

Energy, Sustainability and Waste Management Statement

Ref: Z30031.1 Rev. 1

Office & Retail Development

at

**39 Deansgate
Manchester
M3 2BA**

for

Kames Property Income Fund



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Executive Summary

This document evaluates the technical and economic feasibility of using both passive and low and zero carbon technologies and assesses the practical levels of CO₂ reduction possible for this development to comply with the following Manchester City Council planning requirements:

- Manchester City Council's Core Strategy 2012 - 2027 (2012): Policies EN4 – EN6
- Principles of The Guide to Development in Manchester SPD (2007)
- National Planning Policy Framework (2021)

The following low and zero carbon technologies are evaluated:

- | | | |
|----------------------|-------------------|-----------------------|
| • Solar Photovoltaic | • Biogas | • Heat Pumps: Air |
| • Solar Hot Water | • Combined Heat & | Source, Ground Source |
| • Biomass | Power (CHP) | and Exhaust Air |
| • Wind | | |

The approach for the 39 Deansgate development is to embed sustainability into the heart of the development through a range of design measures based on the 'Be Lean, Be Clean, Be Green' design hierarchy. Measures will include:

- 1) Enhanced building fabric to meet Building Regulation ADL2A (2016)
- 2) Enhanced air tightness and thermal bridging
- 3) Heating and cooling will be provided to office areas by a VRF heat pump system
- 4) Hot water will be provided by localised electric water heaters
- 5) Ventilation will be provided by mechanical ventilation and heat recovery (MVHR) units
- 6) Lighting will be provided to all areas by high-efficacy LED-type fittings

An assessment of CO₂ emissions is made based on the Simplified Building Energy Model (SBEM) methodology to comply with Approved Document Part L2A (2016) and in line with the requirements of Manchester City Council planning policy. The development will be provided with energy savings through the use of passive improvement measures, such as improved energy efficiency. This passive approach to compliance will complement the integrated approach to the sustainable energy objectives of the national and local policies.

The principles of a 'Be Lean, Be Clean, Be Green' design philosophy have been applied, which results in a 18.47% improvement over Building Regulations Part L2A (2016), as indicated in Table 1.

Table 1 - Proposed development CO₂ emissions against Building Regulations Part L2A 2016

	Total CO ₂ Emissions (KgCO ₂ /yr)
Baseline Emissions of Development (pre-improvement)	266,329
Proposed Strategy	217,134
Total Reduction in Carbon (KgCO₂/yr)	49,195
Percentage Improvement in Carbon Emissions (over Building Regulations ADL2A 2016)	18.47%

A full design specification that confirms inputs used within the Part L2A (2016) calculations is provided within the appendices of this report.

The development has also been assessed to maximise its sustainability and environmental credentials. This strategy considers many aspects of the design and construction of the development and the following issues have been identified:

- | | |
|-------------------------------------|---|
| 1. Energy Efficiency | 6. Ecological Aspects (Land Use and Ecology) |
| 2. Transport | 7. Health and Wellbeing |
| 3. Pollution | 8. Sustainable Management of the Construction Process |
| 4. Construction Materials and Waste | |
| 5. Water Consumption | |

Waste minimisation, on-site reuse and off-site recycling measures will be explored in line with the waste hierarchy as the project develops.

Operational waste storage will be provided in tenanted and communal areas, with a waste strategy capable of catering to all predicted waste streams. An existing centralised bin store is provided on the ground floor.

A BREEAM pre-assessment has been undertaken by Mainer Associates, with a targeted score of 73.76% (Excellent) for the BREEAM 2018 New Construction scheme.

1. Introduction

This Energy, Sustainability & Waste Management Statement has been developed in support of the planning application for the proposed redevelopment of 39 Deansgate in Manchester.

The proposed development consists of seventeen storeys with a basement level on the site of the existing 39 Deansgate building. The development is required to achieve compliance under Building Regulations Approved Document Part L2A (2016).

This assessment has been undertaken to strategically look at the technical and economic feasibility of energy and sustainability measures to maximise the scheme's sustainable and environmental credentials and in accordance with the following planning policies:

- Manchester City Council's Core Strategy 2012 - 2027 (2012) policies EN4 - EN7
- Principles of The Guide to Development in Manchester SPD (2007)
- National Planning Policy Framework (2021)

A range of sustainable design principles are explored for this development to minimise the adverse effects of development on the environment at global and local scales, whilst promoting healthy indoor conditions for the occupants. Throughout this report, passive design techniques, energy efficient equipment and appropriate low carbon technologies will also be appraised in line with the 'Be Lean, Be Clean, Be Green' philosophy of relevant planning documents and the energy hierarchy.

An assessment of CO₂ emissions is made based on the calculation methodology dictated by the Simplified Building Energy Model (SBEM) methodology to comply with Approved Document Part L2A (2016) and in line with the requirements of Manchester City Council planning policy.

1.1. Location

The area of land for the proposed development at 39 Deansgate, Manchester, M3 2BA is highlighted by the red line boundary shown in Figure 1. The site is located within Manchester city centre.

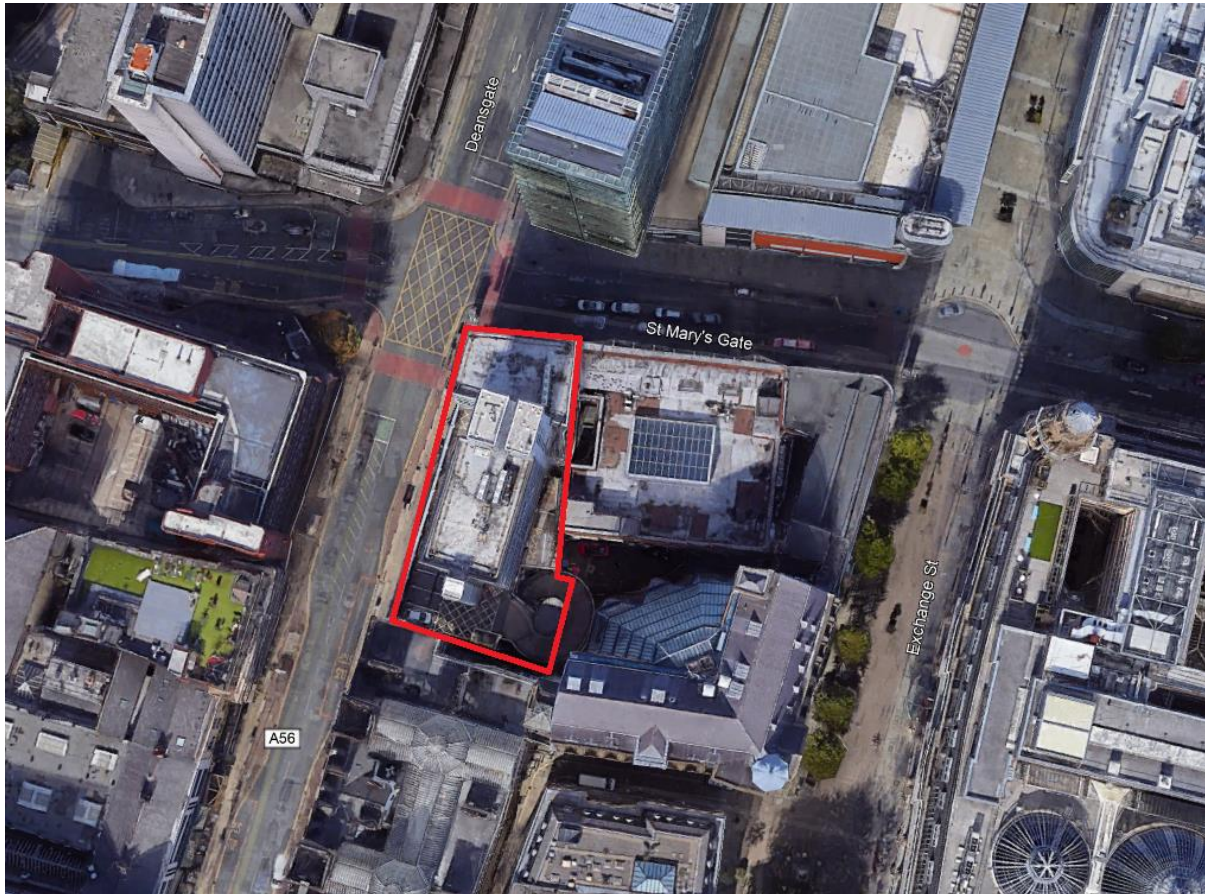


Figure 1 – Site plan for the proposed 39 Deansgate development

The site is located at the intersection of St Mary's Gate and Deansgate. An existing commercial building currently occupies the site. The proposed site is located in a predominantly commercial area.

1.2. Floor Plans



Figure 2 – Proposed floor plans for the 39 Deansgate development

The proposed development consists of a seventeen-storey commercial building with a basement level. Two retail units and a reception area are located on the ground floor. A third retail unit, commercial area and amenity block are located on a mezzanine level. Fourteen floors of open-plan tenanted commercial office space are located on Levels 1 through 14. A co-working space with roof terrace is provided on Level 15, with a large plant room.

2. Policy Drivers for Sustainable Development

This section presents a range of sustainable planning policy that is applicable to the proposed 39 Deansgate development, at both a national and a local level.

