and terminal units

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

Zone name	**SFP [W/(l/s)]**									**HR efficiency**	
ID of system type	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	**Zone**	**Standard**
-1 Lounge	-	-	0.4	-	-	-	-	-	-	-	N/A
-1 Kitchen & Store	-	-	0.5	-	-	-	-	-	0.5	-	N/A
-1 WC Staff	-	-	0.4	-	-	-	-	-	-	-	N/A
-1 Staff Tea	-	-	0.4	-	-	-	-	-	-	-	N/A
-1 WC	-	-	0.4	-	-	-	-	-	-	-	N/A
00 Hotel Lounge	-	-	-	-	-	-	-	0.4	-	-	N/A
00 Hotel Reception	-	-	-	-	-	-	-	0.4	-	-	N/A
00 Office	-	-	0.4	-	-	-	-	-	-	-	N/A
00 Wc	-	-	0.4	-	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
01 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
01 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
01 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
01 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
01 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
01 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
01 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
01 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
01 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
01 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
01 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
01 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
01 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
01 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
01 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
01 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
01 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
01 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
01 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
01 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
01 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
03 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
03 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
03 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
03 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
03 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
03 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
03 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
03 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
03 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
03 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
03 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
03 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
03 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
03 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
03 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
03 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
03 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
03 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
04 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
04 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
04 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
04 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	**Zone**	**Standard**
04 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
04 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
04 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
04 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
04 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
04 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
04 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
04 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
04 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
04 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
04 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
04 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
04 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
04 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
01 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
01 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
01 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
01 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
01 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
01 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
01 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
01 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
01 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
01 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
01 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
01 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
01 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
01 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
01 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
01 Guest Room	-	-	-	-	-	-	-	0.4	-	-	N/A
01 Guest Room	-	-	0.4	-	-	-	-	-	-	-	N/A
01 Guest Room	-	-	0.4	-	-	-	-	-	-	-	N/A
01 Guest Room	-	-	0.4	-	-	-	-	-	-	-	N/A
01 Guest Room	-	-	0.4	-	-	-	-	-	-	-	N/A
01 Guest Room	-	-	0.4	-	-	-	-	-	-	-	N/A

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
-1 Lounge	-	87	100	285
-1 Comms	87	-	-	65
-1 Circulation	-	87	-	68
-1 Kitchen & Store	-	87	-	340

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
-1 Store - Linen	87	-	-	20
-1 WC Staff	-	87	-	43
-1 Staff Tea	87	-	-	190
-1 Circulation	-	87	-	47
-1 WC	-	87	-	56
-1 Circulation	-	87	-	20
00 Stairs	-	87	-	86
00 Circulation	-	87	-	76
00 LV Switch	87	-	-	92
00 Store Bins	87	-	-	35
00 Luggage	87	-	-	16
00 Substations	87	-	-	171
00 Store Residential	87	-	-	19
00 Lobby Residential	-	87	-	92
00 Hotel Lounge	-	87	100	120
00 Lobby Hotel	-	87	-	37
00 Retail	-	87	100	1771
00 Store Retail	87	-	-	21
00 Store Bin	87	-	-	15
00 Store Cycle	87	-	-	14
00 Hotel Reception	-	87	100	184
00 Office	87	-	-	149
00 Wc	-	87	-	64
00 Lobby BOH	-	87	-	43
01 Stairs	-	87	-	46
01 Stairs	-	87	-	33
01 Guest Room	-	87	-	35
01 Guest Room	-	87	-	34
01 Store Linen	87	-	-	19
01 Guest Room	-	87	-	44
01 Circulation	-	87	-	218
01 Guest Room	-	87	-	41
01 Guest Room	-	87	-	40
01 Guest Room	-	87	-	31
01 Guest Room	-	87	-	31
01 Guest Room	-	87	-	31
01 Guest Room	-	87	-	31
01 Guest Room	-	87	-	31
01 Guest Room	-	87	-	42
01 Guest Room	-	87	-	50
01 Guest Room	-	87	-	31
01 Guest Room	-	87	-	31
01 Guest Room	-	87	-	31

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
01 Stairs	-	87	-	38
01 Guest Room	-	87	-	40
01 Guest Room	-	87	-	34
01 Guest Room	-	87	-	29
01 Guest Room	-	87	-	30
01 Guest Room	-	87	-	30
01 Guest Room	-	87	-	30
03 Stairs	-	87	-	46
03 Guest Room	-	87	-	35
03 Guest Room	-	87	-	34
03 Store Linen	87	-	-	19
03 Guest Room	-	87	-	44
03 Circulation	-	87	-	218
03 Guest Room	-	87	-	42
03 Guest Room	-	87	-	50
03 Guest Room	-	87	-	31
03 Guest Room	-	87	-	31
03 Guest Room	-	87	-	31
03 Stairs	-	87	-	38
03 Guest Room	-	87	-	40
03 Guest Room	-	87	-	34
03 Guest Room	-	87	-	29
03 Guest Room	-	87	-	30
03 Guest Room	-	87	-	30
03 Guest Room	-	87	-	30
03 Guest Room	-	87	-	48
03 Guest Room	-	87	-	47
03 Guest Room	-	87	-	48
03 Guest Room	-	87	-	49
04 Stairs	-	87	-	46
04 Guest Room	-	87	-	35
04 Guest Room	-	87	-	34
04 Store Linen	87	-	-	19
04 Guest Room	-	87	-	44
04 Circulation	-	87	-	218
04 Guest Room	-	87	-	42
04 Guest Room	-	87	-	50
04 Guest Room	-	87	-	31
04 Guest Room	-	87	-	31
04 Stairs	-	87	-	38
04 Guest Room	-	87	-	34
04 Guest Room	-	87	-	29
04 Guest Room	-	87	-	30

