mes buildingsolutions
Part of the FOCUS consultancy group

Energy and Sustainability Statement

Arches 30-38, Prowse Place NW1 9PN

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About *MES Building Solutions*

***MES Building Solutions* is an established consultancy practice specialising in providing building solutions throughout the UK.**

We offer a full range of services for both residential and commercial buildings from small individual properties through to highly complex mixed use developments.

We are an industry leader in delivering a professional, accredited and certified service to a wide range of clients including architects, developers, builders, housing associations, the public sector and private householders.

Employing highly qualified staff, our team comes from a variety of backgrounds within the construction industry with combined knowledge of building design, engineering, assessment, construction, development, research and surveying.

We are renowned for our creative thinking and provide a high quality, honest and diligent service.

MES Building Solutions maintains its position at the forefront of changes in planning, building regulations and neighbourly matters, as well as technological advances. Our clients, large or small are therefore assured of a cost effective, cohesive and fully integrated professional service.

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Section 1: Introduction

1.1 Executive Summary

To ensure compliance with London Borough of Camden Core Strategy and Local Plan a number of sustainable construction strategies will be incorporated in the design and construction of the development. These will include, amongst others, minimum standards relating to energy and water use which will reduce the developments environmental impact over its lifetime, which assists in ensuring a sustainable development for both current and future users.

To ensure compliance with London Borough of Camden Local Plan (2017), Camden Planning Guidance- Energy Efficiency and Adaptation (March 2019) and the London Plan the energy strategy proposed for the development at Arches 30-38, Prowse Place NW1 9PN is the specification of a Daikin air source heat pump.

This approach results in an overall reduction in emissions of 72.35% which complies with both the London Plan and the Camden Local Plan.

Table 1a shows the reduction in tonnes of CO_2 and kWh per year through the recommended fabric improvements, energy efficiency measures and LZC technologies.

Table 1a: Total anticipated reduction in regulated emissions & energy use

	kWh/m²	**Tonnes CO_2 per year**
Total Part L2A 'Baseline' annual figures	648.43	146.82
Unregulated energy figures	25.17	13.06
Total 'be lean, be clean & be green' annual figures	293.38	40.59
Contribution from renewables	**54.76%**	**72.35%**
Total reduction over Baseline	**54.76%**	**72.35%**

1.2 Introduction

MES Building Solutions has been to provide an energy statement in order to address the requirements of requirements of Camden Council. The purpose of this Energy and Sustainability Statement is to establish the predicted energy requirements for the proposed development illustrating how energy efficiency measures in conjunction with renewable generation can be used to reduce the predicted energy consumption and associated carbon dioxide emissions.

This is achieved by following the energy hierarchy which includes:

- Calculation of baseline energy consumption & CO_2 emissions using SBEM calculations
- Implementation of the energy hierarchy (be lean, be clean, be green)
- Calculation of energy consumption & CO_2 emissions at each stage of energy hierarchy
- Calculation of final energy consumption & CO_2 emissions
- Calculation of reduction in emissions achieved
- Calculation of contribution from renewable generation

The report also addresses wider sustainability principles, looking at the following areas:

- Energy use
- Water conservation
- Materials selection
- Flood risk & surface water management
- Waste management
- Pollution mitigation
- Health & Wellbeing
- Construction & building management
- Site ecology

1.2 Planning Policy

National Policy

In February 2019, the Government published the National Planning Policy Framework (NPPF) which superseded a number of planning policies including the Planning Policy Statement (PPS) suite.

The NPPF outlines the Government's planning policies for England. It provides a framework within which local people and accountable councils can produce their own distinctive local plan which reflect the needs and priorities of their neighbourhoods and communities. The purpose of the NPPF is to contribute to the achievement of sustainable development.

The NPPF aims to strengthen local decision making as a way to foster the delivery of sustainable developments. However, the NPPF also outlines that sustainable developments require careful attention to viability and costs in plan-making and decision-taking processes. Over everything else, plans should be deliverable. Therefore, the size and scale of development within the plan should not be subjected to large scale obligations and burdens, so that their ability to be developed viably is threatened.

The NPPF guidance promotes planning for climate change. Chapter 14 of the NPPF, Meeting the Challenge of Climate Change, Flooding and Coastal Change (paragraphs 149 to 154) state that:

Plans should take a proactive approach to mitigating and adapting to climate change, taking into account the long-term implications for flood risk, coastal change, water supply, biodiversity and landscapes, and the risk of overheating from rising temperatures. Policies should support appropriate measures to ensure the future resilience of communities and infrastructure to climate change impacts, such as providing space for physical protection measures, or making provision for the possible future relocation of vulnerable development and infrastructure.

- New development should be planned for in ways that:
    - Avoid increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaptation measures, including through the planning of green infrastructure; and

- Can help to reduce greenhouse gas emissions, such as through its location, orientation and design. Any local requirements for the sustainability of buildings should reflect the Government's policy for national technical standards.

- To help increase the use and supply of renewable and low carbon energy and heat, plans should:
  - Provide a positive strategy for energy from these sources, that maximises the potential for suitable development, while ensuring that adverse impacts are addressed satisfactorily (including cumulative landscape and visual impacts);
  - Consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development; and
  - Identify opportunities for development to draw its energy supply from decentralised, renewable or low carbon energy supply systems and for co-locating potential heat customers and suppliers.

- Local planning authorities should support community-led initiatives for renewable and low carbon energy, including developments outside areas identified in local plans or other strategic policies that are being taken forward through neighbourhood planning.

- In determining planning applications, local planning authorities should expect new development to:
  - Comply with any development plan policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved and its design, that this is not feasible or viable; and
  - Take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption.

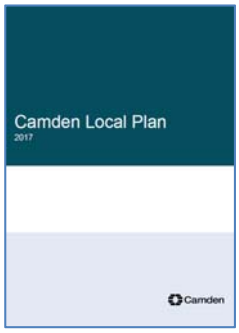
- When determining planning applications for renewable and low carbon development, local planning authorities should:
  - Not require applicants to demonstrate the overall need for renewable or low carbon energy, and recognise that even small-scale projects provide a valuable contribution to cutting greenhouse gas emissions; and

Approve the application if its impacts are (or can be made) acceptable. Once suitable areas for renewable and low carbon

energy have been identified in plans, local planning authorities should expect subsequent applications for commercial scale projects outside these areas to demonstrate that the proposed location meets the criteria used in identifying suitable areas.

Camden Local Plan 2017

Policy CC1 Climate change mitigation



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

We will:

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

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

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

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

e. require all proposals that involve substantial demolition to demonstrate that it is not possible to retain and improve the existing building; and

f. expect all developments to optimise resource efficiency. For decentralised energy networks, we will promote decentralised energy by:

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

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

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

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

Policy CC2 Adapting to climate change

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

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

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

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

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

d. measures to reduce the impact of urban and dwelling overheating, including application of the cooling hierarchy.

Any development involving 5 or more residential units or 500 sqm or more of any additional floorspace is required to demonstrate the above in a Sustainability Statement.

Sustainable design and construction measures

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

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

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

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

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

London Plan (2016)

Policy 5.2 Minimising Carbon Dioxide Emissions
Planning decisions

A Development proposals should make the fullest contribution to minimising carbon dioxide emissions in accordance with the following energy hierarchy:

1 Be lean: use less energy
2 Be clean: supply energy efficiently
3 Be green: use renewable energy

B The Mayor will work with boroughs and developers to ensure that major developments meet the following targets for carbon dioxide emissions reduction in buildings. These targets are expressed as minimum improvements over the Target Emission Rate (TER) outlined in the national Building Regulations leading to zero carbon residential buildings from 2016 and zero carbon non-domestic buildings from 2019.

Residential buildings:

Year	Improvement on 2010 Building Regulations
2010 – 2013	25 per cent (Code for Sustainable Homes level 4)
2013 - 2016	40 per cent
2016 - 2031	Zero Carbon

Non-domestic buildings:

Year	Improvement on 2010 Building Regulations
2010 – 2013	25 per cent
2013 - 2016	40 per cent
2016 - 2019	As per building regulations requirements
2019 - 2031	Zero Carbon

C Major development proposals should include a detailed energy assessment to demonstrate how the targets for carbon dioxide

emissions reduction outlined above are to be met within the framework of the energy hierarchy.

D As a minimum, energy assessments should include the following details:

a calculation of the energy demand and carbon dioxide emissions covered by Building Regulations and, separately, the energy demand and carbon dioxide emissions from any other part of the development, including plant or equipment, that are not covered by the Building Regulations (see paragraph 5.22) at each stage of the energy hierarchy

b proposals to reduce carbon dioxide emissions through the energy efficient design of the site, buildings and services

c proposals to further reduce carbon dioxide emissions through the use of decentralised energy where feasible, such as district heating and cooling and combined heat and power (CHP)

d proposals to further reduce carbon dioxide emissions through the use of on-site renewable energy technologies.

E The carbon dioxide reduction targets should be met on-site. Where it is clearly demonstrated that the specific targets cannot be fully achieved on-site, any shortfall may be provided off-site or through a cash in lieu contribution to the relevant borough to be ring fenced to secure delivery of carbon dioxide savings elsewhere.

Policy 5.3 Sustainable Design and Construction

Strategic

A The highest standards of sustainable design and construction should be achieved in London to improve the environmental performance of new developments and to adapt to the effects of climate change over their lifetime.

Planning decisions

B Development proposals should demonstrate that sustainable design standards are integral to the proposal, including its construction and operation, and ensure that they are considered at the beginning of the design process.

C Major development proposals should meet the minimum standards outlined in the Mayor's supplementary planning guidance and this should be clearly demonstrated within a design and access statement. The standards include measures to achieve other policies in this Plan and the following sustainable design principles:

a minimising carbon dioxide emissions across the site, including the building and services (such as heating and cooling systems)
b avoiding internal overheating and contributing to the urban heat island effect
c efficient use of natural resources (including water), including making the most of natural systems both within and around buildings
d minimising pollution (including noise, air and urban runoff)
e minimising the generation of waste and maximising reuse or recycling
f avoiding impacts from natural hazards (including flooding)
g ensuring developments are comfortable and secure for users, including avoiding the creation of adverse local climatic conditions
h securing sustainable procurement of materials, using local supplies where feasible, and
i promoting and protecting biodiversity and green infrastructure.

LDF preparation

D Within LDFs boroughs should consider the need to develop more detailed policies and proposals based on the sustainable design principles outlined above and those which are outlined in the Mayor's supplementary planning guidance that are specific to their local circumstances.