2.1. National Policy

The National Planning Policy Framework, published in July 2021, sets out the government's planning policies for England and how they should be applied. Table 2 sets out the relevant sustainability standards for new developments and provides an indication of the design response to be provided.

Table 2 – Key National Planning Policy Requirements and Design Responses

Section	Policy Requirements	Design Response
14 Meeting the challenge of climate change, flooding and coastal change	The planning system should support the transition to a low carbon future in a changing climate, taking full account of flood risk and coastal change. It should help to: Shape places in ways that contribute to radical reductions in greenhouse gas emissions, minimise vulnerability and improve resilience; encourage the reuse of existing resources, including the conversion of existing buildings; and support renewable and low carbon energy and associated infrastructure.	This development will follow the principles set out in Manchester City Council's Core Strategy 2012 – 2027 (2012), using a 'Be Lean, Be Clean, Be Green' approach in reducing operational carbon emissions. An overview of current decentralised energy schemes around the Manchester area and an assessment on the potential for future schemes in relation to this development is provided in Section 4 of this report. This Energy, Sustainability and Waste Management Statement appraises site specific information to determine the most appropriate approach to minimise energy consumption.

2.2. Local Policy

The adopted Manchester Core Strategy 2012 – 2027 (2012) and the Supplementary Planning Document and Planning Guidance (2007) provide a set of guidelines for new development. All relevant energy and sustainability policy within these documents are provided within this section together with a design response.

Table 3 – Key Local Planning Policy Requirements and Design Responses

Manchester Core Strategy 2012 – 2027 (2012)		
Section	Policy Requirements	Design Response
EN 4 - Reducing CO₂ Emissions by Enabling Low and Zero Carbon Development	All development must follow the principle of the Energy Hierarchy, being designed: - to reduce the need for energy through design features that provide passive heating, natural lighting and cooling - to reduce the need for energy through energy efficient features such as improved insulation and glazing - to meet residual energy requirements through the use of low or zero carbon energy generating technologies Wherever possible new development and retrofit projects, including energy generation plant, must be located and designed in a manner that allows advantage to be taken of opportunities for low and zero carbon energy supplies. Where possible new development and retrofit projects will be used as a mechanism to help improve energy efficiency and provide low and zero carbon energy supplies to existing buildings. Where appropriate new development and retrofit projects will be required to connect to and/or make contributions to low or zero carbon energy schemes and/or to incorporate provision to enable future connection to any existing / potential decentralised energy schemes. The use of building materials with low embodied carbon in new development and refurbishment schemes.	The proposed 39 Deansgate development will follow the principles of the energy hierarchy by adopting a passive approach to reducing emissions through the building design before the use of renewable technologies. A full energy strategy is provided in Section 6 of this report, following an appraisal of a range of site specific measures in line with the 'Be Lean, Be Clean, Be Green' approach. A review of district heating opportunities is provided in Section 4 of this report, in line with current local development.
Policy EN 5 – Strategic Areas for low and zero carbon	Within Manchester it is considered that the following strategic areas, indicated on the key diagram, will have a major role to play in achieving an increase in the level of decentralised, low and zero carbon energy supplies available:	The proposed 39 Deansgate development falls within The Regional Centre, considered as a

decentralised energy infrastructure	• The Regional Centre, which also includes the Oxford Road Corridor and Eastlands • District Centres and associated major development sites • Airport Strategic Site • Strategic housing location • Strategic employment locations Within these areas' new development, regeneration and retrofit projects, will be expected to take place in the context of more detailed proposals for decentralised low and zero carbon energy infrastructure in the form of energy proposals plans. The Council will work with all relevant stakeholders, which may include developers, landowners, residents, community groups, private sector partners, utilities companies, neighbouring authorities and other public sector bodies, as appropriate, to bring forward such plans. Where investment or development is being undertaken into or adjacent to a public building/asset or district heating network, full consideration shall be given to the potential role that these can have in providing an anchor load within a decentralised energy network or in creating opportunities for CO2 reduction funded by contributions.	strategic area for decentralised development, as defined within the Manchester City Council Core Strategy 2012 – 2027. An assessment of viability for creating a new heat network is provided within Section 4 of this report. In addition, the proximity of the site to current decentralised energy networks is illustrated within Section 4 of this report, with an assessment of connection viability.
Policy EN 6 - Target Framework for CO2 reductions from low or zero carbon energy supplies	Applications for residential development of 10 or more units and all other development over 1,000m² will be expected as a minimum to meet the target for the defined areas below. This should be demonstrated through an energy statement, submitted as part of the Design and Access Statement. Such a statement will be expected to set out the projected regulated energy demand and associated CO₂ emissions for all phases of the development. The target framework relates to three broad development locations and their potential for low and zero carbon, decentralised energy. The areas are defined as follows: • Target 1 Network development areas: Locations where the proximity of new and existing buildings, the mix of uses and density of development provide the right conditions to support district heating (and cooling). • Target 2 Electricity intense areas: Locations where the	The proposed development consists of a seventeen-storey commercial building with basement level. The gross floor area ensures the development is classified within the threshold of a major development. A 15% improvement on Part L 2010 is therefore required. This is roughly equivalent to a 6% improvement over Part L 2013/2016. An overview of the site in relation to current

	predominant building type has an all-electric fit-out such as retail units and leisure complexes. Target 3 Micro-generation areas: Locations where lower densities and a fragmented mix of uses tend to mean that only building scale solutions are practical. <table><tr><th>Target</th><th>% Minimum Requirement</th></tr><tr><td>Target 1: Network development area</td><td>CHP/district heating anchor or connection or where not feasible a 15% increase on Part L 2010.</td></tr><tr><td>Target 2: Electricity intense buildings</td><td>+10% increase on Part L 2010</td></tr><tr><td>Target 3: Micro generation area</td><td>+15% increase on Part L 2010</td></tr></table>	Target	% Minimum Requirement	Target 1: Network development area	CHP/district heating anchor or connection or where not feasible a 15% increase on Part L 2010.	Target 2: Electricity intense buildings	+10% increase on Part L 2010	Target 3: Micro generation area	+15% increase on Part L 2010	decentralised networks in the region is provided in Section 4. The development will seek to provide emissions savings through a fabric first and energy efficiency approach. The use of heat pumps and an LED lighting scheme ensure carbon emissions savings against the Part L TER baseline.
Target	% Minimum Requirement									
Target 1: Network development area	CHP/district heating anchor or connection or where not feasible a 15% increase on Part L 2010.									
Target 2: Electricity intense buildings	+10% increase on Part L 2010									
Target 3: Micro generation area	+15% increase on Part L 2010									
Supplementary Planning Document and Planning Guidance (2007)										
Section	Policy Requirements	Design Response								
4.5 – Energy Efficiency	Part 1 Policy E1.5 encourages high standards of energy efficiency in new development. In the Environmental Standards Statement, developers should show how they have considered the steps necessary to reduce energy demand at the earliest stages of design. Developers should aim to reduce CO2 emissions by at least 25% more than the requirements of the current Building Regulations, which at present are Building Regulations: Approved Document L (2006) – ‘Conservation of Fuel and Power.’ The following design principles will assist developers in achieving energy efficiency targets: - Minimise reliance on energy-using equipment for heating, cooling, lighting and natural ventilation - Position trees and soft landscaping on and around the development and within buildings to provide natural shading, insulation and air conditioning - Integrate energy efficient micro-generation and community heating schemes, such as combined heat and power (CHP) - Site layout and building design principles should maximise the capture and use of daylight and passive	In line with the principles of the Be Lean, Be Clean, Be Green design philosophy, the 39 Deansgate development seeks to provide a sufficient design solution that provides compliance with Building Regulations Part L2A. An early stage overview of these calculations is provided in Section 6. A review of decentralised energy and its feasibility for this site is also provided in Section 4. Sustainable design and								

	solar energy, whilst avoiding excessive solar gain in summer Specify energy and water efficient appliances and systems	construction measures are reviewed in Section 7. A BREEAM pre-assessment has been undertaken by Mainer Associates with a target of Excellent stated.
4.6 – Renewable Energy	To reduce energy demand and the harmful impact of using energy from non-renewables, in line with UDP Part 1 Policy E1.5, developers should aim for at least 20% of final site energy demand to be met by on-site renewable energy technologies. Renewable energy targets can be achieved more readily by undertaking the measures suggested above reducing the total energy demand of the building. It is possible to produce developments that use 50% and even 100% energy from renewable sources. To achieve this, developers should: - Assess opportunities for integrating small- and large-scale renewable energy generation systems to improve the energy security of occupants and the neighbourhood, including siting of energy generation businesses on-site and export of surplus energy - Use a mix of technologies to help generation patterns match demand - Investigate energy generation opportunities before designing building envelopes or fixing their location, to optimise utilisation of wind, solar and geothermal resources - Consider final energy demand rather than building energy consumption in the selection and sizing of generation equipment - Explore opportunities to tackle waste and energy issues collectively through use of anaerobic digesters linked to CHPs (Combined Heat and Power devices) - Consider private wire networks as an alternative to grid connection and availability charges on larger developments.	A full appraisal of low and zero carbon technologies is provided in Section 5 of this report. Achieving compliance with Building Regulations Part L2A will be demonstrated through a passive fabric-first approach. This ensures that the highest standards of fabric efficiency and energy efficiency are achieved, prior to applying renewable technologies to the development. The levels of the energy hierarchy are defined below in Section 3.