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
04 Guest Room	-	87	-	30
04 Guest Room	-	87	-	30
04 Guest Room	-	87	-	37
04 Guest Room	-	87	-	40
04 Guest Room	-	87	-	45
04 Guest Room	-	87	-	42
04 Plant	87	-	-	79
04 Guest Room	-	87	-	40
04 Guest Room	-	87	-	52
01 Stairs	-	87	-	46
01 Stairs	-	87	-	33
01 Guest Room	-	87	-	35
01 Guest Room	-	87	-	34
01 Store Linen	87	-	-	19
01 Guest Room	-	87	-	44
01 Circulation	-	87	-	218
01 Guest Room	-	87	-	41
01 Guest Room	-	87	-	40
01 Guest Room	-	87	-	31
01 Guest Room	-	87	-	31
01 Guest Room	-	87	-	31
01 Guest Room	-	87	-	31
01 Guest Room	-	87	-	31
01 Guest Room	-	87	-	42
01 Guest Room	-	87	-	50
01 Guest Room	-	87	-	31
01 Guest Room	-	87	-	31
01 Guest Room	-	87	-	31
01 Stairs	-	87	-	38
01 Guest Room	-	87	-	40
01 Guest Room	-	87	-	34
01 Guest Room	-	87	-	29
01 Guest Room	-	87	-	30
01 Guest Room	-	87	-	30
01 Guest Room	-	87	-	30
03 Stairs	-	87	-	25
03 Comms	87	-	-	33

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

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
-1 Lounge	N/A	N/A
-1 Staff Tea	N/A	N/A
00 Hotel Lounge	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
00 Retail	NO (-90.1%)	NO
00 Hotel Reception	NO (-99.4%)	NO
00 Office	N/A	N/A
01 Guest Room	N/A	N/A
01 Guest Room	N/A	N/A
01 Guest Room	N/A	N/A
01 Guest Room	NO (-83.8%)	NO
01 Guest Room	NO (-58.8%)	NO
01 Guest Room	NO (-68.7%)	NO
01 Guest Room	NO (-68.6%)	NO
01 Guest Room	NO (-69.3%)	NO
01 Guest Room	NO (-68.3%)	NO
01 Guest Room	NO (-68.8%)	NO
01 Guest Room	NO (-78.8%)	NO
01 Guest Room	NO (-72.8%)	NO
01 Guest Room	NO (-66.8%)	NO
01 Guest Room	NO (-67%)	NO
01 Guest Room	NO (-67.2%)	NO
01 Guest Room	NO (-73.4%)	NO
01 Guest Room	N/A	N/A
01 Guest Room	N/A	N/A
01 Guest Room	N/A	N/A
01 Guest Room	N/A	N/A
01 Guest Room	N/A	N/A
03 Guest Room	N/A	N/A
03 Guest Room	N/A	N/A
03 Guest Room	N/A	N/A
03 Guest Room	NO (-77.5%)	NO
03 Guest Room	NO (-71.2%)	NO
03 Guest Room	NO (-63.9%)	NO
03 Guest Room	NO (-63.8%)	NO
03 Guest Room	NO (-63.8%)	NO
03 Guest Room	NO (-70.7%)	NO
03 Guest Room	N/A	N/A
03 Guest Room	N/A	N/A
03 Guest Room	N/A	N/A
03 Guest Room	N/A	N/A
03 Guest Room	N/A	N/A
03 Guest Room	NO (-87%)	NO
03 Guest Room	NO (-82%)	NO
03 Guest Room	NO (-83.8%)	NO
03 Guest Room	NO (-84.3%)	NO
04 Guest Room	N/A	N/A
04 Guest Room	N/A	N/A
04 Guest Room	N/A	N/A
04 Guest Room	NO (-76%)	NO
04 Guest Room	NO (-69.9%)	NO
04 Guest Room	NO (-62.7%)	NO
04 Guest Room	NO (-62.7%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
04 Guest Room	N/A	N/A
04 Guest Room	N/A	N/A
04 Guest Room	N/A	N/A
04 Guest Room	N/A	N/A
04 Guest Room	N/A	N/A
04 Guest Room	NO (-83.5%)	NO
04 Guest Room	NO (-82.5%)	NO
04 Guest Room	NO (-84.1%)	NO
04 Guest Room	NO (-86.9%)	NO
04 Guest Room	NO (-89.8%)	NO
04 Guest Room	NO (-82.2%)	NO
01 Guest Room	N/A	N/A
01 Guest Room	N/A	N/A
01 Guest Room	N/A	N/A
01 Guest Room	NO (-85.1%)	NO
01 Guest Room	NO (-61.9%)	NO
01 Guest Room	NO (-71%)	NO
01 Guest Room	NO (-71%)	NO
01 Guest Room	NO (-71.4%)	NO
01 Guest Room	NO (-70.5%)	NO
01 Guest Room	NO (-70.6%)	NO
01 Guest Room	NO (-80.1%)	NO
01 Guest Room	NO (-74.2%)	NO
01 Guest Room	NO (-68.8%)	NO
01 Guest Room	NO (-69.1%)	NO
01 Guest Room	NO (-69.5%)	NO
01 Guest Room	NO (-75.3%)	NO
01 Guest Room	N/A	N/A
01 Guest Room	N/A	N/A
01 Guest Room	N/A	N/A
01 Guest Room	N/A	N/A
01 Guest Room	N/A	N/A

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

Separate submission

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

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	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
Area [m^2]	2684.7	2684.7
External area [m^2]	2713.4	2713.4
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	4	3
Average conductance [W/K]	548.38	0
Average U-value [W/m^2K]	0.2	0
Alpha value* [%]	10.25	10

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

Building Use

% Area	Building Type
6	**A1/A2 Retail/Financial and Professional services**
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
	B1 Offices and Workshop businesses
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
94	**C1 Hotels**
	C2 Residential Institutions: Hospitals and Care Homes
	C2 Residential Institutions: Residential schools
	C2 Residential Institutions: Universities and colleges
	C2A Secure Residential Institutions
	Residential spaces
	D1 Non-residential Institutions: Community/Day Centre
	D1 Non-residential Institutions: Libraries, Museums, and Galleries
	D1 Non-residential Institutions: Education
	D1 Non-residential Institutions: Primary Health Care Building
	D1 Non-residential Institutions: Crown and County Courts
	D2 General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others: Stand alone utility block

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

	Actual	Notional
Heating	10.24	22.06
Cooling	1.93	1.33
Auxiliary	16.69	20.04
Lighting	10.31	18.77
Hot water	156.88	156.24
Equipment*	32.97	32.97
TOTAL**	**196.05**	**218.43**

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

Energy Production by Technology [kWh/m^2]

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

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	49.71	86.59
Primary energy* [kWh/m^2]	290.49	337.66
Total emissions [kg/m^2]	50.7	58.8