Policy 5.6 Decentralised Energy in Development Proposals

Planning decisions

A Development proposals should evaluate the feasibility of Combined Heat and Power (CHP) systems, and where a new CHP system is appropriate also examine opportunities to extend the system beyond the site boundary to adjacent sites.

B Major development proposals should select energy systems in accordance with the following hierarchy:

1 Connection to existing heating or cooling networks;
2 Site wide CHP network;
3 Communal heating and cooling;

C Potential opportunities to meet the first priority in this hierarchy are outlined in the London Heat Map tool. Where future network opportunities are identified, proposals should be designed to connect to these networks.

Policy 5.7 Renewable Energy

Strategic

A The Mayor seeks to increase the proportion of energy generated from renewable sources, and expects that the projections for installed renewable energy capacity outlined in the Climate Change Mitigation and Energy Strategy and in supplementary planning guidance will be achieved in London.

Planning decisions

B Within the framework of the energy hierarchy (see Policy 5.2), major development proposals should provide a reduction in expected carbon dioxide emissions through the use of on-site renewable energy generation, where feasible.

LDF preparation

C Within LDFs boroughs should, and other agencies may wish to, develop more detailed policies and proposals to support the development of renewable energy in London – in particular, to identify broad areas where specific renewable energy technologies, including large scale systems and the large scale deployment of small scale systems, are appropriate. The identification of areas should be consistent with any guidelines and criteria outlined by the Mayor.

D All renewable energy systems should be located and designed to minimise any potential adverse impacts on biodiversity, the natural environment and historical assets, and to avoid any adverse impacts on air quality.

London Plan (December 2019) - Intend to publish version

A draft new London Plan was published by the Mayor for consultation in December 2017, although the current 2016 Plan is still the adopted Development Plan, the proposed document is given significant weight.

Policy SI 2 Minimising greenhouse gas emissions

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

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

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

C A minimum on-site reduction of at least 35 per cent beyond Building Regulations156 is required for major development. Residential development should achieve 10 per cent, and non-residential development should achieve 15 per cent through energy efficiency measures. Where it is clearly demonstrated that the zero-carbon target cannot be fully achieved on-site, any shortfall should be provided, in agreement with the borough, either:

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

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

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

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

Policy SI 3 Energy infrastructure

A Boroughs and developers should engage at an early stage with relevant energy companies and bodies to establish the future energy and infrastructure requirements arising from large-scale development proposals such as Opportunity Areas, Town Centres, other growth areas or clusters of significant new development.

B Energy masterplans should be developed for large-scale development locations (such as those outlined in Part A and other opportunities) which establish the most effective energy supply options. Energy masterplans should identify:

1) major heat loads (including anchor heat loads, with particular reference to sites such as universities, hospitals and social housing)
2) heat loads from existing buildings that can be connected to future phases of a heat network
3) major heat supply plant including opportunities to utilise heat from energy from waste plants
4) secondary heat sources, including both environmental and waste heat
5) opportunities for low and ambient temperature heat networks
6) possible land for energy centres and/or energy storage
7) possible heating and cooling network routes
8) opportunities for futureproofing utility infrastructure networks to minimise the impact from road works
9) infrastructure and land requirements for electricity and gas supplies
10) implementation options for delivering feasible projects, considering issues of procurement, funding and risk, and the role of the public sector
11) opportunities to maximise renewable electricity generation and incorporate demand-side response measures.

C Development Plans should:
1) identify the need for, and suitable sites for, any necessary energy infrastructure requirements including energy centres, energy storage and upgrades to existing infrastructure
2) identify existing heating and cooling networks, identify proposed locations for future heating and cooling networks and identify opportunities for expanding and inter-connecting existing networks as well as establishing new networks.

D Major development proposals within Heat Network Priority Areas should have a communal low-temperature heating system:
1) the heat source for the communal heating system should be selected in accordance with the following heating hierarchy:

a) connect to local existing or planned heat networks
b) use zero-emission or local secondary heat sources (in conjunction with heat pump, if required)
c) use low-emission combined heat and power (CHP) (only where there is a case for CHP to enable the delivery of an area-wide heat network, meet the development's electricity demand and provide demand response to the local electricity network)
d) use ultra-low NOx gas boilers

2) CHP and ultra-low NOx gas boiler communal or district heating systems should be designed to ensure that they meet the requirements in Part B of Policy SI 1 Improving air quality 3) where a heat network is planned but not yet in existence the development should be designed to allow for the cost-effective connection at a later date.

E) Heat networks should achieve good practice design and specification standards for primary, secondary and tertiary systems comparable to those set out in the CIBSE/ADE Code of Practice CP1 or equivalent.

Policy SI 4 Managing heat risk

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

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

1) reduce the amount of heat entering a building through orientation, shading, high albedo materials, fenestration, insulation and the provision of green infrastructure
2) minimise internal heat generation through energy efficient design
3) manage the heat within the building through exposed internal thermal mass and high ceilings
4) provide passive ventilation
5) provide mechanical ventilation
6) provide active cooling systems.

Policy SI 12 Flood risk management

A Current and expected flood risk from all sources (as defined in paragraph 9.12.2) across London should be managed in a sustainable and cost-effective way in collaboration with the Environment Agency, the Lead Local Flood Authorities, developers and infrastructure providers.
B Development Plans should use the Mayor's Regional Flood Risk Appraisal and their Strategic Flood Risk Assessment as well as Local Flood Risk Management Strategies, where necessary, to identify areas where particular and cumulative flood risk issues exist and develop actions and policy approaches aimed at reducing these risks. Boroughs should co-operate and jointly address cross-boundary flood risk issues including with authorities outside London.

C Development proposals should ensure that flood risk is minimised and mitigated, and that residual risk is addressed. This should include, where possible, making space for water and aiming for development to be set back from the banks of watercourses.

D Developments Plans and development proposals should contribute to the delivery of the measures set out in Thames Estuary 2100 Plan. The Mayor will work with the Environment Agency and relevant local planning authorities, including authorities outside London, to safeguard an appropriate location for a new Thames Barrier.

E Development proposals for utility services should be designed to remain operational under flood conditions and buildings should be designed for quick recovery following a flood.

F Development proposals adjacent to flood defences will be required to protect the integrity of flood defences and allow access for future maintenance and upgrading. Unless exceptional circumstances are demonstrated for not doing so, development proposals should be set back from flood defences to allow for any foreseeable future maintenance and upgrades in a sustainable and cost-effective way.

G Natural flood management methods should be employed in development proposals due to their multiple benefits including increasing flood storage and creating recreational areas and habitat.

Section 2: Description of development

2.1 Location

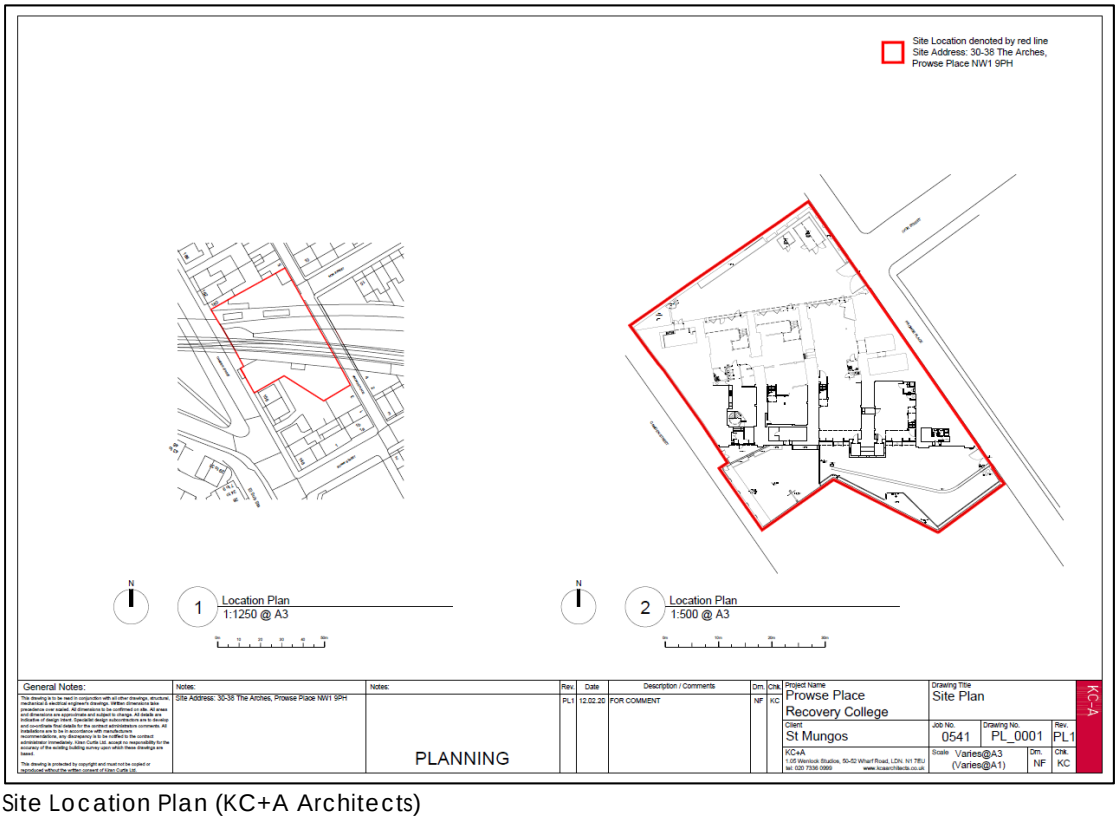
The Site is located at Arches 30-38 adjacent to 5 Prowse Place and 156 Camden Street, London, NW1 9PN.

The Site comprises of a row of double height arches beneath the London Overground line that runs east-west across the site towards Camden Road station as well as associated front and rear parking/courtyard areas.

The main access points in and out of the site are two sets of metal gates leading onto Prowse Place. There is a small doorway access that leads onto Camden Street to the south western side of the site though this currently provides emergency escape only.

Existing floorspace totals approximately 1,200 sqm across the ground floor and a mezzanine level.

The Site is located within the Jeffrey's Street Conservation Area and within the Camden Town business improvement district. The site also abuts the Kentish Town Neighbourhood boundary area to its western boundary.