3. Methodology

The first step of the full energy strategy assessment has been to undertake a baseline energy assessment. The baseline energy assessment consists of calculating the total CO₂ emissions of the development to meet Building Regulations and then compare the proposed improvement measures against this baseline. Building Regulations Part L2A 2016 (SBEM) applies to the development and provides carbon emissions from regulated energy.

The building can then be benchmarked/thermally modelled using the energy hierarchy:

1. Be Lean <i>A reduction in energy use as a result of passive design and energy efficiency</i>
Thermal performance of envelope (U-values) Glazing design Airtight construction Efficient mechanical ventilation and heat recovery Variable speed fans and pumps Energy Efficient lighting
2. Be Clean <i>A focus on supplying energy to the development through efficient means</i>
Connect to low carbon heat networks Develop site wide heat network from single energy centre On site CHP Provide energy efficient individual heating
3. Be Green <i>The installation of renewable technologies to meet energy demand where possible</i>
Consider the feasibility of renewable energy technologies Assess the integration of renewable technologies based on the above measures

The development must be provided with energy savings through the use of thermal improvements to fabric (a 'fabric first' approach), followed by other clean energy solutions (energy efficiency improvements, district heating, etc...) and finally the use of renewable energy technologies, where

practical. This hierarchy complements the integrated approach to the sustainable energy objectives advocated through Manchester City Council local policy.

The planning policies require a full review of the technical and economic feasibility of the following renewable technologies:

- Biomass heating
- Biomass combined heat and power
- Solar hot water
- Solar photovoltaic
- Ground source heat pumps
- Air source heat pumps / exhaust air heat pumps
- Wind power

To achieve the targets set the development must achieve a balance between fabric, heating and control, ventilation and air leakage improvements, the amount of zero or low carbon technology installed and the capital, life cycle and running costs and maintenance and operation.

Feasible renewable energy technologies have been considered during the assessment to ensure the most suitable renewable energy is chosen for the demands of this scheme. The pros and cons of each technology with respect to this site are considered as part of this statement.

4. District & Communal Heating Networks

This section outlines how consideration of energy supplied efficiently from a district heating network can be provided to the development in line with the energy hierarchy.

4.1. Decentralised Heating Networks

The energy policy reaffirms the view that energy generated by centralised power stations and transmitted through the national grid is highly inefficient and wasteful.

One of the priorities for reducing CO₂ emissions is to reduce reliance on centralised power stations. This means increasing the use of local, low-carbon energy supplies through de-centralised energy systems.

De-centralised plant generally means any heating and hot water and/or electricity generation provided on a district wide (DHN) or site wide (CHN) basis. DHN and CHN can typically include combined heat and power equipment (CHP). CHP is an engine which, when running, generates electricity and heats water which can then be distributed around a development.

Benefits of district heating networks can include:

- Provision of low carbon / lower cost heat to domestic and commercial customers
- Diversification of the energy mix
- Reductions in region-wide carbon emissions
- Targeting and reduction of fuel poverty
- Potential long-term revenue streams for local authorities
- Alignment with regeneration programmes
- Driving the growth of the low carbon services sector

However, there are currently no existing district heating networks within proximity to the site, and the development of a decentralised system would not be feasible or beneficial for a project of this scale. An extract from The Association for Decentralised Energy's District Heating Installation Map is provided in Figure 3. This confirms that the nearest existing network is an existing residential network in Ancoats, around 500m east of the 39 Deansgate site. Nearby residential heat networks are indicated by house logos on the map.

Detailed feasibility studies have been undertaken for a future heat network at the NOMA development to the north east of the site, however the cost and additional disruption to connect

into this is considered unlikely to be feasible. In addition to this, the proposed development is likely to require cooling throughout, therefore localised heat pumps are likely to provide a more appropriate sustainable design solution.

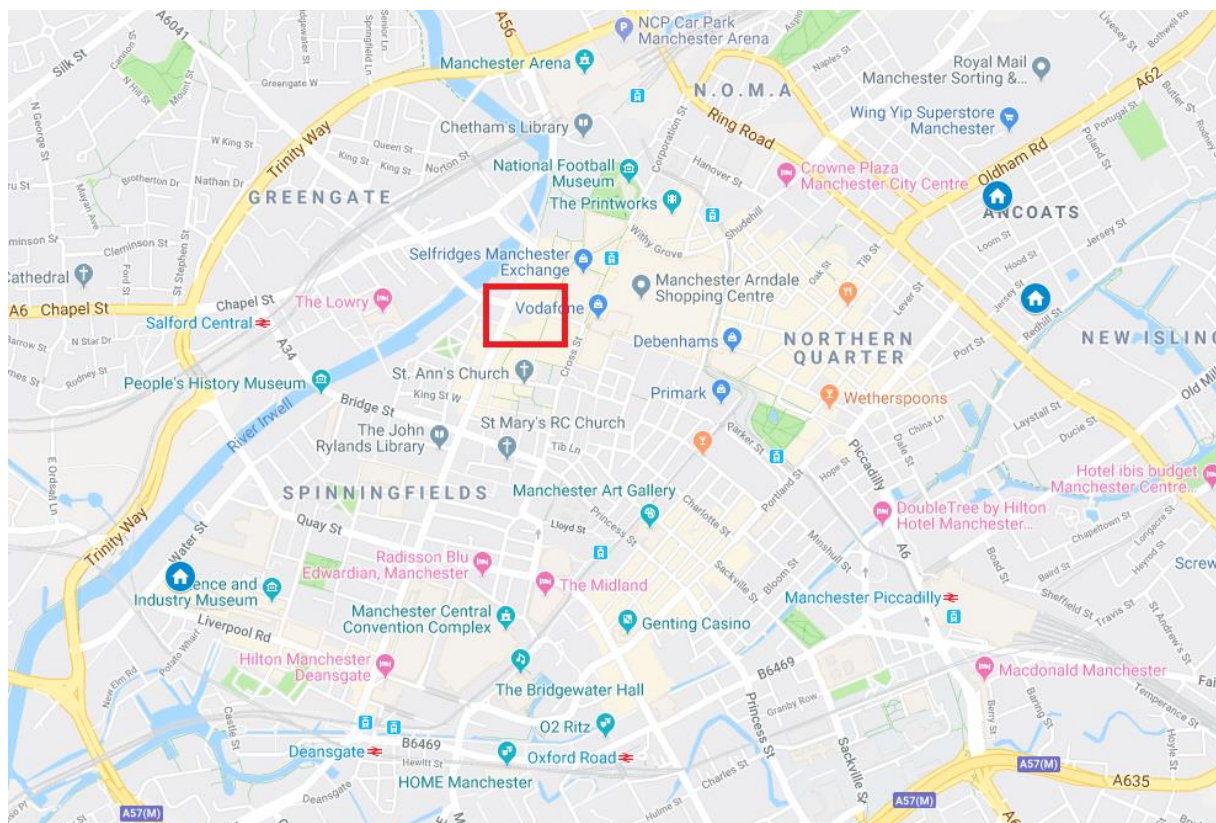


Figure 3 – Location of site in relation to current local heat networks (Source: The Association for Decentralised Energy)

5. Renewable Energy Technologies

Energy Council have reviewed options for the use of on-site renewable energy / Low or Zero Carbon Technology (LZCT) in line with the policy aspirations of Manchester City Council.

This renewable energy statement/strategy reviews the technical and economic feasibility of the following technologies –

- Solar Photovoltaic
- Solar Hot Water
- Ground Source Heat Pumps
- Air Source Heat Pumps / Exhaust Air Heat Pumps
- Micro Wind Power
- Biomass

5.1. Photovoltaics (PV)

Photovoltaic panels convert sunlight into electricity to run lights and appliances. Photovoltaic panels use cells to convert light into electricity. A PV cell normally consists of 1 or 2 layers of a semi conducting material such as silicon. When light shines on a cell it generates energy causing electricity to flow, the higher the light intensity is, the more electricity flows.

The amount of energy PV cells generate is

referred to as Kilowatt Peak (KWp). PV arrays now come in a variety of shapes and colours,

ranging from grey 'solar tiles' that look like roof tiles to panels and transparent cells that you can use on conservatories and glass to provide shading as well as generating electricity. The structural integrity of the roof construction should be assessed to ensure it is strong enough to take the weight of the panels, especially if the panel is placed on top of existing tiles. For flat roofs the panels can be mounted on A-frames to give the optimum angle.