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

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Fan coil systems, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	29.6	38.3	9.8	4	28.7	0.84	2.66	0.95	3.5
	Notional	77.6	37.5	25	2.8	35	0.86	3.79	----	----
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	32.6	0	10.7	0	5.5	0.85	0	0.95	0
	Notional	59.9	0	19.3	0	6.1	0.86	0	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----

Key to terms

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

Key Features

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

Building fabric

Element	$U_{i\text{-}Typ}$	$U_{i\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.15	1_000003:Surf[2]
Floor	0.2	0.15	1_000003:Surf[0]
Roof	0.15	0.1	1_000003:Surf[1]
Windows, roof windows, and rooflights	1.5	1.2	1_000011:Surf[0]
Personnel doors	1.5	1.6	1_00000F:Surf[0]
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building

$U_{i\text{-}Typ}$ = Typical individual element U-values [W/(m²K)] $U_{i\text{-}Min}$ = Minimum individual element U-values [W/(m²K)]

* There might be more than one surface where the minimum U-value occurs.

Air Permeability	Typical value	This building
$m^3/(h.m^2)$ at 50 Pa	5	4

APPENDIX D – STAGE 4 ‘BE GREEN’ BRUKL

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

115 - 119 - Camden High Street - Green

As designed

Date: Thu May 13 17:09:25 2021

Administrative information

Building Details

Address: Camden High Street, London,

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.13

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.13

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

Certifier details

Name: PSH

Telephone number:

Address: 167-169 Great Portland Street, London, W1W 5PF

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

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	41.1
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	41.1
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	39.1
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

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

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

Building fabric

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.15	0.15	1_000003:Surf[2]
Floor	0.25	0.15	0.15	1_000003:Surf[0]
Roof	0.25	0.1	0.1	1_000003:Surf[1]
Windows***, roof windows, and rooflights	2.2	1.2	1.2	1_000011:Surf[0]
Personnel doors	2.2	1.6	1.6	1_00000F:Surf[0]
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building

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

* There might be more than one surface where the maximum U-value occurs.
** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.
*** Display windows and similar glazing are excluded from the U-value check.
N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
$m^3/(h.m^2)$ at 50 Pa	10	4

Building services

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

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

1- System 1 [Basement Floor]

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.48	4.53	0	0	0.81
Standard value	2.5*	2.6	N/A	N/A	0.65
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.					

2- System 2 (DX Basement)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.45	8	-	0	0.85
Standard value	2.5*	2.6	N/A	N/A	0.65
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.					

3- System 3

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	0.2	0	0.85
Standard value	N/A	N/A	N/A	N/A	0.65
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

4- System 1 [Ground Floor]

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.48	4.53	0	0	0.8
Standard value	2.5*	2.6	N/A	N/A	0.65
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.					

5- System 2

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.48	4.53	0	0	0.85
Standard value	2.5*	2.6	N/A	N/A	0.65
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.					

6- Gas Fired DHW (40% @ CoP 0.98) with ASHP pre heat (60% @ CoP 3.19)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1.68	-	0.2	0	-
Standard value	0.91*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.					

7- Retail- VRF Split system

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.39	4.54	0	0	0.75
Standard value	2.5*	2.6	N/A	N/A	0.65
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.					

8- System 2 (DX 3rd Floor)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.01	9	-	0	0.85
Standard value	2.5*	2.6	N/A	N/A	0.65
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.					