Site Location Plan (KC+A Architects)

2.2 Details of development

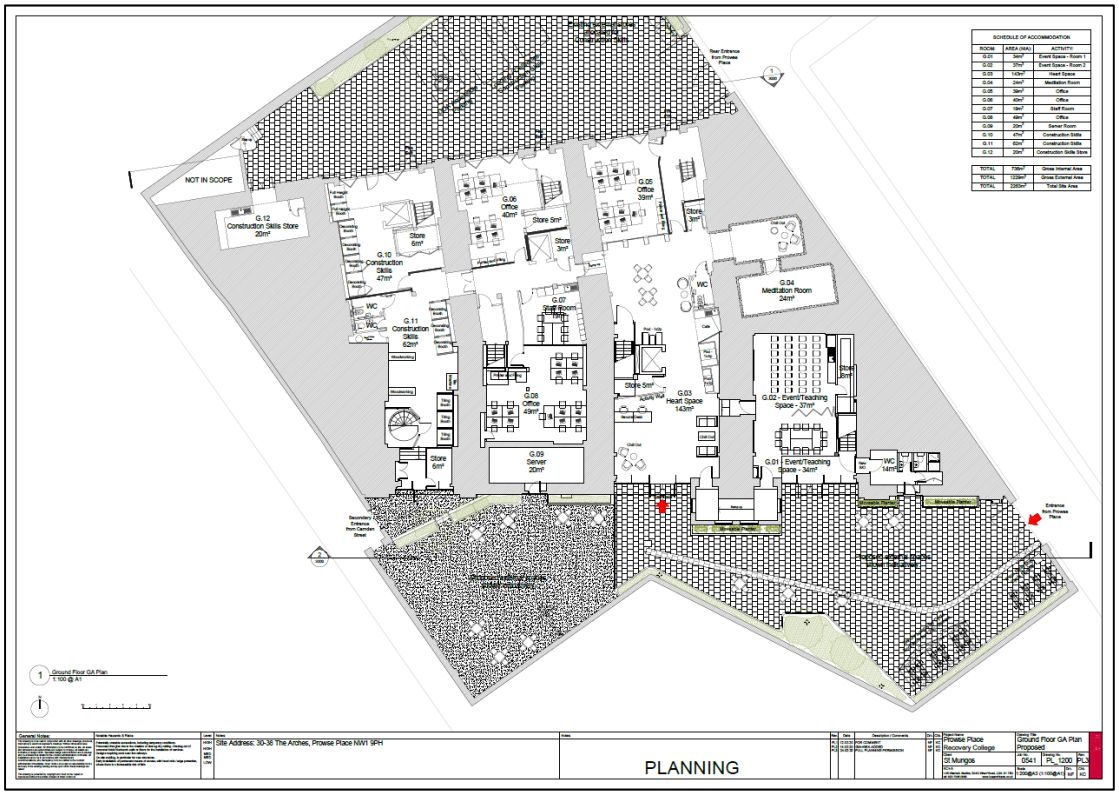
The proposals are made for a mixed use (Use Classes D1, B1 and A1) St Mungo's Recovery College.

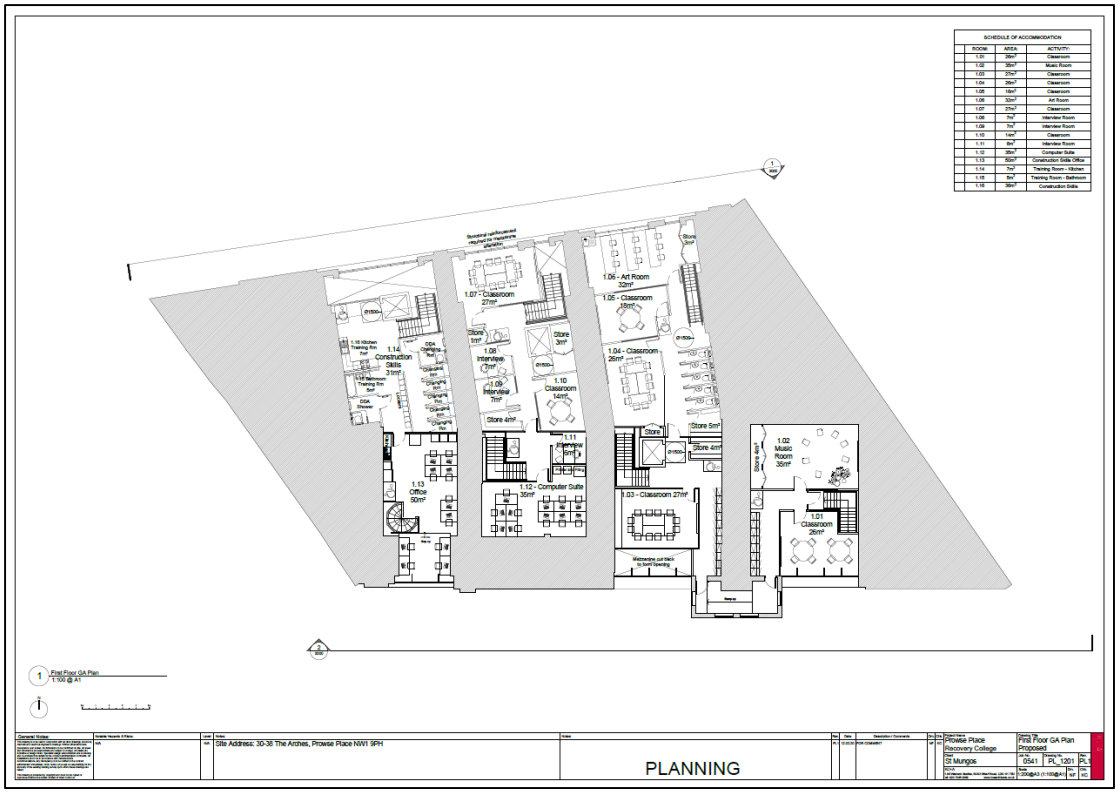
The description of development is:

'Change of use from Sui Generis to a mixed D1, B1 and A1 use and other associated works including minor alterations to the external facades to accommodate new plant and the provision of landscaping and cycle parking.'

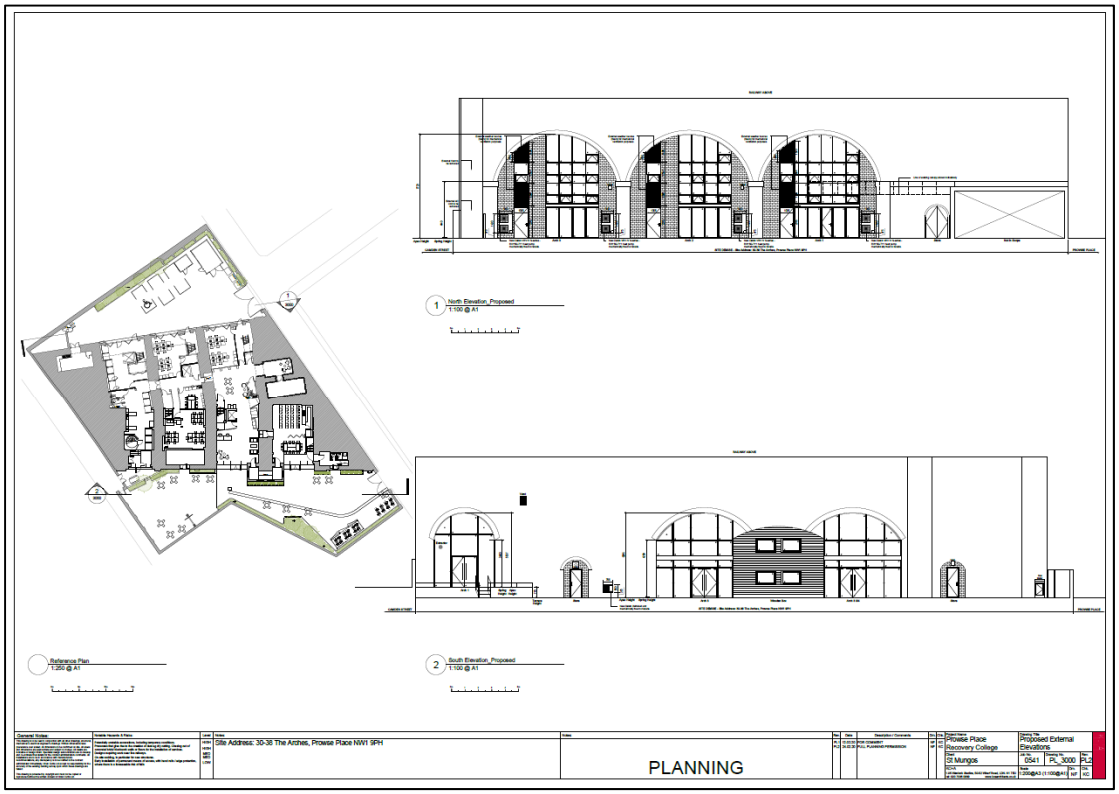
Facilities to be provided within the Recovery College include classrooms, computer suites, event/ teaching/ mediation rooms, offices, staff facilities and storage. Part of the unit will also provide a Construction Skills facility and an ancillary Class A1 use is sought to enable the potential sale of plants grown as part of St Mungo's Putting Down Roots – a horticultural training programme.

No additional floorspace is proposed to that existing and minor external alterations to the unit includes the provision of new plat units for air conditioning and services. No change is proposed to the hard landscaped courtyard and service yards excepting the provision of staff and visitor cycle parking in the southern courtyard.





Proposed Ground and First Floor Plans (KC+A Architects)



Proposed Elevations (KC+A Architects)

Section 3: Energy

3.1 The Energy Hierarchy

The energy hierarchy is generally accepted as the most effective way of reducing building carbon emissions.