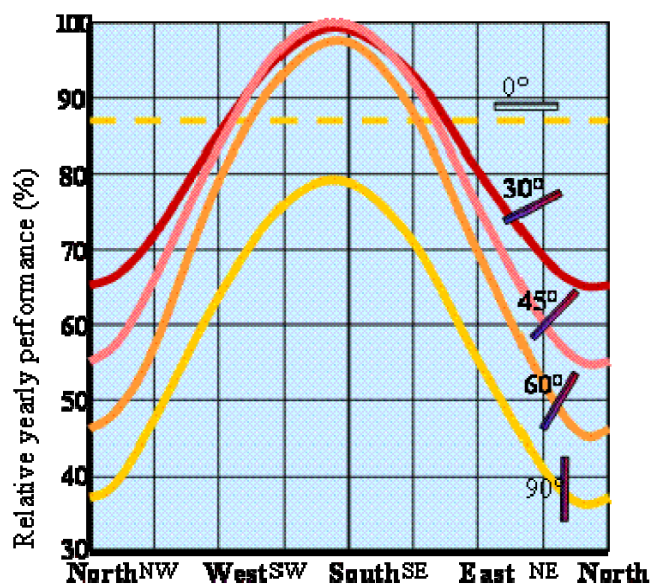


Figure 4 - Performance of photovoltaic panel orientation

The optimum panel inclination for solar collection is 35°, oriented due south; however panels that are inclined between 35° and 45° and oriented south of west or east are generally suitable. If solar collectors are oriented away from due south then a larger surface area will be required to generate a set amount of energy. The effect of non-optimal orientation is illustrated by the graph in Figure 4.

The use of photovoltaic panels have not been specified for this development as greater carbon emissions savings can be made through the use of fabric-first efficiency improvements, in line with the principles of the energy hierarchy.



Figure 5 - Photovoltaic array on a pitched roof

5.2. Solar Thermal HW Panels

Solar panel heating uses the radiant energy from the sun to heat water, most commonly for domestic hot water needs. There are two types of collectors used for solar water heating – flat plate collectors and evacuated tubes collectors. The systems function successfully in all parts of the UK, as they can work in diffuse light conditions. The collector should be mounted on a 10-60 degrees pitch facing south, although other variations can be used, south is the most efficient.

The cost of installing the system is dependent on the distance between the solar collector and the hot water storage and therefore costs vary. The closer the collectors are to the hot water storage, the less pipe work is required. Annual maintenance checks are recommended. The solar collectors are connected to a condensing boiler via a HW cylinder with twin coil.

They are a 'simple' and guaranteed technology which will act as a pre-heat for the Hot Water and Heating usage. Payback between capital cost and energy saving can normally be achieved within 12 – 20 years, subject to usage type.

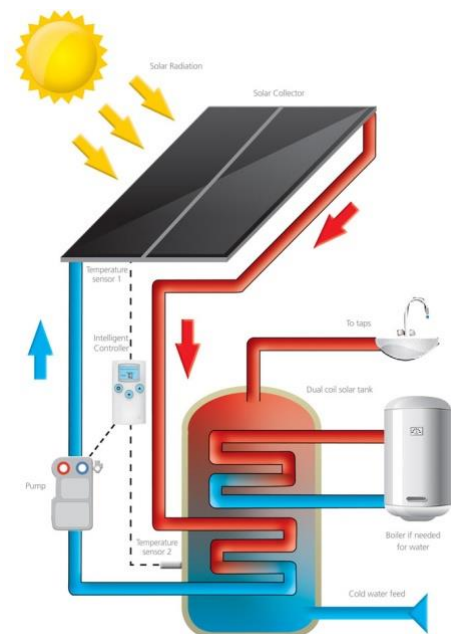


Figure 6 - The principles of a solar thermal system

The use of solar thermal panels work best in conjunction with individual heating systems for dwellings. The orientation of the development is fine for the utilisation of solar water heating to provide domestic hot water however it is not expected to achieve significant carbon savings due to the levels of hot water usage.

5.3. Ground Source Heat Pump (GSHP)

GSHPs have been developed specifically for the housing market and are now considered to be an established reliable technology. The GSHP would be sized to cater for the heating and domestic hot water requirements. Typically, they are more suited to apartments as a centralised system would be installed with multiple bore holes to a depth of up to 125 metres depending on the ground conditions. GSHPs use a heat exchanger to extract heat from the earth.

The efficiency of ground source heat pumps is measured by Co-efficient of Performance (CoP), this is the ratio of units of heat output for each unit of electricity used to drive the compressor and pump for the ground loop. Average CoP is around 2-4 although some systems may produce a greater rate of efficiency. This means that for every unit of electricity used to pump the heat, 2-4 units of heat

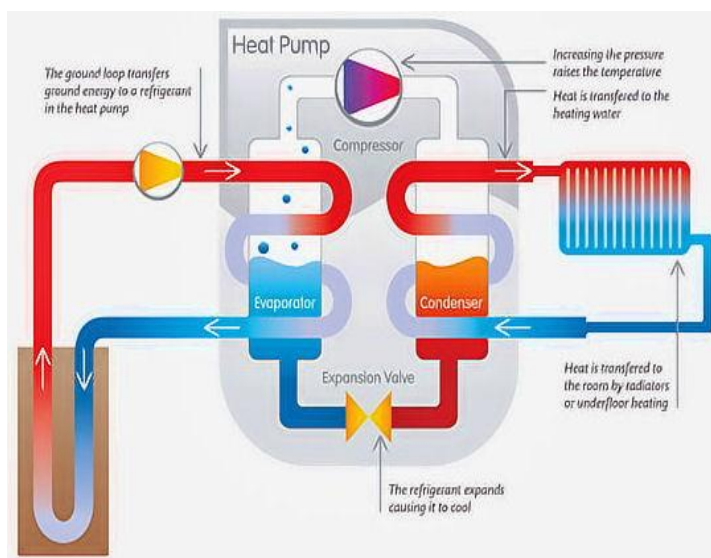


Figure 7 - Principles of a GSHP system

are produced, making it an efficient way of heating a building. If grid electricity is used for the compressor and pump, then there is the opportunity to consider a range of energy suppliers to benefit from the lowest running costs, for example by choosing an economy 10 or economy 7 tariff.

Due to the relatively small scale of this development, GSHPs are not considered an appropriate design solution.

5.4. Air Source Heat Pump/Exhaust Air Heat Pump

Air source heat pumps (ASHP) and exhaust air heat pumps (EAHP) work in a similar way to GSHP. Air source heat pumps can be fitted on the external façade or in the roof space. An air source heat pump uses small amounts of electricity to take in large quantities of air and extract heat. The efficiency of ASHP is measured by Coefficient of Performance (CoP); this is the ratio of units of heat output for each unit of electricity used to drive the system. Average CoP is around 2-4 although some systems may produce a greater rate of efficiency.

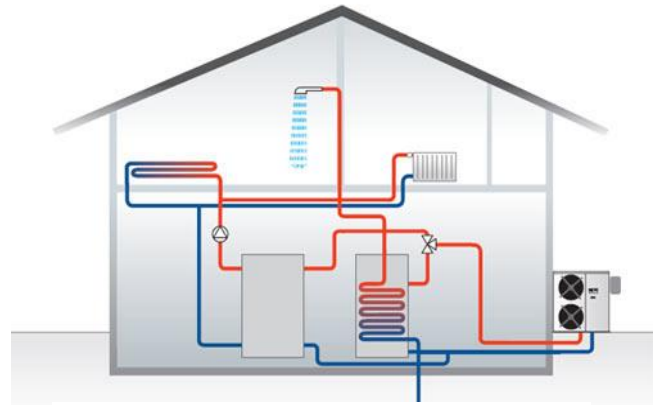


Figure 8 - Principles of an ASHP system

Exhaust air heat pumps such as the NIBE F370 work in a similar manner to ASHP units but have only indoor units (no outdoor compressors) and in addition they also recover heat from their integral exhaust air ventilation system. These units work well on apartment blocks and dwellings where mains gas is unavailable or unsuitable for a development. They are expensive in terms of capital cost of the equipment, installation and the enhanced structural requirements.

ASHPs are proposed for the development, which is likely to require a high heating and cooling demand. A VRF-type system will be specified with a high level of fabric efficiency in line with the principles of the 'Be Lean, Be Clean, Be Green' energy hierarchy to ensure emissions are minimised.

5.5. Micro Wind Power

Wind power is one of the cleanest and safest methods of generating electricity. However, wind power is unfeasible due to the fact the development is in an urban area and local wind conditions would not be sufficient to provide enough power. Most small wind turbines generate Direct Current (DC) electricity. Systems that are not connected to the national grid require battery storage and an inverter to convert DC electricity into Alternating Current (AC) which is mains electricity.

There are two types of wind turbine available:

- Roof mounted – Installed on the roof of the development
- Mast mounted – Which are free standing

Important issues to consider when using wind turbines are:

- Wind speed increases with height so it's best to have the turbine high on a mast or tower.
- The ideal site for a wind turbine is a smooth top hill with a flat, clear exposure, free from excessive turbulence and obstructions such as large trees, dwellings or other buildings.
- Small scale wind power is particularly suitable for remote off grid locations where conventional methods of supply are expensive or impractical.
- Where the local annual average wind speed is 6 m/s or more.
- Where there are no significant nearby obstacles such as buildings, trees or hills that are likely to reduce the wind speed or increase turbulence



Figure 9 - Mounted wind turbine

As this development is in an urban area there will be obstacles which reduce wind speed. The average wind speed in this area is 4.4 m/s at a height of 10 metres, which is less than the 6 m/s required. Therefore, micro wind is not a viable technology for this development.

5.6. Biomass

Biomass is a generic name for any fuel produced from organic sources and falls into mainly two categories:

- Woody biomass- forest products, untreated wood products, energy crops and wood pellets
- Non-wood biomass – liquid biofuels (such as biodiesel, bioethanol) or animal waste industrial municipal products and high energy crops such as rape seed, sugar cane and maize.