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

Local mechanical ventilation, exhaust, and terminal units

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

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
-1 Lounge	-	-	-	1.7	-	-	-	-	-	-	N/A
-1 Kitchen & Store	-	-	-	1.7	-	-	-	-	0	-	N/A
-1 WC Staff	-	-	0.5	-	-	-	-	-	-	-	N/A
-1 Staff Tea	-	-	0.5	-	-	-	-	-	-	-	N/A
-1 WC	-	-	0.5	-	-	-	-	-	-	-	N/A
00 Circulation	-	-	-	1.8	-	-	-	-	-	-	N/A
00 Lobby Residential	-	-	-	1.8	-	-	-	-	-	-	N/A
00 Hotel Lounge	-	-	-	1.8	-	-	-	-	-	-	N/A
00 Lobby Hotel	-	-	-	1.8	-	-	-	-	-	-	N/A
00 Retail	-	-	-	1.6	-	-	-	-	-	-	N/A
00 Hotel Reception	-	-	-	1.8	-	-	-	-	-	-	N/A
00 Office	-	-	-	1.8	-	-	-	-	-	-	N/A
00 Wc	-	-	0.5	-	-	-	-	-	-	-	N/A
00 Lobby BOH	-	-	-	1.8	-	-	-	-	-	-	N/A
01 Guest Room	-	-	-	1.6	-	-	-	-	-	-	N/A
01 Guest Room	-	-	-	1.6	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
01 Guest Room	-	-	-	1.6	-	-	-	-	-	-	N/A
01 Guest Room	-	-	-	0.6	-	-	-	-	-	-	N/A
01 Guest Room	-	-	-	0.6	-	-	-	-	-	-	N/A
01 Guest Room	-	-	-	0.6	-	-	-	-	-	-	N/A
01 Guest Room	-	-	-	0.6	-	-	-	-	-	-	N/A
01 Guest Room	-	-	-	0.6	-	-	-	-	-	-	N/A
01 Guest Room	-	-	-	0.6	-	-	-	-	-	-	N/A
01 Guest Room	-	-	-	0.6	-	-	-	-	-	-	N/A
01 Guest Room	-	-	-	0.6	-	-	-	-	-	-	N/A
01 Guest Room	-	-	-	0.6	-	-	-	-	-	-	N/A
01 Guest Room	-	-	-	0.6	-	-	-	-	-	-	N/A
01 Guest Room	-	-	-	0.6	-	-	-	-	-	-	N/A
01 Guest Room	-	-	-	0.6	-	-	-	-	-	-	N/A
01 Guest Room	-	-	-	0.6	-	-	-	-	-	-	N/A
01 Guest Room	-	-	-	1.6	-	-	-	-	-	-	N/A
01 Guest Room	-	-	-	1.6	-	-	-	-	-	-	N/A
01 Guest Room	-	-	-	1.6	-	-	-	-	-	-	N/A
01 Guest Room	-	-	-	1.6	-	-	-	-	-	-	N/A
01 Guest Room	-	-	-	1.6	-	-	-	-	-	-	N/A
03 Guest Room	-	-	-	1.6	-	-	-	-	-	-	N/A
03 Guest Room	-	-	-	1.6	-	-	-	-	-	-	N/A
03 Guest Room	-	-	-	1.6	-	-	-	-	-	-	N/A
03 Guest Room	-	-	-	0.6	-	-	-	-	-	-	N/A
03 Guest Room	-	-	-	0.6	-	-	-	-	-	-	N/A
03 Guest Room	-	-	-	0.6	-	-	-	-	-	-	N/A
03 Guest Room	-	-	-	0.6	-	-	-	-	-	-	N/A
03 Guest Room	-	-	-	0.6	-	-	-	-	-	-	N/A
03 Guest Room	-	-	-	0.6	-	-	-	-	-	-	N/A
03 Guest Room	-	-	-	1.6	-	-	-	-	-	-	N/A
03 Guest Room	-	-	-	1.6	-	-	-	-	-	-	N/A
03 Guest Room	-	-	-	1.6	-	-	-	-	-	-	N/A
03 Guest Room	-	-	-	1.6	-	-	-	-	-	-	N/A
03 Guest Room	-	-	-	1.6	-	-	-	-	-	-	N/A
03 Guest Room	-	-	-	0.6	-	-	-	-	-	-	N/A
03 Guest Room	-	-	-	0.6	-	-	-	-	-	-	N/A
03 Guest Room	-	-	-	0.6	-	-	-	-	-	-	N/A
03 Guest Room	-	-	-	0.6	-	-	-	-	-	-	N/A
04 Guest Room	-	-	-	1.6	-	-	-	-	-	-	N/A
04 Guest Room	-	-	-	1.6	-	-	-	-	-	-	N/A
04 Guest Room	-	-	-	1.6	-	-	-	-	-	-	N/A
04 Guest Room	-	-	-	0.6	-	-	-	-	-	-	N/A
04 Guest Room	-	-	-	0.6	-	-	-	-	-	-	N/A
04 Guest Room	-	-	-	0.6	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
04 Guest Room	-	-	-	0.6	-	-	-	-	-	-	N/A
04 Guest Room	-	-	-	1.6	-	-	-	-	-	-	N/A
04 Guest Room	-	-	-	1.6	-	-	-	-	-	-	N/A
04 Guest Room	-	-	-	1.6	-	-	-	-	-	-	N/A
04 Guest Room	-	-	-	1.6	-	-	-	-	-	-	N/A
04 Guest Room	-	-	-	1.6	-	-	-	-	-	-	N/A
04 Guest Room	-	-	-	0.6	-	-	-	-	-	-	N/A
04 Guest Room	-	-	-	0.6	-	-	-	-	-	-	N/A
04 Guest Room	-	-	-	0.6	-	-	-	-	-	-	N/A
04 Guest Room	-	-	-	0.6	-	-	-	-	-	-	N/A
04 Guest Room	-	-	-	0.6	-	-	-	-	-	-	N/A
04 Guest Room	-	-	-	0.6	-	-	-	-	-	-	N/A
01 Guest Room	-	-	-	1.6	-	-	-	-	-	-	N/A
01 Guest Room	-	-	-	1.6	-	-	-	-	-	-	N/A
01 Guest Room	-	-	-	1.6	-	-	-	-	-	-	N/A
01 Guest Room	-	-	-	0.6	-	-	-	-	-	-	N/A
01 Guest Room	-	-	-	0.6	-	-	-	-	-	-	N/A
01 Guest Room	-	-	-	0.6	-	-	-	-	-	-	N/A
01 Guest Room	-	-	-	0.6	-	-	-	-	-	-	N/A
01 Guest Room	-	-	-	0.6	-	-	-	-	-	-	N/A
01 Guest Room	-	-	-	0.6	-	-	-	-	-	-	N/A
01 Guest Room	-	-	-	0.6	-	-	-	-	-	-	N/A
01 Guest Room	-	-	-	0.6	-	-	-	-	-	-	N/A
01 Guest Room	-	-	-	0.6	-	-	-	-	-	-	N/A
01 Guest Room	-	-	-	0.6	-	-	-	-	-	-	N/A
01 Guest Room	-	-	-	0.6	-	-	-	-	-	-	N/A
01 Guest Room	-	-	-	0.6	-	-	-	-	-	-	N/A
01 Guest Room	-	-	-	0.6	-	-	-	-	-	-	N/A
01 Guest Room	-	-	-	1.6	-	-	-	-	-	-	N/A
01 Guest Room	-	-	-	1.6	-	-	-	-	-	-	N/A
01 Guest Room	-	-	-	1.6	-	-	-	-	-	-	N/A
01 Guest Room	-	-	-	1.6	-	-	-	-	-	-	N/A
01 Guest Room	-	-	-	1.6	-	-	-	-	-	-	N/A

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
-1 Lounge	-	87	100	285
-1 Comms	87	-	-	65
-1 Circulation	-	87	-	68
-1 Kitchen & Store	-	87	-	340
-1 Store - Linen	87	-	-	20
-1 WC Staff	-	87	-	43

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
-1 Staff Tea	87	-	-	190
-1 Circulation	-	87	-	47
-1 WC	-	87	-	56
-1 Circulation	-	87	-	20
00 Stairs	-	87	-	86
00 Circulation	-	87	-	76
00 LV Switch	87	-	-	92
00 Store Bins	87	-	-	35
00 Luggage	87	-	-	16
00 Substations	87	-	-	171
00 Store Residential	87	-	-	19
00 Lobby Residential	-	87	-	92
00 Hotel Lounge	-	87	100	120
00 Lobby Hotel	-	87	-	37
00 Retail	-	87	100	1771
00 Store Retail	87	-	-	21
00 Store Bin	87	-	-	15
00 Store Cycle	87	-	-	14
00 Hotel Reception	-	87	100	184
00 Office	87	-	-	149
00 Wc	-	87	-	64
00 Lobby BOH	-	87	-	43
01 Stairs	-	87	-	46
01 Stairs	-	87	-	33
01 Guest Room	-	87	-	35
01 Guest Room	-	87	-	34
01 Store Linen	87	-	-	19
01 Guest Room	-	87	-	44
01 Circulation	-	87	-	218
01 Guest Room	-	87	-	41
01 Guest Room	-	87	-	40
01 Guest Room	-	87	-	31
01 Guest Room	-	87	-	31
01 Guest Room	-	87	-	31
01 Guest Room	-	87	-	31
01 Guest Room	-	87	-	31
01 Guest Room	-	87	-	42
01 Guest Room	-	87	-	50
01 Guest Room	-	87	-	31
01 Guest Room	-	87	-	31
01 Guest Room	-	87	-	31
01 Stairs	-	87	-	38
01 Guest Room	-	87	-	40