1. Be lean: use less energy
2. Be clean: supply energy efficiently
3. Be green: use renewable energy
4. Be seen: monitor, verify and report on energy performance

Development proposals should:

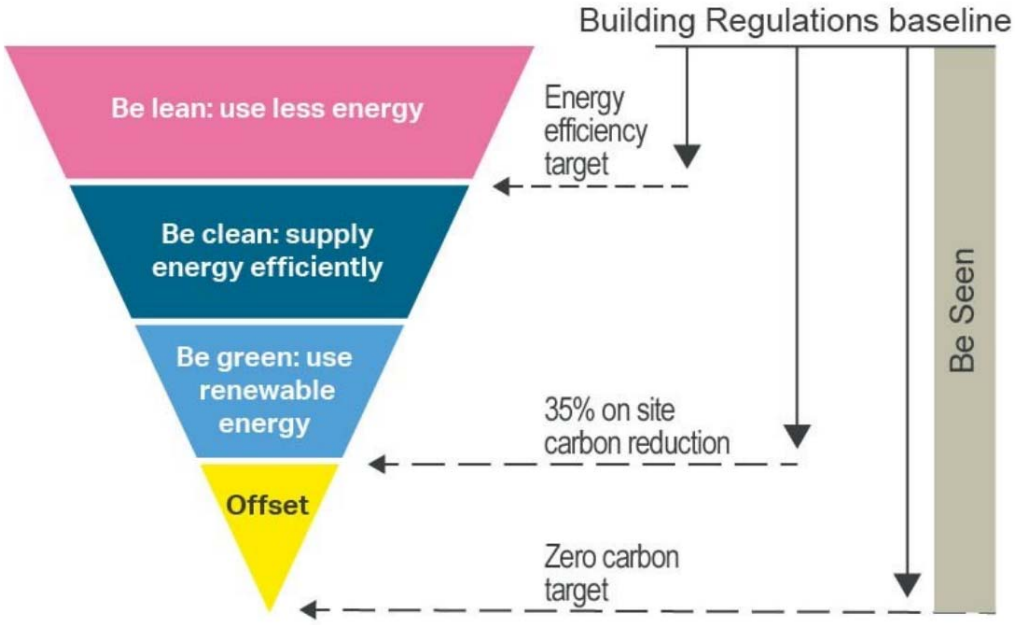


Figure 3.1: The Energy Hierarchy

- ***Reducing energy demand***

The first step in the process of reducing the overall energy used and CO_2 produced by the building is to minimise the energy required to heat it. A well-insulated building envelope and passive design will reduce the energy requirement for heating and ventilating the building.

- ***Energy efficient systems***

The second step is to specify services and controls, lighting and appliances that are energy efficient and which result in further reduction in energy requirements.

- ***Making use of Low or zero-carbon (LZC) technologies***

When the energy demand has been reduced by implementing the processes of improving the fabric and energy efficiency, then LZC

technologies can be employed to reduce the environmental impact of the remaining energy consumption.

- ***Monitoring and reporting***

Ensure comprehensive monitoring and reporting of energy demand and carbon emissions. Major developments are required to undertake this process for at least five years.

3.2 Calculating Baseline Energy Demand

The first step is to calculate compliant baseline emissions for the development. Calculated data using the government's approved methodology has been used to establish baseline energy requirements.

These have then been used to produce a BRUKL Output Document for the whole development with the correct number of zones assigned to each category.

Element	Baseline Specification
Walls	0.71W/m²K
Roof	0.75W/m²K
Heat loss Floors	1.55W/m²K
Glazing	3.30W/m²K
Space Heating	100% efficient electric panel heaters
DHW	95% efficient point of use
Ventilation	Mechanical supply/extract
Lighting	95 Lm/W
Controls	Manual On/Off
LZC Technology	None
Air tightness	25m3/hr/m2
Electrical Power Factor	<0.9

Table 3a: Baseline specification

The baseline emissions and energy consumption figures are produced by the Part L2A 'notional' building calculations taken from the IES software modelling. The combined results are shown in table 3b below:

3b: Total Annual Part L Baseline Regulated Emissions & Fabric Energy Efficiency	
Emissions	**109.6 kgCO_2/m²**
Energy	**648.43 kWh/m²**

The strategic aim is to reduce carbon emissions overall, so that while planning decisions and monitoring requirements will be underpinned by the targets expressed above, the requirement for energy assessments to include separate details of unregulated emissions is to recognise explicitly the additional contribution that can be made through use of efficient equipment, building controls and good management practices, including green leases. Unregulated emissions are therefore included in the calculations, but are not taken into account when calculating percentage improvement.

3.3 Emission Reduction Targets (Be Lean and Be Clean)

The first two steps of the energy hierarchy look at reducing energy consumption in the building through improvements to its fabric and by increasing the efficiency of the building services. This reduces the energy required to run the building and thus the emissions associated with that energy use.

The existing fabric specification used in the 'notional building' (used to calculate the target emission rate) can be difficult to enhance and in reality further opportunities for improvement to the building fabric are limited. The proposed services are scheduled to be upgraded, with the introduction of the Daikin air source heat pump to provide space heating and cooling, although full specifications are not known for all replacement lighting and water heating.

Element	Be Lean and Be Clean Specification
Walls	0.71W/m²K
Roof	0.75W/m²K
Heat loss Floors	1.55W/m²K
Glazing	3.30W/m²K
Space Heating	Daikin VRV ASHP
DHW	95% efficient point of use
Ventilation	Mechanical supply/extract
Lighting	95 Lm/W
Controls	Manual On/Off
LZC Technology	None
Air tightness	25m3/hr/m2
Electrical Power Factor	<0.9

Table 3c: Be Lean and Be Clean specification

The improved Be Lean and Be Clean emissions and energy consumption figures produced by the Part L2A 'notional' building calculations taken from the IES software modelling are shown in table 3d below:

3d: Total Annual Part L Be Lean and Be Clean Regulated Emissions & Fabric Energy Efficiency	
Emissions	**30.3 kgCO_2/m²**
Energy	**293.38 kWh/m²**

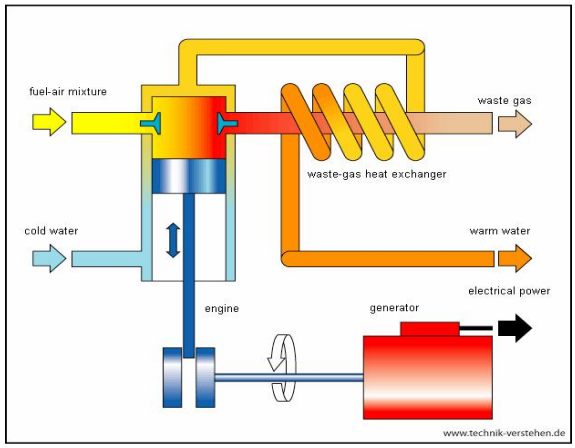
3.4 Communal Heating and CHP

Communal heating scheme

The benefit of communal heating systems becomes questionable for small scale installation. Additional space is required for centralised plant rooms and ducting/pipework. The increased cost and complexity of such systems is not offset by the minimal performance improvement that may be achieved and given this; communal heating is not proposed for the development.

Combined heat & power (CHP)

Combined heat and power uses an electricity generator, generally a gas powered internal combustion engine, with heat recovery on the exhaust used to heat water for heating and domestic hot water supply.



The proportions of heat and electricity produced are normally in the region of 65:35. This requires a constant heat load throughout the year for the system to perform efficiently.

For CHP to be viable on commercial developments a high hot water demand is usually required in order to generate sufficient heating baseload. As this is not the case on this occasion CHP is not viable for consideration.

3.5 CO_2 reduction through the use of renewable or low carbon technology (Be green)

Camden planning guidance (March 2019) requires renewable or low-carbon energy in both new and refurbishment developments. The below table set a target of 20% reduction in CO_2 emissions from renewable energy provision on major non-residential developments of more than 1,000m^2.

Table 2b Energy reduction targets, non-domestic

Development should comply with these standards/provide this information	Non-domestic New Build (assessed under L2A)			Non-domestic Refurbishment (assessed under L2B)		
	Major (>1,000 sqm)	Medium (500sq.m and <1,000 sqm)	Minor (<500sq.m)	Major (>1,000 sqm)	Medium (500sq.m and <1,000 sqm)	Minor (<500sq.m)
Energy and carbon reduction targets						
Overall carbon reduction targets	*35% below Part L of 2013 Building Regulations (London Plan 5.2, Local Plan CC1)*	*Greatest possible reduction below Part L of 2013 Building Regulations (Local Plan CC1)*	*Greatest possible reduction below Part L of 2013 Building Regulations (Local Plan CC1)*	*Greatest possible reduction, meeting Part L2B for retained thermal elements. (London Plan 5.4, Local Plan CC1)*	*Greatest possible reduction below Part L of 2013 Building Regulations (Local Plan CC1)*	*Greatest possible reduction below Part L of 2013 Building Regulations (Local Plan CC1)*
Reduction in CO2 from onsite renewables (after all other energy efficiency measures have been incorporated)	*20% (London Plan 5.7, Local Plan CC1)*	*20% (London Plan 5.7, Local Plan CC1)*	*Incorporate renewables where feasible*	*20% (London Plan 5.4, 5.7, Local Plan CC1*	*20% (London Plan 5.4, 5.7, Local Plan CC1*	*Incorporate renewables where feasible*

3e: Target contribution from low carbon & renewable technologies	
Total 'baseline' Part L 2013 compliant CO_2 emissions (Tonnes CO_2 per year)	146.82
Required reduction (20%) from renewables (Tonnes CO_2 per year)	29.36
Total reduction over Baseline (Tonnes CO_2 per year)	**106.23**
Total 'be lean, be clean & be green' annual figures	**40.59**

Energy resources accepted as renewable or low carbon technologies are defined by the Department of Energy and Climate Change Low Carbon Buildings Program as:

- Solar photovoltaics
- Wind turbines
- Small hydro
- Solar thermal hot water
- Ground source heat pumps
- Air source heat pumps
- Bio-energy
- Renewable CHP
- Micro CHP (Combined heat and power)

The proposal is to install a highly efficient Daikin air source heat pump that will exceed the requirements of Camden by having a COP of more than 4. This strategy will save approximately 475,625 kWh/yr of electricity whilst offsetting 142.31 tonnes of CO_2 across the development.

The final specification for the scheme is shown below in table 3f with the results shown in tables 3g.

Element	Be Lean, Be Clean and Be Green Specification
Walls	0.71W/m²K
Roof	0.75W/m²K
Heat loss Floors	1.55W/m²K
Glazing	3.30W/m²K
Space Heating	Daikin VRV ASHP
DHW	95% efficient point of use
Ventilation	Mechanical supply/extract
Lighting	95 Lm/W
Controls	Manual On/Off
LZC Technology	None
Air tightness	25m3/hr/m2
Electrical Power Factor	<0.9

Table 3f: Be Lean, Be Clean and Be Green specification

3g: Total improvement over Part L	
Total Baseline Emissions (Tonnes CO_2/yr)	146.82
Contribution from renewables (Tonnes CO_2/yr)	106.23
Total compliant Be Green Emissions (Tonnes CO_2/yr)	40.59
Percentage reduction achieved from renewables	72.35%
Total improvement over baseline (%)	**72.35%**

3.6 The Cooling Hierarchy

Overheating within buildings has become a more prevalent issue and steps to mitigate this risk are included within the steps over the cooling hierarchy listed below.