For domestic properties the fuel used is normally wood pellets, wood chips or wood logs. For larger applications, biomass boilers replace conventional fossil fuel boilers and come with an automated feed by screw drives from hoppers.

Biomass systems require more cleaning than gas or oil boilers and they must be capable of being taken out of service for cooling and cleaning whilst maintaining the building heating supply particularly in communal heating systems. Centralised gas boilers are therefore still required to

support the biomass boiler, which would be the lead boiler. The size of the dedicated plant rooms is substantial. Fuel availability, delivery and storage are also important issues to consider.

Air quality issues are also an important factor when looking to install biomass. The cost of the fuel depends on the type, delivery distances and whether it is obtained as simple waste product or from another organisation. The cost of wood pellets is currently a little more expensive than mains gas, and woodchip is approx. 30% cheaper, however prices are fluctuating rapidly in the bio-fuel market at the present time creating uncertainty over their take up.

Biomass CHP is still relatively new to the UK market and is more suitable to large developments where energy demand does not require significant modulation. There are technical issues with small scale Biomass CHP and until these can be resolved and proven the take up of these systems in the UK and Europe has been slow.



Figure 10 - Biomass boiler and hopper

Overall carbon savings of 40%+ are achievable with biomass technology. Biomass is more suited to a communal heating system; there is insufficient space to accommodate the equipment and fuel storage to facilitate a biomass boiler. Furthermore, there are noise and air quality issues associated with this type of technology. For this reason, biomass is discounted.

6. Energy Assessment of Proposed Scheme

The proposed 39 Deansgate development has adopted the principles of the 'Be Lean, Be Clean, Be Green' approach. The thermal performance of the modelled elements in the proposed development is indicated in Table 4.

Table 4 - Fabric efficiency in the preliminary 39 Deansgate Part L2A model

	U-value (W/m ² K)	G Value	Light Transmittance
Roof	0.14	n/a	n/a
Ground Floor	0.15	n/a	n/a
External Wall	0.19	n/a	n/a
External Glazing	1.40	0.40	0.71
Spandrel Panels	0.90	n/a	n/a
Door	2.20	n/a	n/a

The most practical and economically feasible solution for the development is a good quality thermally insulated fabric, airtight envelope, passive improvements and the use of highly efficient building services to condition spaces.

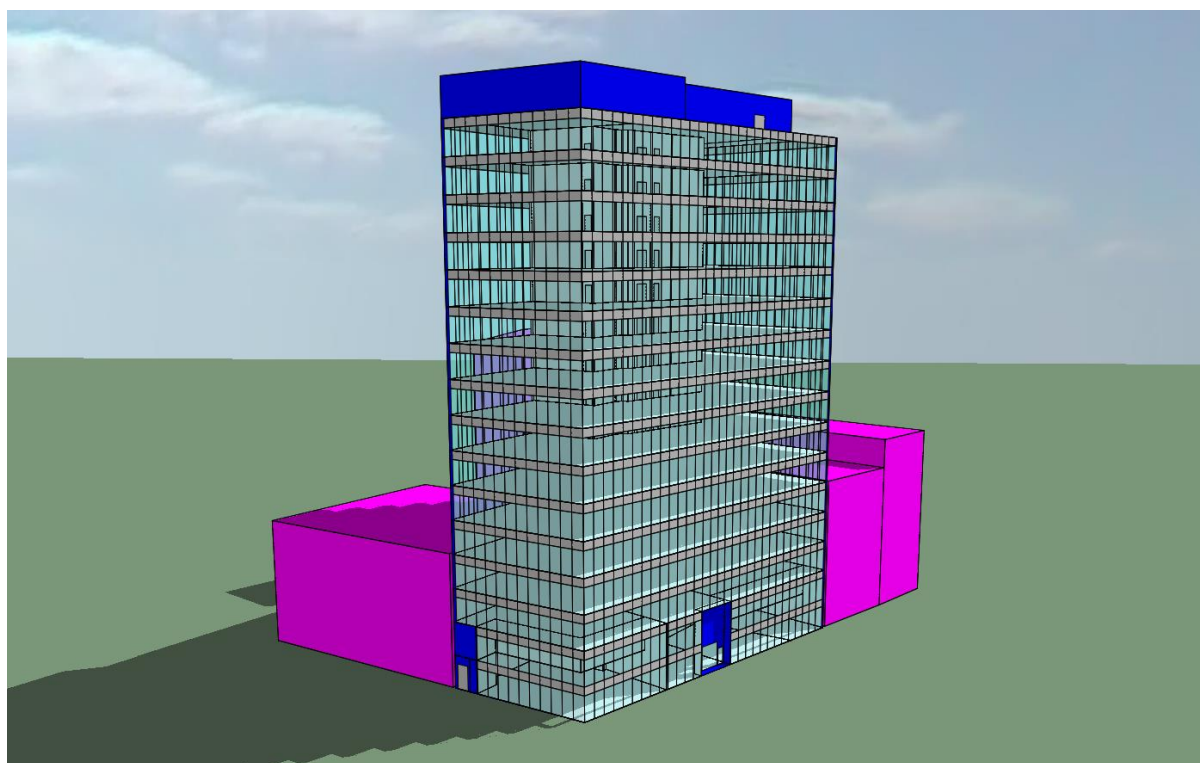


Figure 11 – 39 Deansgate Part L2A model within IES-VE 2019

A preliminary model design has been developed within IES-VE 2019 to understand the likely performance of the development against Approved Document Part L2A 2016. A full overview of inputs within the model is provided within the appendices of this report.

The results in Table 5 indicate that a 18.47% improvement can be achieved through the adoption of passive design techniques and energy efficiency systems. This provides a 49,195 kg reduction in annual carbon emissions above Part L2A 2016 compliance.

Table 5 - Results of preliminary model Part L2A 2016 calculations

Emissions	Actual	Notional	Carbon Emissions Improvement
Total emissions (kg/m ²)	BER: 12.8	TER: 15.7	18.47%
Annual emissions (kg)	217,134	266,329	

7. Sustainable Design & Construction

The 39 Deansgate development will have an emphasis on sustainability throughout the design and construction phases. The following sustainable design and construction measures will be integrated into the project.

Management

- The contractor will utilise the Considerate Constructors Scheme and aim for a best practice standard, which is a score of 35+ with a minimum score of 7 in each category, at the final CCS visit.
- The contractor will manage and monitor environmental issues during construction process. This will include the monthly monitoring and management of energy and water consumption of site activities, separation, streaming and recycling of waste, the reduction of air, dust and ground pollution.

Health and Wellbeing

- Lighting within the proposed development will be highly efficient and will comply with all current guidelines and regulations.
- Safety issues will incorporate recommendations from a CPDA or ALO input no later than RIBA Stage 2, wherever practicable.

Energy

- The development will be designed and constructed to achieve low energy and carbon dioxide emissions, improving upon current Building Regulations Part L using the Be Lean, Be Clean, Be Green energy hierarchy.
- Sub-metering of all major energy consuming systems will be provided to differentiate between energy loads for heating and hot water, lighting and small power consumption.
- Dedicated energy efficient lighting will be installed internally and externally. Movement and daylight-controlled lighting will be introduced, where practicable. The efficacy and colour rendering index ratings will be considered.
- A preliminary workshop will be undertaken by the design team to establish the likely energy consumption of the final development and to provide a review of options to mitigate any unnecessary energy use.

Transport

- A travel plan will be developed at the preliminary stages of the project, with a range of transport improvement measures to be included within the development. These measures aim to promote the use of sustainable modes of transport.

Water

- Dual-flush toilets will be provided with low-flow water consuming fittings, to ensure water use within the development is minimised.
- Where areas use more than 10% of the buildings predicted total water usage, sub-metered pulsed output meters will be considered.
- Leak detection and system shut off will be installed on the cold-water system to minimise any unnecessary water consumption within the building as a result of leakage.

Materials

- The scheme will undertake a full life cycle analysis for all materials used throughout the construction process to ensure the lowest impact materials are procured.
- All building and construction materials used on the schemes will aim to be sought from environmentally managed accreditation schemes, (such as EMAS/ ISO 14001 accreditation). All timber will be sourced from a certified chain of custody. Overall at least 80% of all material sourced on this project will be responsibly sourced, and where practical.
- The building will incorporate suitable durability and protection measures or designed features/solutions to prevent damage to vulnerable parts of the internal and external building and landscaping elements

Waste

- A SWMP will be used on this site with an aim to divert as much waste from landfill as possible by reducing construction waste below 8 tonnes/100m² GIFA and re-use or recycling waste, with diversion from landfill of non-hazardous waste >95%.
- An analysis of the proposed development's future adaptability and capacity to be disassembled will be undertaken as part of the design process.

Ecology and Land-use

- The contractor will enlist the help of a suitably qualified ecologist to recommend appropriate ecological features that will positively enhance the ecology of the site.

- Protection and mitigation measures will be introduced, where practicable, to reduce the impact of the development on the existing site and to enhance the development.
- Ecological improvement will be undertaken to enhance the ecological value of the site once the development is built, wherever practicable.