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
01 Guest Room	-	87	-	34
01 Guest Room	-	87	-	29
01 Guest Room	-	87	-	30
01 Guest Room	-	87	-	30
01 Guest Room	-	87	-	30
03 Stairs	-	87	-	46
03 Guest Room	-	87	-	35
03 Guest Room	-	87	-	34
03 Store Linen	87	-	-	19
03 Guest Room	-	87	-	44
03 Circulation	-	87	-	218
03 Guest Room	-	87	-	42
03 Guest Room	-	87	-	50
03 Guest Room	-	87	-	31
03 Guest Room	-	87	-	31
03 Guest Room	-	87	-	31
03 Stairs	-	87	-	38
03 Guest Room	-	87	-	40
03 Guest Room	-	87	-	34
03 Guest Room	-	87	-	29
03 Guest Room	-	87	-	30
03 Guest Room	-	87	-	30
03 Guest Room	-	87	-	30
03 Guest Room	-	87	-	48
03 Guest Room	-	87	-	47
03 Guest Room	-	87	-	48
03 Guest Room	-	87	-	49
04 Stairs	-	87	-	46
04 Guest Room	-	87	-	35
04 Guest Room	-	87	-	34
04 Store Linen	87	-	-	19
04 Guest Room	-	87	-	44
04 Circulation	-	87	-	218
04 Guest Room	-	87	-	42
04 Guest Room	-	87	-	50
04 Guest Room	-	87	-	31
04 Guest Room	-	87	-	31
04 Stairs	-	87	-	38
04 Guest Room	-	87	-	34
04 Guest Room	-	87	-	29
04 Guest Room	-	87	-	30
04 Guest Room	-	87	-	30
04 Guest Room	-	87	-	30

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
04 Guest Room	-	87	-	37
04 Guest Room	-	87	-	40
04 Guest Room	-	87	-	45
04 Guest Room	-	87	-	42
04 Plant	87	-	-	79
04 Guest Room	-	87	-	40
04 Guest Room	-	87	-	52
01 Stairs	-	87	-	46
01 Stairs	-	87	-	33
01 Guest Room	-	87	-	35
01 Guest Room	-	87	-	34
01 Store Linen	87	-	-	19
01 Guest Room	-	87	-	44
01 Circulation	-	87	-	218
01 Guest Room	-	87	-	41
01 Guest Room	-	87	-	40
01 Guest Room	-	87	-	31
01 Guest Room	-	87	-	31
01 Guest Room	-	87	-	31
01 Guest Room	-	87	-	31
01 Guest Room	-	87	-	31
01 Guest Room	-	87	-	42
01 Guest Room	-	87	-	50
01 Guest Room	-	87	-	31
01 Guest Room	-	87	-	31
01 Guest Room	-	87	-	31
01 Stairs	-	87	-	38
01 Guest Room	-	87	-	40
01 Guest Room	-	87	-	34
01 Guest Room	-	87	-	29
01 Guest Room	-	87	-	30
01 Guest Room	-	87	-	30
01 Guest Room	-	87	-	30
03 Stairs	-	87	-	25
03 Comms	87	-	-	33

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

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
-1 Lounge	N/A	N/A
-1 Comms	N/A	N/A
-1 Circulation	N/A	N/A
-1 Kitchen & Store	N/A	N/A
-1 Store - Linen	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
-1 WC Staff	N/A	N/A
-1 Staff Tea	N/A	N/A
-1 Circulation	N/A	N/A
-1 WC	N/A	N/A
-1 Circulation	N/A	N/A
00 Circulation	NO (-49.4%)	NO
00 Store Bins	N/A	N/A
00 Store Residential	N/A	N/A
00 Lobby Residential	NO (-89.2%)	NO
00 Hotel Lounge	N/A	N/A
00 Lobby Hotel	NO (-67.7%)	NO
00 Retail	NO (-90.1%)	NO
00 Store Retail	N/A	N/A
00 Store Bin	N/A	N/A
00 Store Cycle	N/A	N/A
00 Hotel Reception	NO (-99.4%)	NO
00 Office	N/A	N/A
00 Lobby BOH	N/A	N/A
01 Guest Room	N/A	N/A
01 Guest Room	N/A	N/A
01 Store Linen	N/A	N/A
01 Guest Room	N/A	N/A
01 Circulation	N/A	N/A
01 Guest Room	NO (-83.8%)	NO
01 Guest Room	NO (-58.8%)	NO
01 Guest Room	NO (-68.7%)	NO
01 Guest Room	NO (-68.6%)	NO
01 Guest Room	NO (-69.3%)	NO
01 Guest Room	NO (-68.2%)	NO
01 Guest Room	NO (-68.8%)	NO
01 Guest Room	NO (-78.8%)	NO
01 Guest Room	NO (-72.8%)	NO
01 Guest Room	NO (-66.8%)	NO
01 Guest Room	NO (-67%)	NO
01 Guest Room	NO (-67.2%)	NO
01 Guest Room	NO (-73.4%)	NO
01 Guest Room	N/A	N/A
01 Guest Room	N/A	N/A
01 Guest Room	N/A	N/A
01 Guest Room	N/A	N/A
01 Guest Room	N/A	N/A
03 Guest Room	N/A	N/A
03 Guest Room	N/A	N/A
03 Store Linen	N/A	N/A
03 Guest Room	N/A	N/A
03 Circulation	N/A	N/A
03 Guest Room	NO (-77.5%)	NO
03 Guest Room	NO (-71.2%)	NO
03 Guest Room	NO (-63.9%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
03 Guest Room	NO (-63.8%)	NO
03 Guest Room	NO (-63.8%)	NO
03 Guest Room	NO (-70.7%)	NO
03 Guest Room	N/A	N/A
03 Guest Room	N/A	N/A
03 Guest Room	N/A	N/A
03 Guest Room	N/A	N/A
03 Guest Room	N/A	N/A
03 Guest Room	NO (-87%)	NO
03 Guest Room	NO (-82%)	NO
03 Guest Room	NO (-83.8%)	NO
03 Guest Room	NO (-84.3%)	NO
04 Guest Room	N/A	N/A
04 Guest Room	N/A	N/A
04 Store Linen	N/A	N/A
04 Guest Room	N/A	N/A
04 Circulation	N/A	N/A
04 Guest Room	NO (-76%)	NO
04 Guest Room	NO (-69.9%)	NO
04 Guest Room	NO (-62.7%)	NO
04 Guest Room	NO (-62.7%)	NO
04 Guest Room	N/A	N/A
04 Guest Room	N/A	N/A
04 Guest Room	N/A	N/A
04 Guest Room	N/A	N/A
04 Guest Room	N/A	N/A
04 Guest Room	NO (-83.5%)	NO
04 Guest Room	NO (-82.5%)	NO
04 Guest Room	NO (-84.1%)	NO
04 Guest Room	NO (-86.9%)	NO
04 Guest Room	NO (-89.8%)	NO
04 Guest Room	NO (-82.2%)	NO
01 Guest Room	N/A	N/A
01 Guest Room	N/A	N/A
01 Store Linen	N/A	N/A
01 Guest Room	N/A	N/A
01 Circulation	N/A	N/A
01 Guest Room	NO (-85.1%)	NO
01 Guest Room	NO (-61.9%)	NO
01 Guest Room	NO (-71%)	NO
01 Guest Room	NO (-71%)	NO
01 Guest Room	NO (-71.4%)	NO
01 Guest Room	NO (-70.5%)	NO
01 Guest Room	NO (-70.6%)	NO
01 Guest Room	NO (-80.1%)	NO
01 Guest Room	NO (-74.2%)	NO
01 Guest Room	NO (-68.8%)	NO
01 Guest Room	NO (-69.1%)	NO
01 Guest Room	NO (-69.5%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
01 Guest Room	NO (-75.3%)	NO
01 Guest Room	N/A	N/A
01 Guest Room	N/A	N/A
01 Guest Room	N/A	N/A
01 Guest Room	N/A	N/A
01 Guest Room	N/A	N/A
03 Comms	N/A	N/A