1. Minimising internal heat generation through energy efficient design: For example, heat distribution infrastructure within buildings should be designed to minimise pipe lengths, particularly lateral pipework in corridors of apartment blocks, and adopting pipe configurations which minimise heat loss e.g. twin pipes.
2. Reducing the amount of heat entering the building in summer: For example, through use of carefully designed shading measures, including balconies, louvres, internal or external blinds, shutters, trees and vegetation.
3. Use of thermal mass and high ceilings to manage the heat within the building: Increasing the amount of exposed thermal mass can help to absorb excess heat within the building.
4. Passive ventilation: For example, through the use of openable windows, shallow floorplates, dual aspect units, designing in the 'stack effect'
5. Mechanical ventilation: Mechanical ventilation can be used to make use of 'free cooling' where the outside air temperature is below that in the building during summer months. This will require a by-pass on the heat recovery system for summer mode operation.

For this development the risk of over overheating has been assessed by as being minimal. This is a result of the high thermal mass specification of the existing structure, the use of passive ventilation as the windows could be open to allow cross ventilation and the installation of air source heat pumps that can be run in a cooling mode.

Solar Photovoltaics

Solar panel electricity systems, also known as solar photovoltaics (PV), capture the sun's energy using photovoltaic cells. These cells do not need direct sunlight to work – they can still generate some electricity on a cloudy day. The cells convert the sunlight into electricity, which can be used to run household appliances and lighting. When excess power is generated this can be sold back to the grid. PV panels typically have a lifetime performance of 20-25 years, and can typically see paybacks of around 8-10 years. As this development has no roof space, given the location of the railway lines overhead, the incorporation of solar PV is discounted.

Wind Turbines

Wind turbines harness the power of the wind and use it to generate electricity. Forty percent of all the wind energy in Europe blows over the UK, making it an ideal country for domestic turbines. Urban sites such as the location of this development are generally unsuitable for wind turbine installations due to the interrupted turbulent wind flows caused by surrounding buildings and large obstacles. There are also possible issues with noise and 'flicker' for the neighbouring buildings.

The urban nature of the site and lack of space mean that a wind turbine cannot be recommended as a viable option for this development. There are also general issues surrounding the use of building mounted turbines with the potential for excessive noise and vibration within the building and the effect of flicker on surrounding buildings and amenity spaces.

Table 3j: Average wind speeds for the site NW1 9PN	
45m above ground level	6.1m/s
25m above ground level	5.6m/s
10m above ground level	4.8m/s

Small Hydro Generation

Hydroelectricity generation uses running water to generate electricity, whether it is a small stream or a larger river. All streams and rivers flow downhill. Before the water flows down the hill, it has potential energy because of its height. Hydro power systems convert this potential energy into kinetic energy in a turbine, which drives a generator to produce electricity. Small, or 'micro' hydro generation requires a reliable source of flowing water with a reasonably constant flow velocity. Systems of this nature are normally installed in locations with a natural moving water source such as a river, stream or spring where part of the flow can be diverted through a generator.

There is no such source of flowing water in this case and small hydro generation is not an option for this development.

Solar Water heating

Solar water heating systems use free heat from the sun to warm domestic hot water. Solar hot water heating can generate a large proportion of a buildings annual DHW requirement. The displaced fuel would be mains gas meaning that the CO_2 savings of this type of system would be relatively low due to the low carbon intensity of the displaced fuel. Add to this the fact that only a small proportion of the development could benefit from solar thermal and consequently it is not considered to be a suitable system for this development as the roof space would be better used for PV.

The amount of solar thermal panels needed is calculated from the hot water cylinder capacity, at a rate usually of 1m2 of panel for every 60 litres of hot water stored.

However, as the current main contributor to the renewable energy is performing the same function and is expected to perform better this technology has not been considered further for this project.

Heat Pumps

Heat pumps use similar technology as refrigerators but reversed. A refrigerant liquid is used as a medium to extract heat from a source and convert it into useful heat energy. The heat source used can be generally one of three types; the ground, the air or a body of water. Both ground and water source heat pumps use a long circuitous pipe through which a refrigerant is pumped. In ground source heat pumps this can be either a coiled pipe or 'slinky' that is buried in a series of horizontal trenches or a loop inside a vertical bore hole to depths that can be up to 200m or deeper. Water source heat pumps generally use a similar system to the 'slinky' used for ground source systems but either floated on or submerged in a body of water (either a large pool or running water source). Air source heat pumps have a refrigerant coil mounted outside the building through which is passed air so that heat can be extracted. All three types of heat pump generally use the collected heat from the source to heat water. The heated water can then be used for space heating and DHW. Heat pumps require an input of energy to drive pumps, this is usually electricity and so they cannot be considered to be zero carbon unless the supplied electricity is from renewable sources; they do however have very good efficiencies; energy produced by heat pumps is typically in the region of 2.5 times that which is required to run them, giving efficiencies of 250%.

A ground source heating system would have a slightly higher COP, but would also have a higher capital cost due to the additional excavation works to install the ground loop which is not feasible on this existing site.

The CO_2 emissions saving by utilising heat pumps is relatively low, when compared to mains gas, due to the high carbon emission factor of grid electricity. However, this technology is being encouraged as it is hoped that the emission factor for grid electricity will be reduced over the coming years by the use of renewable generation of electricity and the proposed SAP10 emission figures.

The proposed ASHP system demonstrates a 72.35% reduction in CO2 emissions.

Bio Energy

The Low Carbon Buildings Program (LCBP) defines biomass as follows:

"Biomass is often called 'bioenergy' or 'biofuels'. These biofuels are produced from organic materials, either directly from plants or indirectly from industrial, commercial, domestic or agricultural products. Biofuels fall into two main categories:

- *Woody biomass includes forest products, untreated wood products, energy crops, short rotation coppice (SRC), e.g. willow.*
- *Non-woody biomass includes animal waste, industrial and biodegradable municipal products from food processing and high energy crops, e.g. rape, sugar cane, maize."*

For small-scale domestic [and small scale commercial] applications of biomass the fuel usually takes the form of wood pellets, wood chips and logs. The LCBP goes on to state:

"There are two main ways of using biomass to heat a domestic property:

- *Stand-alone stoves providing space heating for a single room. These can be fuelled by logs or pellets but only pellets are suitable for automatic feed. Generally they are 5-11 kW in output, and some models can be fitted with a back boiler to provide water heating.*
- *Boilers connected to central heating and hot water systems. These are suitable for pellets, logs or chips, and are generally larger than 15 kW"*

(http://www.lowcarbonbuildings.org.uk/micro/biomass)

This technology is dismissed as the space requirements needed for the boiler and pellet store make this impractical along with complying with the clean air zone requirements.

Conclusions:

- The cost of installing renewable energies will be higher than conventional technology.
- The 20% target of reduction in CO_2 emissions is 29.34 tonnes of CO_2 a year. This is achieved by the inclusion of air source heat pumps.
- The renewable technologies included would produce emission savings which equate 72.35% of the total CO_2 emissions of the proposed building and would comply with the planning obligations.

Section 4: Sustainability

The proposed development is required to achieve BREEAM certification as required by planning policy. The BREEAM assessment has been undertaken and will be submitted in a separate report.

Sustainable Design and Construction requires development to demonstrate that sustainable design standards are integral to the proposal, including its construction and operation, and ensure that they are considered at the beginning of the design process.

The design addresses issues regarding sustainability in a number of areas:

4.1 Management

Sustainability Objective:

To use sustainable construction methods and encourage best practice in building delivery.

Consultation between the stakeholders, including the architect, client and local authority has ensured that all key design needs have been met.

Best practice will be used during construction so as to reduce the impact of works on the surrounding environment.

The construction site will be managed so as to reduce resource use, energy for site operations, water consumption, waste and pollution. A system of monitoring, target setting and reporting will be put in place to ensure standards are met.

A system of commissioning will be instigated by the design team to ensure that all installed M&E plant is fully commissioned on installation and that this is followed up by further seasonal commissioning of heating and cooling systems for at least the first 12 months after completion.

Building user guides will be provided to building end users if requested to ensure they are provided with adequate information to enable effective use of the building and its systems. These will be tailored for both building managers and occupiers to ensure all building users fully understand the buildings operation so as to encourage efficient use. A programme of aftercare support will be implemented upon handover.

4.2 Health & Wellbeing

> ***Sustainability Objective:***
>
> *To provide comfortable working and living spaces that promotes a healthy environment and which is adaptable to changing needs.*

Health and wellbeing considers the environment provided for building users and how this promotes healthy happy lives.

The internal spaces are designed and orientated wherever possible in such a way as to provide natural daylight, sunlight and external views to occupied spaces thus adding to the internal environment.

Finishing elements will be chosen which do not contain harmful chemicals such as VOCs and formaldehyde.

Every practical effort will be made to minimise sound transmission to the external environment. The measures employed will aim to go beyond current Building Regulation standards for minimising sound transmission wherever practical.

The internal spaces have been designed to be adaptable and accessible in order to accommodate occupiers changing needs over time.

4.3 Energy

> ***Sustainability Objective:***
>
> *To ensure that the development is energy efficient in order to reduce running costs while maximising internal comfort for the building occupiers and ensure the emission of climate change gasses is minimised.*

Section 3 details the energy strategy proposed for the building. A number of other areas are addressed below thus reducing energy consumption with an aim to reduce running costs and lifecycle carbon emissions.

Smart meters can be requested from the energy supplier so that the electricity use can be monitored by occupants. Visual displays providing this information encourage energy efficiency and reduce running costs.

External lighting will use low energy fittings where appropriate with adequate controls such as timers, daylight sensors and movement sensors.

4.4 Transport

Sustainability Objective:

To reduce pollution and congestion levels. To encourage walking, cycling and the use of public transport.

As around 30% of UK energy use is associated with transport. Developments of this nature that can encourage a reduction in car use have a positive impact on the environment both through a reduced reliance on precious fossil fuel resources and a reduction in harmful emissions.

The proposals will be car free and staff and visitors will be expected to travel to the site via public transport, cycle or walking. Cycle parking for staff and visitors will be provided in the southern courtyard to meet London Plan standards.

The location of the development means that it is close to local amenities and has excellent public transport links, with regular bus routes close to the site and Camden Road Overground Station adjacent to the site.

Access for staff and visitors will be via the existing access points from Camden Street to the west and Prowse Place to the east into the southern part of the site.

Service access will be made from the northern Prowse Place entrance.

Compared to the existing use of the unit and the previous retail/ bed showroom and storage use it is not expected that any large vehicles will be required for servicing of the unit.

4.5 Water Use

Sustainability Objective:
Conserve water through efficiency measures and recycling. Mitigating against increases in flood risk due to reduction in permeable areas and climate change.