Pollution

- A flood risk assessment will be undertaken, with the results of which guiding a drainage design that ensures surface water run-off, flooding in the case of drainage failure and watercourse pollution are minimised.
- Reduction of night-time light pollution using ILE compliant light fittings will be installed, where practicable.

7.1. BREEAM Assessment

A BREEAM pre-assessment has been undertaken by Mainer Associates in line with the requirements of the Manchester City Council Core Strategy (2012). A proposed score of 73.76% (Excellent) has been targeted against the BREEAM 2018 New Construction scheme.

The development seeks to provide sustainability through an energy strategy that focuses on reducing energy demand and prioritising energy efficiency. The requirements set out in the Manchester City Council Core Strategy (2012) will also be met by integrating sustainability into the heart of the development through a range of design and construction measures as detailed throughout the BREEAM assessment.

For more information on the BREEAM assessment, please refer to the Mainer Associates BREEAM Pre-Assessment report dated 13th July 2021.

8. Waste Management

The proposed design and construction strategies are based on the following objectives:

- reduce the amount of waste produced in Manchester
- make the best use of waste that is produced
- choose waste management options which minimise the risk of immediate and future environmental pollution and harm to human health



Figure 12 – Waste minimisation hierarchy

8.1. Construction Waste

The contractor will adopt the use of a Site Waste Management Plan for the duration of the build.

Within this document the contractor will ensure they:

- Set target benchmarks for resource efficiency
- Set procedures and commitments to minimise non-hazardous waste at the design stage
- Set procedures to minimise hazardous waste
- Monitor, measure and report hazardous and non-hazardous waste produced on site
- Implement key procedures and commitments to sort and divert waste from landfill

Key procedures and commitments implemented throughout the build will cover:

- Re-use on site (in situ or for new applications)
- Re-use on another site
- Salvage/reclaim for re-use
- Return to the supplier via a 'take-back' scheme
- Recovery and recycling using an approved waste management contractor
- Compost

8.2. Operational Waste

Operational waste will be managed in line with the Waste Management and Servicing Strategy prepared by Curtins, which should be referred to in conjunction with this report.

9. Conclusions

The approach for the proposed 39 Deansgate development is to embed sustainability into the heart of the development through the 'Be Lean, Be Clean, Be Green' design hierarchy. The proposed design is predicted to reduce the total carbon emissions by 49,195 Kg/CO₂/yr from the baseline emissions of 266,329 kg/CO₂/yr. This equates to a 18.47% carbon reduction from the calculated baseline regulated emissions. Measures will include:

- 1) Enhanced building fabric to meet Building Regulation ADL2A (2016)
- 2) Enhanced air tightness and thermal bridging
- 3) Heating and cooling will be provided to office areas by a VRF heat pump system
- 4) Hot water will be provided by localised electric water heaters
- 5) Ventilation will be provided by mechanical ventilation and heat recovery (MVHR) units
- 6) Lighting will be provided to all areas by LED-type fittings

9.1. Low/ Zero Carbon Technologies Review

- Photovoltaic panels have not been specified for this development as the carbon emissions savings can be achieved by utilising highly efficient M&E systems.
- Solar Thermal Hot Water is not considered a viable option as an accurate estimate of hot water demand is not known - however it is not expected to be a major energy contributor.
- Biomass has been discounted as it poses problems in terms of air quality, delivery of fuel, storage and transportation for deliveries, etc. It would require a centralised larger plant space for storing fuel, which is not suitable.
- Micro-wind turbines do not work on this type of development due to problems with wind turbulence and mounting of the units. The wind speeds in the area are not conducive to wind power electricity generation and there would be issues with turbulence, wind shading and noise.
- GSHPs are not viable for site because of spatial and financial costs. There is no room to accommodate a GSHP vertical bore and associated communal plant room, ground conditions are unknown and systems are very costly.
- ASHP units have been specified for this development as the development is likely to have a large heating and cooling demand.

An overall 18.47% improvement in CO₂ emissions above the Building Regulations Part L2A 2016 baseline is proposed to support our application and to meet policy requirements.

Table 6 - Summary of Carbon Emissions

	Total CO₂ Emissions (KgCO₂/yr)
Baseline Emissions of Development (pre-improvement)	266,329
Proposed Strategy	217,134
Total Reduction in Carbon (KgCO₂/yr)	49,195
Percentage Improvement in Carbon Emissions (above Building Regs ADL2A 2016)	18.47%

Several sustainable initiatives will be implemented by the project team and commitments have been identified to further improve the environmental and sustainability profile of the proposed development in the future stages of the design and construction processes. This will offer building occupiers, and the surrounding area added benefits in terms of quality of living standards, lower energy and water bills and enhanced/improved surroundings and facilities.

- A preliminary assessment has been undertaken to review how the orientation, layout, design and materials used in the construction of the development will impact on the sustainability. A range of improvements have been listed in Section 7.
- Water efficiency will be promoted throughout the development through the incorporation of water efficient fittings and water metering. Reduction in water usage indirectly impacts on energy usage embodied carbon reductions through water treatment.
- Procurement and construction processes will be carried out to minimise the environmental impacts of materials, with sustainable locally sourced and/or recycled materials being selected wherever practicable. This also impacts on embodied carbon and energy usage.
- The development provides compliance with the sustainability measures in Manchester City Council local policy through a holistic range of sustainability and energy efficiency measures to ensure impact is minimised.
- A BREEAM Pre-Assessment has been undertaken by Mainer Associates with a targeted score of 73.76%, to achieve an Excellent rating under the BREEAM 2018 New Construction scheme.

Based on the range of energy, carbon and sustainability measures proposed within this Energy, Sustainability & Waste Management Statement it is hoped the proposal for the 39 Deansgate development is viewed favourably.

10. Appendices

10.1. Energy Model Inputs for Part L2A 2016 Compliance

Item	Brief description	Notes	Confirm
	The following information is required for the design submission (as per requirements of approved doc L2A).	Please note submission is now in two stages. A) Design B) As installed	
1. Building Details			
1.1	Building Regulations Part L2A 2016 applies.		
1.2	Full building address is:		
1.3	Building owner is:		
1.4	Electric Power Factor Correction = <0.90		
2. Floor Construction Details			
2.1	Ground floor is insulated to achieve the U-value stated opposite.	U-Value = 0.15 W/m ² K	
3. Wall Construction Details			
3.1	External walls are insulated to achieve the U-value stated opposite.	U-Value = 0.19 W/m ² K	
4. Roof Construction Details			
4.1	Roof is insulated to achieve the U-value indicated opposite.	U-Value = 0.14 W/m ² K	
5. Openings			
5.1	External solid personnel doors are installed to achieve the U-value opposite.	U-Value = 2.20 W/m ² K	
5.2	All double-glazed windows achieve the U-Value indicated opposite.	U-value = 1.40 W/m ² K G-Value = 0.40	
5.3	Spandrel panels between floors are assumed to achieve the U-value indicated opposite.	U-value = 0.90 W/m ² K	
6. Ventilation			
6.1	This Design Stage SBEM calculation assumes an air permeability of 5m³/hr.m² at 50pa will be achieved.		
6.2	Mechanical ventilation with heat recovery (MVHR) is provided to all office areas with CO ₂ demand control.	SFP = 1.1 W/l/s HR Efficiency = 75%	
6.3	Mechanical ventilation with heat recovery (MVHR) is provided to all WC areas with occupancy demand control.	SFP = 1.1 W/l/s HR Efficiency = 75%	
6.4	All other areas of the building are naturally ventilated.		
7. Space Heating and Cooling			
7.1	Heating and cooling are provided to all areas by a VRF fan coil system.	SCoP = 4.0 SEER = 6.0	
7.2	The heating and cooling system is provided with central time control, local time and temperature control.		
7.3	Heating and cooling systems are metered but not provided with automatic monitoring and targeting with alarms for out-of-range values warn of out of range values.		
7.4	Weather compensation is assumed as part of the VRF system.		
8. Water Heating			
8.1	Water heating is provided to all areas by localised electric storage heaters.	Assumed storage = 20L Storage Loss Factor = 0.0047kWh/l/day	
9. Lighting and Lighting Controls			
9.1	All light fittings will be LED type and have a minimum luminous efficacy of 90 lamp lumens/circuit Watt.		
9.2	All display light fittings will be low-energy type with a minimum luminous efficacy of 60 lamp lumens/circuit Watt.		

9.3	Lighting to office areas includes occupancy sensing and daylight dimming with manual switch override.	Parasitic power = 0.1W/m ²	
9.4	Lighting to communal areas includes occupancy sensing with a timeclock and manual switch override.	Parasitic power = 0.1W/m ²	
9.5	Light fitting energy use is metered but the system does not warn of out of range values.		
10. Renewables			
10.1	No renewables are provided within the development.		
11. Other			
11.1	All fans are in accordance with the minimum requirements of 'Non-Domestic Building Services Compliance Guide, 2013' in terms of Specific Fan Power.		
11.2	A Building Log Book will be provided following the guidance in CIBSE TM31, Building Log Book Toolkit.		
11.3	Building Regulations Part L2A 2016 apply. Please confirm that all fixed building services are in accordance with the minimum standards set out in paragraphs 2.45-2.48 of Building Regulations Part L2A 2016.		