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

Separate submission

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

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	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
Area [m^2]	2684.7	2684.7
External area [m^2]	2713.4	2713.4
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	4	3
Average conductance [W/K]	548.2	0
Average U-value [W/m^2K]	0.2	0
Alpha value* [%]	10.25	10

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

Building Use

% Area	Building Type
6	**A1/A2 Retail/Financial and Professional services**
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
	B1 Offices and Workshop businesses
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
94	**C1 Hotels**
	C2 Residential Institutions: Hospitals and Care Homes
	C2 Residential Institutions: Residential schools
	C2 Residential Institutions: Universities and colleges
	C2A Secure Residential Institutions
	Residential spaces
	D1 Non-residential Institutions: Community/Day Centre
	D1 Non-residential Institutions: Libraries, Museums, and Galleries
	D1 Non-residential Institutions: Education
	D1 Non-residential Institutions: Primary Health Care Building
	D1 Non-residential Institutions: Crown and County Courts
	D2 General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others: Stand alone utility block

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

	Actual	Notional
Heating	5.17	11.82
Cooling	3.97	4.78
Auxiliary	4.45	3.1
Lighting	10.31	18.77
Hot water	87.71	94.09
Equipment*	32.97	32.97
TOTAL**	**111.61**	**132.56**

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

Energy Production by Technology [kWh/m^2]

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

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	70.3	115.64
Primary energy* [kWh/m^2]	227.6	264.43
Total emissions [kg/m^2]	39.1	41.1

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

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	30.4	0	10.5	0	2.4	0.8	0	1	0
	Notional	71.2	0	23	0	3.3	0.86	0	----	----
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	12.7	0	2.4	0	2.3	1.5	0	1.68	0
	Notional	10.8	0	2	0	1.7	1.51	0	----	----
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	2.7	82.7	0.2	7.1	5.9	4.09	3.22	4.39	4.54
	Notional	10.1	149.8	1.1	11	3.1	2.56	3.79	----	----
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	22.6	49.2	1.5	4.2	4.4	4.17	3.22	4.48	4.53
	Notional	41	71.4	4.5	5.2	2.3	2.56	3.79	----	----
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	7.6	155.2	0.5	13.4	10.1	4.17	3.22	4.48	4.54
	Notional	28.6	214.5	3.1	15.7	4.5	2.56	3.79	----	----
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	31.4	143.6	2.1	12.4	9.3	4.17	3.22	4.48	4.54
	Notional	39.4	178.9	4.3	13.1	4.5	2.56	3.79	----	----
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	0	0	0	0	0	3.21	5.68	3.45	8
	Notional	0	0	0	0	0	2.56	3.79	----	----
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	0	0	0	0	0	3.74	6.39	4.01	9
	Notional	0	0	0	0	0	2.56	3.79	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----

Key to terms

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

Key Features

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

Building fabric

Element	$U_{i\text{-}Typ}$	$U_{i\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.15	1_000003:Surf[2]
Floor	0.2	0.15	1_000003:Surf[0]
Roof	0.15	0.1	1_000003:Surf[1]
Windows, roof windows, and rooflights	1.5	1.2	1_000011:Surf[0]
Personnel doors	1.5	1.6	1_00000F:Surf[0]
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building

$U_{i\text{-}Typ}$ = Typical individual element U-values [W/(m²K)] $U_{i\text{-}Min}$ = Minimum individual element U-values [W/(m²K)]

* There might be more than one surface where the minimum U-value occurs.