Clean water is a precious resource and efforts to be efficient in its use and minimise waste are of ever growing in importance.

The following example specification demonstrates how a target of 105litres per person per day can be achieved without requiring rainwater or greywater harvesting, however, the BREEAM requirement will dictate the minimum standards to be set for sanitary fittings. In addition, measures will be taken to minimise the risks of leaks and identify them when they do occur.

Maximum design flow rates & capacities:

***Taps** (other than kitchen taps)*		***5.00**(litres/min)*
Kitchen and Utility Taps		***7.00**(litres/min)*
Showers		***7.00**(litres/min)*
***Baths** (with shower over)*		***170**(litres to overflow)*
***WCs** (Flush Volume)*	***Full Flush:***	***6.00**(litres)*
	Part Flush:	***4.00**(litres)*
***Washing Machine** (Where specified)*		***8.17**(litres/kg dry load)*
***Dishwasher** (Where Specified)*		***1.25**(litres/place setting)*

4.6 Materials

Sustainability Objective:

To reduce the impact of construction on natural resources by using sustainable, legally sourced product.

Building materials have a significant impact when the embodied energy and resources used in their manufacture, transport and disposal are considered. Responsible sourcing of materials can have a real beneficial effect on the embodied impact of the final development. Part of the building will be of a timber construction with further investigation into offsite manufacture.

All relevant materials in basic and finishing elements will be responsibly and legally sourced from certified suppliers using sustainable raw materials where possible.

Wherever possible reused and recycled materials will be sourced.

All materials will be sourced from local suppliers where possible to reduce transport miles and support the local supply chain.

Materials containing chemicals which are harmful to health or the environment will be avoided wherever possible.

4.7 Waste Management

Sustainability Objective:

To reduce waste going to landfill through material efficiency, recycling and sustainable construction methods.

A key part of sustainability is to manage resources efficiently. Reducing the amount of waste created and maximising resource efficiency during demolition, construction and during the building's lifetime is fundamental to providing sustainable developments.

Efforts to reduce construction waste generally will concentrate on reducing site waste together with increasing reuse and recycling of waste that cannot be avoided in an effort to reduce volumes going to landfill. This can be implemented through a Site Waste Management Plan.

Adequate facilities will be provided for the storage and recycling of waste and recycling and this in conjunction with the adoption of the Local Authority collection scheme for waste and recycling will encourage occupants to minimise waste going to landfill.

4.8 Land Use & Ecology

Sustainability Objective:

To protect, maintain and enhance existing biodiversity and habitats. To create new habitats to add value to the landscape in order to improve the urban environment.

This is an urban location with an existing Sui Generis use and as such it is assessed to have limited ecological value and any undertaking to improve upon this will have a positive ecological impact.

The nature of the development means there is opportunity to improve the ecology and introduce improved areas of planting. Efforts will be made to protect any existing habitats while encouraging new ones.

4.9 Pollution

Sustainability Objective:

To reduce the environmental impact of atmospheric, watercourse, noise and sound pollution.

There are a variety of forms of environmental pollution that can potentially arise from the construction and use of buildings. A significant proportion is airborne in the form of dust, fumes and chemicals. Other forms of pollution include unwanted noise or light.

Best practice will be used during the construction phase to ensure that environmental pollution due to construction work will be minimised. Any waste that is generated will be taken to, and processed by a local recycling centre.

Efforts will be made to ensure the environmental impact of the materials used for the build will be reduced through responsible sourcing and reduced wastage.

The use of materials where the manufacture or installation requires the use of harmful global warming chemicals will be avoided.

Initial investigations of the Environment Agency Flood Map suggest that the site is inside Zone 1 with a low risk of flooding.

We have assumed that this development will cause no increase in surface water run-off. There is an opportunity to reduce the amount of impermeable area by incorporating permeable paving around the building and this should have the effect of reducing run-off from the site post development.

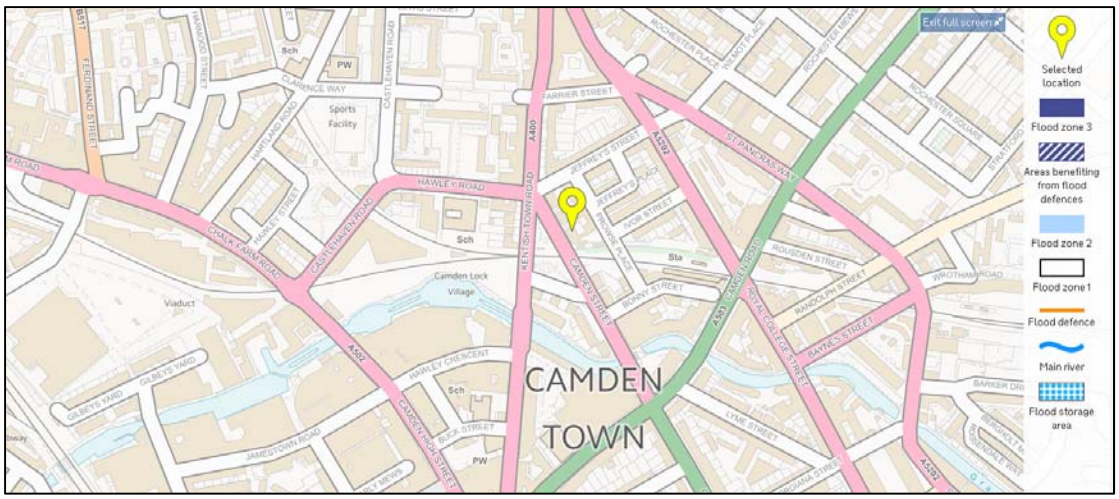


Figure 4.1: Environment Agency Flood Map for NW1 9PN.

Section 5: Summary

To ensure compliance with London Borough of Camden Core Strategy and Local Plan a number of sustainable construction strategies will be incorporated in the design and construction of the development. These will include, amongst others, minimum standards relating to energy and water use which will reduce the developments environmental impact over its lifetime, which assists in ensuring a sustainable development for both current and future users.

To ensure compliance with London Borough of Camden Local Plan (2017) and the London Plan the energy strategy proposed for the development at Arches 30-38, Prowse Place NW1 9PN is for the specification of a Daikin air source heat pump.

This approach results in an overall reduction in emissions of 72.35% which complies with both the London Plan and the Camden Local Plan.

Table 5a shows the reduction in tonnes of CO_2 and kWh per year through the recommended LZC technologies.

Table 5a: Total anticipated reduction in regulated emissions & energy use

	kWh/m²	**Tonnes CO_2 per year**
Total Part L2A 'Baseline' annual figures	648.43	146.82
Unregulated energy figures	25.17	13.06
Total 'be lean, be clean & be green' annual figures	293.38	40.59
Contribution from renewables	**54.76%**	**72.35%**
Total reduction over Baseline	**54.76%**	**72.35%**

The proposed strategy will offset approximately 475,625 kWh/yr of electricity whilst offsetting 142.31 tonnes of CO_2 across the development, which ensures a sustainable development for now and the future.

This development fully complies with National and Local Policy along with meeting all adopted policy and also delivering a sustainable scheme.

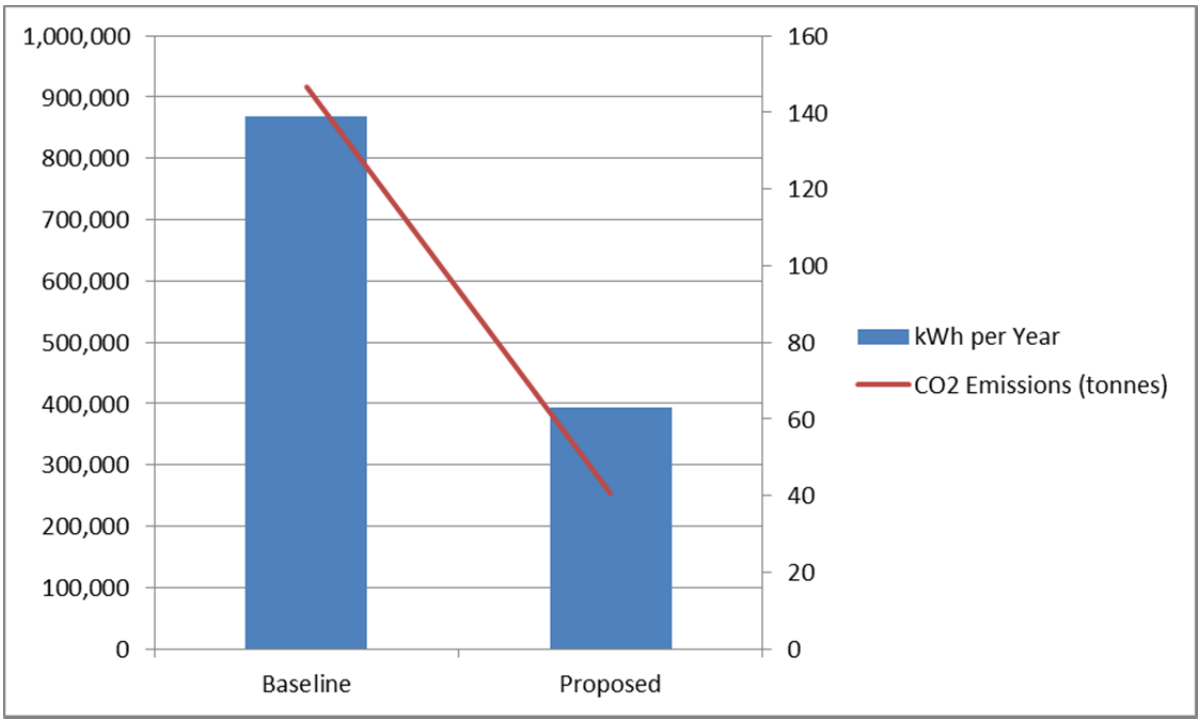


Figure 5.1: CO_2 emissions for each stage of the assessment

Appendix

SBEM Summary

Prowse Place, Camden St. NW1

Base Model		Red. Energy Demand *Changes over Base Model*	Inc. Energy Efficiency *Changes over Base Model*	LZC Sources *Changes over Base Model*
Drawings *numbers*		**1**	**2**	**3**
U Values				
Ext. Walls	**0.71**			
Gnd Floor	**1.55**			
Windows	**3.30**			
Access Doors	**2.20**			
Roof	**0.75**			
Mech Services				
Space Heating	**Elec Panel**		**Daikin VRV ASHP**	
Seasonal Efficiency	**100%**			
DHW	**Point of Use**			
Delivery Efficiency	**95%**			
Ventilation				
General	**Mechanical Supply/Extract**			
WCs/Bathrooms	**Remote Zone Extract**			
Lighting	**95.0 Lm/W**			
Control	**Manual**			
Renewables	**None**			
Air Tightness	**25 $m^3/hr/m^2$**			
Electrical Power Factor	**<0.9**			
Lighting Metering Prov?	**No**			
Lighting Out-of range Warning?	**No**			
BER	**109.6**		**30.3**	
		Impmnt. **100%**	**Impmnt.** **72%**	**Impmnt.** **100%**