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10.3. Preliminary Design BRUKL Report

Project name

39 Deansgate - Planning Stage

As designed

Date: Wed Sep 18 11:13:02 2019

Administrative information

Building Details

Address: 39 Deansgate, MANCHESTER, M3 2BA

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:

Telephone number:

Address: , ,

Certifier details

Name: Anthony Turner

Telephone number:

Address: Energy Council, Viridor House, 3 Bolholt Terrace,
BURY, BL8 1PPCriterion 1: The calculated CO₂ emission rate for the building must not exceed the target

CO ₂ emission rate from the notional building, kgCO ₂ /m ² .annum	15.7
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	15.7
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	12.8
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 -Limit	U _a -Calc	U _i -Calc	Surface where the maximum value occurs*
Wall**	0.35	0.19	0.19	LG000002:Surf[2]
Floor	0.25	0.15	0.15	LG000002:Surf[0]
Roof	0.25	0.14	0.14	LG000002:Surf[1]
Windows***, roof windows, and rooflights	2.2	1.28	1.4	GF00000D:Surf[0]
Personnel doors	2.2	2.2	2.2	GF000003:Surf[0]
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building
U _a -Limit = Limiting area-weighted average U-values [W/(m ² K)] U _a -Calc = Calculated area-weighted average U-values [W/(m ² K)] U _i -Calc = Calculated maximum individual element U-values [W/(m ² K)]				
* 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	5

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- VRF + MVHR

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4	6	0	0	0.75
Standard value	2.5*	3.2	N/A	N/A	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.					

2- VRF

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4	6	0	0	0.75
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	Zone	Standard
	Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1		
009 GF Building Management Office		-	-	-	1.1	-	-	-	-	-	-	N/A
030 MZ WC		-	-	-	1.1	-	-	-	-	-	-	N/A
031 MZ WC		-	-	-	1.1	-	-	-	-	-	-	N/A
039 MZ Gym		-	-	-	1.1	-	-	-	-	-	-	N/A
043 MZ WC		-	-	-	1.1	-	-	-	-	-	-	N/A
044 MZ Shower/ Changing		-	-	-	1.1	-	-	-	-	-	-	N/A
054 1F Office		-	-	-	1.1	-	-	-	-	-	-	N/A
056 1F WC		-	-	-	1.1	-	-	-	-	-	-	N/A
057 1F WC		-	-	-	1.1	-	-	-	-	-	-	N/A
058 1F WC		-	-	-	1.1	-	-	-	-	-	-	N/A
068 2F Office		-	-	-	1.1	-	-	-	-	-	-	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
070 2F WC	-	-	-	1.1	-	-	-	-	-	-	N/A
071 2F WC	-	-	-	1.1	-	-	-	-	-	-	N/A
072 2F WC	-	-	-	1.1	-	-	-	-	-	-	N/A
082 3F Office	-	-	-	1.1	-	-	-	-	-	-	N/A
084 3F WC	-	-	-	1.1	-	-	-	-	-	-	N/A
085 3F WC	-	-	-	1.1	-	-	-	-	-	-	N/A
086 3F WC	-	-	-	1.1	-	-	-	-	-	-	N/A
096 4F Office	-	-	-	1.1	-	-	-	-	-	-	N/A
098 4F WC	-	-	-	1.1	-	-	-	-	-	-	N/A
099 4F WC	-	-	-	1.1	-	-	-	-	-	-	N/A
100 4F WC	-	-	-	1.1	-	-	-	-	-	-	N/A
110 5F Office	-	-	-	1.1	-	-	-	-	-	-	N/A
112 5F WC	-	-	-	1.1	-	-	-	-	-	-	N/A
113 5F WC	-	-	-	1.1	-	-	-	-	-	-	N/A
114 5F WC	-	-	-	1.1	-	-	-	-	-	-	N/A
124 6F Office	-	-	-	1.1	-	-	-	-	-	-	N/A
126 6F WC	-	-	-	1.1	-	-	-	-	-	-	N/A
127 6F WC	-	-	-	1.1	-	-	-	-	-	-	N/A
128 6F WC	-	-	-	1.1	-	-	-	-	-	-	N/A
139 7F WC	-	-	-	1.1	-	-	-	-	-	-	N/A
140 7F WC	-	-	-	1.1	-	-	-	-	-	-	N/A
141 7F WC	-	-	-	1.1	-	-	-	-	-	-	N/A
142 7F Office	-	-	-	1.1	-	-	-	-	-	-	N/A
153 8F WC	-	-	-	1.1	-	-	-	-	-	-	N/A
154 8F WC	-	-	-	1.1	-	-	-	-	-	-	N/A
155 8F WC	-	-	-	1.1	-	-	-	-	-	-	N/A
156 8F Office	-	-	-	1.1	-	-	-	-	-	-	N/A
167 9F WC	-	-	-	1.1	-	-	-	-	-	-	N/A
168 9F WC	-	-	-	1.1	-	-	-	-	-	-	N/A
169 9F WC	-	-	-	1.1	-	-	-	-	-	-	N/A
170 9F Office	-	-	-	1.1	-	-	-	-	-	-	N/A
181 10F WC	-	-	-	1.1	-	-	-	-	-	-	N/A
182 10F WC	-	-	-	1.1	-	-	-	-	-	-	N/A
183 10F WC	-	-	-	1.1	-	-	-	-	-	-	N/A
184 10F Office	-	-	-	1.1	-	-	-	-	-	-	N/A
195 11F WC	-	-	-	1.1	-	-	-	-	-	-	N/A
196 11F WC	-	-	-	1.1	-	-	-	-	-	-	N/A
197 11F WC	-	-	-	1.1	-	-	-	-	-	-	N/A
198 11F Office	-	-	-	1.1	-	-	-	-	-	-	N/A
209 12F WC	-	-	-	1.1	-	-	-	-	-	-	N/A
210 12F WC	-	-	-	1.1	-	-	-	-	-	-	N/A
211 12F WC	-	-	-	1.1	-	-	-	-	-	-	N/A
212 12F Office	-	-	-	1.1	-	-	-	-	-	-	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	
223 13F WC	-	-	-	1.1	-	-	-	-	-	-	N/A	
224 13F WC	-	-	-	1.1	-	-	-	-	-	-	N/A	
225 13F WC	-	-	-	1.1	-	-	-	-	-	-	N/A	
226 13F Office	-	-	-	1.1	-	-	-	-	-	-	N/A	
237 14F WC	-	-	-	1.1	-	-	-	-	-	-	N/A	
238 14F WC	-	-	-	1.1	-	-	-	-	-	-	N/A	
239 14F WC	-	-	-	1.1	-	-	-	-	-	-	N/A	
240 14F Office	-	-	-	1.1	-	-	-	-	-	-	N/A	
251 15F WC	-	-	-	1.1	-	-	-	-	-	-	N/A	
252 15F WC	-	-	-	1.1	-	-	-	-	-	-	N/A	
253 15F WC	-	-	-	1.1	-	-	-	-	-	-	N/A	
254 15F Co-Working	-	-	-	1.1	-	-	-	-	-	-	N/A	

General lighting and display lighting		Luminous efficacy [lm/W]			General lighting [W]
Zone name		Luminaire	Lamp	Display lamp	
	Standard value	60	60	22	
002 LG Circulation		-	90	-	59
003 LG Circulation		-	90	-	56
005 LG Circulation		-	90	-	50
006 LG Motor Room		90	-	-	64
007 LG / B Plant		90	-	-	1022
009 GF Building Management Office		90	-	-	133
011 GF Circulation		-	90	-	63
012 GF Circulation		-	90	-	71
014 GF Circulation		-	90	-	20
015 GF Cycle Store		90	-	-	71
016 GF Plant		90	-	-	143
017 GF Circulation		-	90	-	124
019 GF Circulation		-	90	-	134
021 GF Bin Store		90	-	-	49
022 GF Circulation		-	90	-	63
023 MZ Plant		90	-	-	266
024 MZ Circulation		-	90	-	69
026 MZ Circulation		-	90	-	47
029 MZ Circulation		-	90	-	89
030 MZ WC		-	90	-	107
031 MZ WC		-	90	-	46
032 MZ Store		90	-	-	16
033 MZ Circulation		-	90	-	68
037 MZ Circulation		-	90	-	68
038 MZ Retail 05		-	90	80	2055
039 MZ Gym		-	90	-	555
040 GF Retail 02		-	90	80	2807