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	4

APPENDIX E – BASELINE SAPS

BASIC COMPLIANCE REPORT
Calculation Type: New Build (As Designed)

Design SAP elmhurst energy

Property Reference	014089	**Issued on Date**	08/05/2019
Assessment Reference	As designed R0	**Prop Type Ref**	Mid Floor
Property	Flat, 115-119 , Camden High Street, Camden, London, NW1 7JR		

SAP Rating	85 B	**DER**	14.47	**TER**	15.20
Environmental	90 B	**% DER<TER**	4.78		
CO_2 Emissions (t/year)	0.71	**DFEE**	28.80	**TFEE**	30.44
General Requirements Compliance	Fail	**% DFEE<TFEE**	5.38		

Assessor Details	Mr. Neville Duggan, Seven Consulting Limited, Tel: 01612093259, nev@7consulting.co.uk	**Assessor ID**	E399-0001
Client			

SUMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	15.20	$kgCO_2/m^2$	
Dwelling Carbon Dioxide Emission Rate (DER)	14.47	$kgCO_2/m^2$	Pass
	-0.73 (-4.8%)	$kgCO_2/m^2$	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	30.44	$kWh/m^2/yr$	
Dwelling Fabric Energy Efficiency (DFEE)	28.80	$kWh/m^2/yr$	
	-1.6 (-5.3%)	$kWh/m^2/yr$	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated using default y-value of 0.15

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system	Boiler system with radiators or underfloor - Mains gas Data from database ATAG A325EC X Combi boiler Efficiency: 89.7% SEDBUK2009 Minimum: 88.0%	Pass
Secondary heating system	None	

BASIC COMPLIANCE REPORT
Calculation Type: New Build (As Designed)

Design SAP elmhurst energy

5 Cylinder insulation

Hot water storage	No cylinder	

6 Controls

Space heating controls	Programmer and room thermostat	Fail
Hot water controls	No cylinder	
Boiler interlock	No	Fail

7 Low energy lights

Percentage of fixed lights with low-energy fittings	83	%	
Minimum	75	%	Pass

8 Mechanical ventilation

Continuous extract system		
Specific fan power	0.34	
Maximum	0.7	Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)	Slight	Pass
Based on:		
Overshading	Average	
Windows facing South East	6.20 m^2, Overhang twice as wide as window, ratio 1.00	
Windows facing South West	8.80 m^2, Overhang width less than twice window, ratio 1.49	
Air change rate	4.00 ach	
Blinds/curtains	None	

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type	U-value		
Filled Cavity with Edge Sealing	0.00	W/m^2K	Pass
Filled Cavity with Edge Sealing	0.00	W/m^2K	Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)		
Maximum	10.0		Pass

10 Key features

Party wall U-value	0.00	W/m^2K
Party wall U-value	0.00	W/m^2K
Door U-value	1.00	W/m^2K

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BASIC COMPLIANCE REPORT
Calculation Type: New Build (As Designed)

Design SAP elmhurst energy

Property Reference	014090	**Issued on Date**	08/05/2019
Assessment Reference	As designed R0	**Prop Type Ref**	Top Floor
Property	Flat, 115-119 , Camden High Street, Camden, London, NW1 7JR		

SAP Rating	83 B	**DER**	18.64	**TER**	17.24
Environmental	87 B	**% DER<TER**	-8.10		
CO_2 Emissions (t/year)	0.89	**DFEE**	43.54	**TFEE**	40.87
General Requirements Compliance	Fail	**% DFEE<TFEE**	-6.55		

Assessor Details	Mr. Neville Duggan, Seven Consulting Limited, Tel: 01612093259, nev@7consulting.co.uk	**Assessor ID**	E399-0001
Client			

SUMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	17.24	$kgCO_2/m^2$	
Dwelling Carbon Dioxide Emission Rate (DER)	18.64	$kgCO_2/m^2$	
Excess emissions	1.40 (8.1%)	$kgCO_2/m^2$	Fail

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	40.87	kWh/m²/yr	
Dwelling Fabric Energy Efficiency (DFEE)	43.54	kWh/m²/yr	
Excess energy	2.6 (6.4%)	kWh/m²/yr	Fail

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Roof	0.15 (max. 0.20)	0.15 (max. 0.35)	Pass
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated using default y-value of 0.15

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system	Boiler system with radiators or underfloor - Mains gas Data from database ATAG A325EC X Combi boiler Efficiency: 89.7% SEDBUK2009 Minimum: 88.0%	Pass

BASIC COMPLIANCE REPORT
Calculation Type: New Build (As Designed)

Design SAP elmhurst energy

Secondary heating system	None		

5 Cylinder insulation

Hot water storage	No cylinder		

6 Controls

Space heating controls	Programmer and room thermostat		Fail
Hot water controls	No cylinder		
Boiler interlock	No		Fail

7 Low energy lights

Percentage of fixed lights with low-energy fittings	83	%	
Minimum	75	%	Pass

8 Mechanical ventilation

Continuous extract system		
Specific fan power	0.34	
Maximum	0.7	Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)	Slight	Pass

Based on:

Overshading	Average
Windows facing South East	6.20 m², Overhang twice as wide as window, ratio 1.00
Windows facing South West	8.80 m², Overhang width less than twice window, ratio 1.49
Air change rate	4.00 ach
Blinds/curtains	None

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type	U-value		
Filled Cavity with Edge Sealing	0.00	W/m²K	Pass
Filled Cavity with Edge Sealing	0.00	W/m²K	Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	
Maximum	10.0	Pass

10 Key features

Party wall U-value	0.00	W/m²K
Party wall U-value	0.00	W/m²K
Door U-value	1.00	W/m²K

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

APPENDIX F – STAGE 4 ‘BE LEAN’ SAPS

BLOCK COMPLIANCE
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Block Reference	000725	**Issued on Date**	07/06/2021
Block Name	Cam Hub - Stage 4 [June 21]		
Assessor Details	Mr. Neville Duggan, Seven Consulting Limited, Tel: 01612093259, nev@7consulting.co.uk	**Assessor ID**	E399-0001
Client			

Block Compliance Report - DER

Block Reference: 000725		Block Name: Cam Hub - Stage 4 [June 21]			
Property-Assessment Reference	**Multiplier**	**Floor Area (m^2)**	**DER ($kgCO_2/m^2$)**	**TER ($kgCO_2/m^2$)**	**% DER/TER**
112955-As designed R0	2	59.6	12.03	15.20	20.84 %
112956-As designed R0	1	59.6	14.81	17.24	14.11 %
Totals:	3	178.8	26.84	32.44	
Average DER = 12.96 $kgCO_2/m^2$		**% DER/TER**	PASS		
Average TER = 15.88 $kgCO_2/m^2$		18.39 %			