Without CHP	
	100%

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

Prowes Place - TWO

As built

Date: Fri Feb 21 16:50:03 2020

Administrative information

Building Details

Address: St Mungo's Recovery College, LONDON, NW1 9PN

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.12

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.12

BRUKL compliance check version: v5.6.a.1

Owner Details

Name: St Mungo's Charity

Telephone number: ---

Address: ---, ---, ---

Certifier details

Name: MES Building Solutions

Telephone number: 01636 653 055

Address: Newark Beacon, Cafferta Way, NEWARK, NG24 2TN

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

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

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	17.1
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	17.1
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	30.3
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	0.71	0.74	GN000002:Surf[4]
Floor	0.25	1.55	1.55	GN000002:Surf[0]
Roof	0.25	0.75	0.75	GN000002:Surf[1]
Windows***, roof windows, and rooflights	2.2	3.3	3.3	GN000000:Surf[1]
Personnel doors	2.2	2.2	2.2	GN000002:Surf[2]
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	25

Building services

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

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

1- Air Con Mech Vent

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.4	3.3	0	0	-
Standard value	2.5*	3.2	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

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

"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
Gnd_G.09 Server	-	1.1	0.5	-	-	-	-	-	-	-	N/A
Gnd_Store	-	1.1	0.5	-	-	-	-	-	-	-	N/A
Gnd_Stairs	-	1.1	0.5	-	-	-	-	-	-	-	N/A
Gnd_G.11 Construction Skills	-	1.1	0.5	-	-	-	-	-	-	-	N/A
Gnd_Cylinder	-	1.1	0.5	-	-	-	-	-	-	-	N/A
Gnd_WCs	-	-	0.5	-	-	-	-	-	-	-	N/A
Gnd_Store	-	1.1	0.5	-	-	-	-	-	-	-	N/A
Gnd_G10 Construction Skills	-	1.1	0.5	-	-	-	-	-	-	-	N/A
Gnd_G.08 Office	-	1.1	0.5	-	-	-	-	-	-	-	N/A
Gnd_G.07 Staff Room	-	1.1	0.5	-	-	-	-	-	-	-	N/A
Gnd_Circulation	-	1.1	0.5	-	-	-	-	-	-	-	N/A
Gnd_Store	-	1.1	0.5	-	-	-	-	-	-	-	N/A
Gnd_Store	-	1.1	0.5	-	-	-	-	-	-	-	N/A
Gnd_Circulation	-	1.1	0.5	-	-	-	-	-	-	-	N/A
Gnd_G.06 Office	-	1.1	0.5	-	-	-	-	-	-	-	N/A
Gnd_G.05 Office	-	1.1	0.5	-	-	-	-	-	-	-	N/A
Gnd_Circulation	-	1.1	0.5	-	-	-	-	-	-	-	N/A
Gnd_Store	-	1.1	0.5	-	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
Gnd_G.04 Meditation Room	-	1.1	0.5	-	-	-	-	-	-	-	N/A
Gnd_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Gnd_Circulation	-	1.1	0.5	-	-	-	-	-	-	-	N/A
Gnd_Store	-	1.1	0.5	-	-	-	-	-	-	-	N/A
Gnd_Circulation	-	1.1	0.5	-	-	-	-	-	-	-	N/A
Gnd_G.03 Heart Space	-	1.1	0.5	-	-	-	-	-	-	-	N/A
Gnd_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Gnd_Store	-	1.1	0.5	-	-	-	-	-	-	-	N/A
Gnd_G.01/02 Event / Teaching	-	1.1	0.5	-	-	-	-	-	-	-	N/A
Gnd_Circulation	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_1.13 Office	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_1.12 Computer Suite	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_1.11 Interview	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_Circulation	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_1.03 Classroom	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_Store	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_Circulation	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_Store	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_Toilets	-	-	0.5	-	-	-	-	-	-	-	N/A
1st_Store	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_1.04 Classroom	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_1.05 Classroom	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_1.06 Art Room	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_Circulation	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_1.01 Classroom	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_Circulation	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_Store	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_1.02 Music Room	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_1.10 Classroom	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_Store	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_1.08 Interview	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_1.09 Interview	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_Store	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_Circulation	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_1.07 Classroom	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_Circulation	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_DDA Shower	-	-	0.5	-	-	-	-	-	-	-	N/A
1st_Circulation	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_1.14 Construction Skills	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_Circulation	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_Changing	-	-	0.5	-	-	-	-	-	-	-	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	
Gnd_G.09 Server	95	-	-	80
Gnd_Store	95	-	-	9
Gnd_Stairs	-	95	-	18
Gnd_G.11 Construction Skills	95	-	-	358
Gnd_Cylinder	95	-	-	19
Gnd_WCs	-	95	-	34
Gnd_Store	95	-	-	9
Gnd_G10 Construction Skills	95	-	-	302
Gnd_G.08 Office	95	-	-	353
Gnd_G.07 Staff Room	95	-	-	151
Gnd_Circulation	-	95	-	64
Gnd_Store	95	-	-	7
Gnd_Store	95	-	-	9
Gnd_Circulation	-	95	-	26
Gnd_G.06 Office	95	-	-	279
Gnd_G.05 Office	95	-	-	273
Gnd_Circulation	-	95	-	40
Gnd_Store	95	-	-	6
Gnd_G.04 Meditation Room	95	-	-	167
Gnd_WC	-	95	-	29
Gnd_Circulation	-	95	-	19
Gnd_Store	95	-	-	9
Gnd_Circulation	-	95	-	35
Gnd_G.03 Heart Space	95	-	-	1007
Gnd_WC	-	95	-	63
Gnd_Store	95	-	-	12
Gnd_G.01/02 Event / Teaching	95	-	-	369
Gnd_Circulation	-	95	-	15
1st_1.13 Office	95	-	-	384
1st_1.12 Computer Suite	95	-	-	252
1st_1.11 Interview	95	-	-	71
1st_Circulation	-	95	-	36
1st_1.03 Classroom	95	-	-	156
1st_Store	95	-	-	7
1st_Circulation	-	95	-	109
1st_Store	95	-	-	2
1st_Toilets	-	95	-	50
1st_Store	95	-	-	8
1st_1.04 Classroom	95	-	-	151
1st_1.05 Classroom	95	-	-	113
1st_1.06 Art Room	95	-	-	229
1st_Circulation	-	95	-	68

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
1st_1.01 Classroom	95	-	-	148
1st_Circulation	-	95	-	62
1st_Store	95	-	-	9
1st_1.02 Music Room	95	-	-	187
1st_1.10 Classroom	95	-	-	92
1st_Store	95	-	-	8
1st_1.08 Interview	95	-	-	81
1st_1.09 Interview	95	-	-	82
1st_Store	95	-	-	7
1st_Circulation	-	95	-	27
1st_1.07 Classroom	95	-	-	192
1st_Circulation	-	95	-	130
1st_DDA Shower	-	95	-	31
1st_Circulation	-	95	-	74
1st_1.14 Construction Skills	95	-	-	215
1st_Circulation	-	95	-	30
1st_Changing	-	95	-	71

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?
Gnd_G.09 Server	N/A	N/A
Gnd_Store	NO (-40.2%)	NO
Gnd_Stairs	N/A	N/A
Gnd_G.11 Construction Skills	NO (-61.9%)	NO
Gnd_Cylinder	N/A	N/A
Gnd_WCs	N/A	N/A
Gnd_Store	N/A	N/A
Gnd_G10 Construction Skills	NO (-36.6%)	NO
Gnd_G.08 Office	N/A	N/A
Gnd_G.07 Staff Room	N/A	N/A
Gnd_Circulation	N/A	N/A
Gnd_Store	N/A	N/A
Gnd_Store	N/A	N/A
Gnd_Circulation	N/A	N/A
Gnd_G.06 Office	NO (-68.7%)	NO
Gnd_G.05 Office	NO (-68.5%)	NO
Gnd_Circulation	N/A	N/A
Gnd_Store	N/A	N/A
Gnd_G.04 Meditation Room	N/A	N/A
Gnd_WC	N/A	N/A
Gnd_Circulation	N/A	N/A
Gnd_Store	N/A	N/A
Gnd_Circulation	NO (-71.7%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Gnd_G.03 Heart Space	NO (-79.3%)	NO
Gnd_WC	N/A	N/A
Gnd_Store	N/A	N/A
Gnd_G.01/02 Event / Teaching	YES (+0.4%)	NO
Gnd_Circulation	N/A	N/A
1st_1.13 Office	NO (-73%)	NO
1st_1.12 Computer Suite	N/A	N/A
1st_1.11 Interview	N/A	N/A
1st_Circulation	NO (-78.4%)	NO
1st_1.03 Classroom	N/A	N/A
1st_Store	N/A	N/A
1st_Circulation	NO (-51.9%)	NO
1st_Store	N/A	N/A
1st_Toilets	N/A	N/A
1st_Store	N/A	N/A
1st_1.04 Classroom	N/A	N/A
1st_1.05 Classroom	N/A	N/A
1st_1.06 Art Room	YES (+53.7%)	NO
1st_Circulation	N/A	N/A
1st_1.01 Classroom	YES (+197.5%)	NO
1st_Circulation	N/A	N/A
1st_Store	N/A	N/A
1st_1.02 Music Room	N/A	N/A
1st_1.10 Classroom	N/A	N/A
1st_Store	N/A	N/A
1st_1.08 Interview	N/A	N/A
1st_1.09 Interview	N/A	N/A
1st_Store	N/A	N/A
1st_Circulation	N/A	N/A
1st_1.07 Classroom	YES (+94.8%)	NO
1st_Circulation	N/A	N/A
1st_DDA Shower	N/A	N/A
1st_Circulation	NO (-46.9%)	NO
1st_1.14 Construction Skills	N/A	N/A
1st_Circulation	N/A	N/A
1st_Changing	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?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m²]	1339.6	1339.6
External area [m²]	3325.2	3325.2
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	25	4
Average conductance [W/K]	3574.96	1432.3
Average U-value [W/m²K]	1.08	0.43
Alpha value* [%]	9.99	10