General lighting and display lighting		Luminous efficacy [lm/W]			General lighting [W]
Zone name		Luminaire	Lamp	Display lamp	
	Standard value	60	60	22	
041 GF Retail 01		-	90	80	2701
042 GF Reception		-	90	-	237
043 MZ WC		-	90	-	351
044 MZ Shower/ Changing		-	90	-	63
046 1F Circulation		-	90	-	47
049 1F Circulation		-	90	-	68
053 1F Circulation		-	90	-	68
054 1F Office		90	-	-	5844
055 1F Circulation		-	90	-	75
056 1F WC		-	90	-	104
057 1F WC		-	90	-	45
058 1F WC		-	90	-	97
060 2F Circulation		-	90	-	47
063 2F Circulation		-	90	-	68
067 2F Circulation		-	90	-	68
068 2F Office		90	-	-	5844
069 2F Circulation		-	90	-	75
070 2F WC		-	90	-	104
071 2F WC		-	90	-	45
072 2F WC		-	90	-	97
074 3F Circulation		-	90	-	47
077 3F Circulation		-	90	-	68
081 3F Circulation		-	90	-	68
082 3F Office		90	-	-	5844
083 3F Circulation		-	90	-	75
084 3F WC		-	90	-	104
085 3F WC		-	90	-	45
086 3F WC		-	90	-	97
088 4F Circulation		-	90	-	47
091 4F Circulation		-	90	-	68
095 4F Circulation		-	90	-	68
096 4F Office		90	-	-	5844
097 4F Circulation		-	90	-	75
098 4F WC		-	90	-	104
099 4F WC		-	90	-	45
100 4F WC		-	90	-	97
102 5F Circulation		-	90	-	47
105 5F Circulation		-	90	-	68
109 5F Circulation		-	90	-	68
110 5F Office		90	-	-	5844
111 5F Circulation		-	90	-	75
112 5F WC		-	90	-	104
113 5F WC		-	90	-	45

General lighting and display lighting		Luminous efficacy [lm/W]			General lighting [W]
Zone name		Luminaire	Lamp	Display lamp	
	Standard value	60	60	22	
114 5F WC		-	90	-	97
116 6F Circulation		-	90	-	47
119 6F Circulation		-	90	-	68
123 6F Circulation		-	90	-	68
124 6F Office		90	-	-	5844
125 6F Circulation		-	90	-	75
126 6F WC		-	90	-	104
127 6F WC		-	90	-	45
128 6F WC		-	90	-	97
130 7F Circulation		-	90	-	47
133 7F Circulation		-	90	-	68
137 7F Circulation		-	90	-	68
138 7F Circulation		-	90	-	75
139 7F WC		-	90	-	104
140 7F WC		-	90	-	45
141 7F WC		-	90	-	97
142 7F Office		90	-	-	5450
144 8F Circulation		-	90	-	47
147 8F Circulation		-	90	-	68
151 8F Circulation		-	90	-	68
152 8F Circulation		-	90	-	75
153 8F WC		-	90	-	104
154 8F WC		-	90	-	45
155 8F WC		-	90	-	97
156 8F Office		90	-	-	5450
158 9F Circulation		-	90	-	47
161 9F Circulation		-	90	-	68
165 9F Circulation		-	90	-	68
166 9F Circulation		-	90	-	75
167 9F WC		-	90	-	104
168 9F WC		-	90	-	45
169 9F WC		-	90	-	97
170 9F Office		90	-	-	5450
172 10F Circulation		-	90	-	47
175 10F Circulation		-	90	-	68
179 10F Circulation		-	90	-	68
180 10F Circulation		-	90	-	75
181 10F WC		-	90	-	104
182 10F WC		-	90	-	45
183 10F WC		-	90	-	97
184 10F Office		90	-	-	5450
186 11F Circulation		-	90	-	47
189 11F Circulation		-	90	-	68

General lighting and display lighting		Luminous efficacy [lm/W]			General lighting [W]
Zone name		Luminaire	Lamp	Display lamp	
	Standard value	60	60	22	
193 11F Circulation		-	90	-	68
194 11F Circulation		-	90	-	75
195 11F WC		-	90	-	104
196 11F WC		-	90	-	45
197 11F WC		-	90	-	97
198 11F Office		90	-	-	5450
200 12F Circulation		-	90	-	47
203 12F Circulation		-	90	-	68
207 12F Circulation		-	90	-	68
208 12F Circulation		-	90	-	75
209 12F WC		-	90	-	104
210 12F WC		-	90	-	45
211 12F WC		-	90	-	97
212 12F Office		90	-	-	5450
214 13F Circulation		-	90	-	47
217 13F Circulation		-	90	-	68
221 13F Circulation		-	90	-	68
222 13F Circulation		-	90	-	75
223 13F WC		-	90	-	104
224 13F WC		-	90	-	45
225 13F WC		-	90	-	97
226 13F Office		90	-	-	5450
228 14F Circulation		-	90	-	47
231 14F Circulation		-	90	-	68
235 14F Circulation		-	90	-	68
236 14F Circulation		-	90	-	75
237 14F WC		-	90	-	104
238 14F WC		-	90	-	45
239 14F WC		-	90	-	97
240 14F Office		90	-	-	5450
242 15F Circulation		-	90	-	51
245 15F Circulation		-	90	-	72
249 15F Circulation		-	90	-	73
250 15F Circulation		-	90	-	82
251 15F WC		-	90	-	110
252 15F WC		-	90	-	50
253 15F WC		-	90	-	105
254 15F Co-Working		90	-	-	1947
255 15F Plant		90	-	-	1018

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?
009 GF Building Management Office	N/A	N/A
030 MZ WC	N/A	N/A
031 MZ WC	N/A	N/A
038 MZ Retail 05	N/A	N/A
039 MZ Gym	N/A	N/A
040 GF Retail 02	YES (+43.5%)	NO
041 GF Retail 01	YES (+144.7%)	NO
042 GF Reception	YES (+92.4%)	NO
043 MZ WC	N/A	N/A
044 MZ Shower/ Changing	N/A	N/A
054 1F Office	NO (-33.9%)	NO
056 1F WC	N/A	N/A
057 1F WC	N/A	N/A
058 1F WC	N/A	N/A
068 2F Office	NO (-33.9%)	NO
070 2F WC	N/A	N/A
071 2F WC	N/A	N/A
072 2F WC	N/A	N/A
082 3F Office	NO (-33.9%)	NO
084 3F WC	N/A	N/A
085 3F WC	N/A	N/A
086 3F WC	N/A	N/A
096 4F Office	YES (+27.4%)	NO
098 4F WC	N/A	N/A
099 4F WC	N/A	N/A
100 4F WC	N/A	N/A
110 5F Office	YES (+32.7%)	NO
112 5F WC	N/A	N/A
113 5F WC	N/A	N/A
114 5F WC	N/A	N/A
124 6F Office	YES (+35.2%)	NO
126 6F WC	N/A	N/A
127 6F WC	N/A	N/A
128 6F WC	N/A	N/A
139 7F WC	N/A	N/A
140 7F WC	N/A	N/A
141 7F WC	N/A	N/A
142 7F Office	YES (+45.1%)	NO
153 8F WC	N/A	N/A
154 8F WC	N/A	N/A
155 8F WC	N/A	N/A
156 8F Office	YES (+46.5%)	NO
167 9F WC	N/A	N/A
168 9F WC	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
169 9F WC	N/A	N/A
170 9F Office	YES (+46.5%)	NO
181 10F WC	N/A	N/A
182 10F WC	N/A	N/A
183 10F WC	N/A	N/A
184 10F Office	YES (+46.5%)	NO
195 11F WC	N/A	N/A
196 11F WC	N/A	N/A
197 11F WC	N/A	N/A
198 11F Office	YES (+46.5%)	NO
209 12F WC	N/A	N/A
210 12F WC	N/A	N/A
211 12F WC	N/A	N/A
212 12F Office	YES (+46.5%)	NO
223 13F WC	N/A	N/A
224 13F WC	N/A	N/A
225 13F WC	N/A	N/A
226 13F Office	YES (+46.5%)	NO
237 14F WC	N/A	N/A
238 14F WC	N/A	N/A
239 14F WC	N/A	N/A
240 14F Office	YES (+46.5%)	NO
251 15F WC	N/A	N/A
252 15F WC	N/A	N/A
253 15F WC	N/A	N/A
254 15F Co-Working	N/A	N/A

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

Separate submission

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

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m ²]	16963.6	16963.6
External area [m ²]	12752	12752
Weather	MAN	MAN
Infiltration [m ³ /hm ² @ 50Pa]	5	3
Average conductance [W/K]	9320.05	7475.65
Average U-value [W/m ² K]	0.73	0.59
Alpha value* [%]	11.07	10

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

Building Use

% Area	Building Type
4	A1/A2 Retail/Financial and Professional services A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
96	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	2.59	1.83
Cooling	6.2	5.95
Auxiliary	3.68	1.77
Lighting	7.95	18.71
Hot water	4.28	4.47
Equipment*	42.41	42.41
TOTAL **	24.7	32.74

* 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 & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	113.95	98.02
Primary energy* [kWh/m ²]	83.77	95.03
Total emissions [kg/m ²]	12.8	15.7

* 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 SSEFF	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	37.7	93.7	2.8	7.3	4.7	3.73	3.55	4	5
	Notional	18.1	98	2	7.2	2.3	2.56	3.79	----	----
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	101.8	112.7	7.6	8.8	0	3.73	3.55	4	5
	Notional	53.8	82.9	5.8	6.1	0	2.56	3.79	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----

Key to terms

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

Key Features

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

Building fabric

Element	U _{i-Typ}	U _{i-Min}	Surface where the minimum value occurs*
Wall	0.23	0.19	LG000002:Surf[2]
Floor	0.2	0.15	LG000002:Surf[0]
Roof	0.15	0.14	LG000002:Surf[1]
Windows, roof windows, and rooflights	1.5	0.9	GF000002:Surf[9]
Personnel doors	1.5	2.2	GF000003:Surf[0]
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building
U _{i-Typ} = Typical individual element U-values [W/(m²K)]		U _{i-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	5