Block Compliance Report - DFEE

Block Reference: 000725		Block Name: Cam Hub - Stage 4 [June 21]			
Property-Assessment Reference	**Multiplier**	**Floor Area (m^2)**	**DFEE ($kWh/m^2/yr$)**	**TFEE ($kWh/m^2/yr$)**	**% DFEE/TFEE**
112955-As designed R0	2	59.6	26.58	30.44	12.69 %
112956-As designed R0	1	59.6	39.21	40.87	4.06 %
Totals:	3	178.8	65.78	71.31	
Average DFEE = 30.79 $kWh/m^2/yr$		**% DFEE/TFEE**	PASS		
Average TFEE = 33.91 $kWh/m^2/yr$		9.20 %			

BASIC COMPLIANCE REPORT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	112955	**Issued on Date**	07/06/2021
Assessment Reference	As designed R0	**Prop Type Ref**	Mid Floor
Property	Flat, 115-119 , Camden High Street, Camden, London, NW1 7JR		

SAP Rating	86 B	**DER**	12.03	**TER**	15.20
Environmental	92 A	**% DER<TER**	20.84		
CO_2 Emissions (t/year)	0.62	**DFEE**	26.58	**TFEE**	30.44
General Requirements Compliance	Pass	**% DFEE<TFEE**	12.69		

Assessor Details	Mr. Neville Duggan, Seven Consulting Limited, Tel: 01612093259, nev@7consulting.co.uk	**Assessor ID**	E399-0001
Client			

SUMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	15.20	$kgCO_2/m^2$	
Dwelling Carbon Dioxide Emission Rate (DER)	12.03	$kgCO_2/m^2$	Pass
	-3.17 (-20.9%)	$kgCO_2/m^2$	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	30.44	$kWh/m^2/yr$	
Dwelling Fabric Energy Efficiency (DFEE)	26.58	$kWh/m^2/yr$	
	-3.8 (-12.5%)	$kWh/m^2/yr$	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Openings	1.20 (max. 2.00)	1.20 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated using default y-value of 0.15

3 Air permeability

Air permeability at 50 pascals	4.00 (design value)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system	Boiler system with radiators or underfloor - Mains gas Data from database Potterton ASSURE 36 COMBI Combi boiler Efficiency: 89.0% SEDBUK2009 Minimum: 88.0%	Pass
Secondary heating system	None	

5 Cylinder insulation

Hot water storage	No cylinder	

6 Controls

Space heating controls	Time and temperature zone control	Pass
Hot water controls	No cylinder	
Boiler interlock	Yes	Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100	%	
Minimum	75	%	Pass

8 Mechanical ventilation

Continuous supply and extract system			
Specific fan power	0.47		
Maximum	1.5		Pass
MVHR efficiency	91	%	
Minimum	70	%	Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)	Slight	Pass

Based on:

Overshading	Average
Windows facing South East	6.20 m², Overhang twice as wide as window, ratio 1.00
Windows facing South West	8.80 m², Overhang width less than twice window, ratio 1.49
Air change rate	4.00 ach
Blinds/curtains	None

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type	U-value		
Filled Cavity with Edge Sealing	0.00	W/m²K	Pass
Filled Cavity with Edge Sealing	0.00	W/m²K	Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals	4.00 (design value)	
Maximum	10.0	Pass

10 Key features

Party wall U-value	0.00	W/m²K
Party wall U-value	0.00	W/m²K
Door U-value	1.00	W/m²K

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BASIC COMPLIANCE REPORT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	112956	**Issued on Date**	07/06/2021
Assessment Reference	As designed R0	**Prop Type Ref**	Top Floor
Property	Flat, 115-119 , Camden High Street, Camden, London, NW1 7JR		

SAP Rating	85 B	**DER**	14.81	**TER**	17.24
Environmental	90 B	**% DER<TER**	14.11		
CO_2 Emissions (t/year)	0.72	**DFEE**	39.21	**TFEE**	40.87
General Requirements Compliance	Pass	**% DFEE<TFEE**	4.06		

Assessor Details	Mr. Neville Duggan, Seven Consulting Limited, Tel: 01612093259, nev@7consulting.co.uk	**Assessor ID**	E399-0001
Client			

SUMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	17.24	$kgCO_2/m^2$	
Dwelling Carbon Dioxide Emission Rate (DER)	14.81	$kgCO_2/m^2$	Pass
	-2.43 (-14.1%)	$kgCO_2/m^2$	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	40.87	$kWh/m^2/yr$	
Dwelling Fabric Energy Efficiency (DFEE)	39.21	$kWh/m^2/yr$	
	-1.7 (-4.2%)	$kWh/m^2/yr$	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	Pass
Openings	1.20 (max. 2.00)	1.20 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated using default y-value of 0.15

3 Air permeability

Air permeability at 50 pascals	4.00 (design value)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system	Boiler system with radiators or underfloor - Mains gas Data from database Potterton ASSURE 36 COMBI Combi boiler Efficiency: 89.0% SEDBUK2009 Minimum: 88.0%	Pass

Secondary heating system	None		
5 Cylinder insulation			
Hot water storage	No cylinder		
6 Controls			
Space heating controls	Time and temperature zone control		Pass
Hot water controls	No cylinder		
Boiler interlock	Yes		Pass
7 Low energy lights			
Percentage of fixed lights with low-energy fittings	100	%	
Minimum	75	%	Pass
8 Mechanical ventilation			
Continuous supply and extract system			
Specific fan power	0.47		
Maximum	1.5		Pass
MVHR efficiency	91	%	
Minimum	70	%	Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)	Not significant	Pass
Based on:		
Overshading	Average	
Windows facing South East	6.20 m², Overhang twice as wide as window, ratio 1.00	
Windows facing South West	8.80 m², Overhang width less than twice window, ratio 1.49	
Air change rate	6.00 ach	
Blinds/curtains	None	

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type	U-value		
Filled Cavity with Edge Sealing	0.00	W/m²K	Pass
Filled Cavity with Edge Sealing	0.00	W/m²K	Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals	4.00 (design value)		
Maximum	10.0		Pass

10 Key features

Party wall U-value	0.00	W/m²K
Party wall U-value	0.00	W/m²K
Roof U-value	0.10	W/m²K
Door U-value	1.00	W/m²K

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

APPENDIX G – GLA ENERGY ASSESSMENT REPORTING SPREADSHEET

PSH.

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