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

Building Use

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

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	37.13	10.26
Cooling	0.28	6.12
Auxiliary	4.67	3.22
Lighting	14.88	13.19
Hot water	1.48	1.62
Equipment*	25.17	25.17
TOTAL**	**58.43**	**34.41**

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

Energy Production by Technology [kWh/m²]

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

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	552.88	178
Primary energy* [kWh/m²]	293.38	130.65
Total emissions [kg/m²]	30.3	17.1

* 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] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	548	4.8	37.1	0.3	4.6	4.1	4.88	4.4	6.88
	Notional	94.5	83.5	10.3	6.1	3.1	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	0.45	GN000002:Surf[3]
Floor	0.2	1.55	GN000002:Surf[0]
Roof	0.15	0.75	GN000002:Surf[1]
Windows, roof windows, and rooflights	1.5	3.3	GN000000:Surf[1]
Personnel doors	1.5	2.2	GN000002:Surf[2]
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building

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

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

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

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

Prowes Place - BASE

As designed

Date: Fri Feb 21 16:27:46 2020

Administrative information

Building Details

Address: St Mungo's Recovery College, LONDON, NW1 9PN

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.12

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.12

BRUKL compliance check version: v5.6.a.1

Owner Details

Name: St Mungo's Charity

Telephone number: ---

Address: ---, ---, ---

Certifier details

Name: MES Building Solutions

Telephone number: 01636 653 055

Address: Newark Beacon, Cafferta Way, NEWARK, NG24 2TN

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

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

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	18.3
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	18.3
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	109.6
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	0.71	0.74	GN000002:Surf[4]
Floor	0.25	1.55	1.55	GN000002:Surf[0]
Roof	0.25	0.75	0.75	GN000002:Surf[1]
Windows***, roof windows, and rooflights	2.2	3.3	3.3	GN000000:Surf[1]
Personnel doors	2.2	2.2	2.2	GN000002:Surf[2]
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	25

Building services

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

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

1- Electric Panel Mech Vent

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

"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
Gnd_G.09 Server	-	1.1	0.5	-	-	-	-	-	-	-	N/A
Gnd_Store	-	1.1	0.5	-	-	-	-	-	-	-	N/A
Gnd_Stairs	-	1.1	0.5	-	-	-	-	-	-	-	N/A
Gnd_G.11 Construction Skills	-	1.1	0.5	-	-	-	-	-	-	-	N/A
Gnd_Cylinder	-	1.1	0.5	-	-	-	-	-	-	-	N/A
Gnd_WCs	-	-	0.5	-	-	-	-	-	-	-	N/A
Gnd_Store	-	1.1	0.5	-	-	-	-	-	-	-	N/A
Gnd_G10 Construction Skills	-	1.1	0.5	-	-	-	-	-	-	-	N/A
Gnd_G.08 Office	-	1.1	0.5	-	-	-	-	-	-	-	N/A
Gnd_G.07 Staff Room	-	1.1	0.5	-	-	-	-	-	-	-	N/A
Gnd_Circulation	-	1.1	0.5	-	-	-	-	-	-	-	N/A
Gnd_Store	-	1.1	0.5	-	-	-	-	-	-	-	N/A
Gnd_Store	-	1.1	0.5	-	-	-	-	-	-	-	N/A
Gnd_Circulation	-	1.1	0.5	-	-	-	-	-	-	-	N/A
Gnd_G.06 Office	-	1.1	0.5	-	-	-	-	-	-	-	N/A
Gnd_G.05 Office	-	1.1	0.5	-	-	-	-	-	-	-	N/A
Gnd_Circulation	-	1.1	0.5	-	-	-	-	-	-	-	N/A
Gnd_Store	-	1.1	0.5	-	-	-	-	-	-	-	N/A
Gnd_G.04 Meditation Room	-	1.1	0.5	-	-	-	-	-	-	-	N/A
Gnd_WC	-	-	0.5	-	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
Gnd_Circulation	-	1.1	0.5	-	-	-	-	-	-	-	N/A
Gnd_Store	-	1.1	0.5	-	-	-	-	-	-	-	N/A
Gnd_Circulation	-	1.1	0.5	-	-	-	-	-	-	-	N/A
Gnd_G.03 Heart Space	-	1.1	0.5	-	-	-	-	-	-	-	N/A
Gnd_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Gnd_Store	-	1.1	0.5	-	-	-	-	-	-	-	N/A
Gnd_G.01/02 Event / Teaching	-	1.1	0.5	-	-	-	-	-	-	-	N/A
Gnd_Circulation	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_1.13 Office	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_1.12 Computer Suite	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_1.11 Interview	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_Circulation	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_1.03 Classroom	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_Store	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_Circulation	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_Store	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_Toilets	-	-	0.5	-	-	-	-	-	-	-	N/A
1st_Store	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_1.04 Classroom	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_1.05 Classroom	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_1.06 Art Room	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_Circulation	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_1.01 Classroom	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_Circulation	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_Store	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_1.02 Music Room	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_1.10 Classroom	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_Store	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_1.08 Interview	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_1.09 Interview	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_Store	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_Circulation	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_1.07 Classroom	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_Circulation	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_DDA Shower	-	-	0.5	-	-	-	-	-	-	-	N/A
1st_Circulation	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_1.14 Construction Skills	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_Circulation	-	1.1	0.5	-	-	-	-	-	-	-	N/A
1st_Changing	-	-	0.5	-	-	-	-	-	-	-	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	
Gnd_G.09 Server	95	-	-	80

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
Gnd_Store	95	-	-	9
Gnd_Stairs	-	95	-	18
Gnd_G.11 Construction Skills	95	-	-	358
Gnd_Cylinder	95	-	-	19
Gnd_WCs	-	95	-	34
Gnd_Store	95	-	-	9
Gnd_G10 Construction Skills	95	-	-	302
Gnd_G.08 Office	95	-	-	353
Gnd_G.07 Staff Room	95	-	-	151
Gnd_Circulation	-	95	-	64
Gnd_Store	95	-	-	7
Gnd_Store	95	-	-	9
Gnd_Circulation	-	95	-	26
Gnd_G.06 Office	95	-	-	279
Gnd_G.05 Office	95	-	-	273
Gnd_Circulation	-	95	-	40
Gnd_Store	95	-	-	6
Gnd_G.04 Meditation Room	95	-	-	167
Gnd_WC	-	95	-	29
Gnd_Circulation	-	95	-	19
Gnd_Store	95	-	-	9
Gnd_Circulation	-	95	-	35
Gnd_G.03 Heart Space	95	-	-	1007
Gnd_WC	-	95	-	63
Gnd_Store	95	-	-	12
Gnd_G.01/02 Event / Teaching	95	-	-	369
Gnd_Circulation	-	95	-	15
1st_1.13 Office	95	-	-	384
1st_1.12 Computer Suite	95	-	-	252
1st_1.11 Interview	95	-	-	71
1st_Circulation	-	95	-	36
1st_1.03 Classroom	95	-	-	156
1st_Store	95	-	-	7
1st_Circulation	-	95	-	109
1st_Store	95	-	-	2
1st_Toilets	-	95	-	50
1st_Store	95	-	-	8
1st_1.04 Classroom	95	-	-	151
1st_1.05 Classroom	95	-	-	113
1st_1.06 Art Room	95	-	-	229
1st_Circulation	-	95	-	68
1st_1.01 Classroom	95	-	-	148
1st_Circulation	-	95	-	62

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
1st_Store	95	-	-	9
1st_1.02 Music Room	95	-	-	187
1st_1.10 Classroom	95	-	-	92
1st_Store	95	-	-	8
1st_1.08 Interview	95	-	-	81
1st_1.09 Interview	95	-	-	82
1st_Store	95	-	-	7
1st_Circulation	-	95	-	27
1st_1.07 Classroom	95	-	-	192
1st_Circulation	-	95	-	130
1st_DDA Shower	-	95	-	31
1st_Circulation	-	95	-	74
1st_1.14 Construction Skills	95	-	-	215
1st_Circulation	-	95	-	30
1st_Changing	-	95	-	71

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?
Gnd_G.11 Construction Skills	NO (-61.9%)	NO
Gnd_G10 Construction Skills	NO (-36.6%)	NO
Gnd_G.08 Office	N/A	N/A
Gnd_G.07 Staff Room	N/A	N/A
Gnd_G.06 Office	NO (-68.7%)	NO
Gnd_G.05 Office	NO (-68.5%)	NO
Gnd_G.04 Meditation Room	N/A	N/A
Gnd_G.03 Heart Space	NO (-79.3%)	NO
Gnd_G.01/02 Event / Teaching	YES (+0.4%)	NO
1st_1.13 Office	NO (-73%)	NO
1st_1.12 Computer Suite	N/A	N/A
1st_1.11 Interview	N/A	N/A
1st_1.03 Classroom	N/A	N/A
1st_1.04 Classroom	N/A	N/A
1st_1.05 Classroom	N/A	N/A
1st_1.06 Art Room	YES (+53.7%)	NO
1st_1.01 Classroom	YES (+197.5%)	NO
1st_1.02 Music Room	N/A	N/A
1st_1.10 Classroom	N/A	N/A
1st_1.08 Interview	N/A	N/A
1st_1.09 Interview	N/A	N/A
1st_1.07 Classroom	YES (+94.8%)	NO
1st_1.14 Construction Skills	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?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m²]	1339.6	1339.6
External area [m²]	3325.2	3325.2
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	25	4
Average conductance [W/K]	3574.96	1432.3
Average U-value [W/m²K]	1.08	0.43
Alpha value* [%]	9.99	10

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

Building Use

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

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	190.18	29.82
Cooling	0	0
Auxiliary	4.67	3.22
Lighting	14.88	13.19
Hot water	1.48	1.62
Equipment*	25.17	25.17
TOTAL**	**211.21**	**47.84**

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

Energy Production by Technology [kWh/m²]

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

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	547.73	92.53
Primary energy* [kWh/m²]	648.43	83.69
Total emissions [kg/m²]	109.6	18.3

* 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	547.7	0	190.2	0	4.6	0.8	0	1	0
	Notional	92.5	0	29.8	0	3.1	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	0.45	GN000002:Surf[3]
Floor	0.2	1.55	GN000002:Surf[0]
Roof	0.15	0.75	GN000002:Surf[1]
Windows, roof windows, and rooflights	1.5	3.3	GN000000:Surf[1]
Personnel doors	1.5	2.2	GN000002:Surf[2]
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building

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

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

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