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Moss Lane East, Manchester

Energy Statement

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Section 1 – Executive Summary

This Energy Statement addresses the planning requirements of Manchester City Council as set out in Manchester's Local Development Framework, Core Strategy Development Plan Document, adopted 11th July 2012. The document sets out the long-term strategic policies for Manchester's future development and will form the framework that the planning application for the Moss Lane East Site will be assessed against.

Specific policies that will be targeted to be achieved within this report will be:

- **Policy EN 4 Reducing CO2 Emissions by Enabling Low and Zero Carbon Development**
- **Policy EN 5 Strategic area for low and zero carbon decentralised energy infrastructure**
- **Policy EN 6 Target Framework for CO2 reductions from low or zero carbon energy supplies**

This Energy Statement has been prepared to illustrate the environmental aspects of the proposed development highlighting the Energy/Carbon emission profile and, assess the options available for reducing energy consumption and associated CO_2 emissions in accordance with Manchester City Council's policies and guidelines.

A number of planning policies, both national and local that apply to the proposed development, have been reviewed together with the Building Regulations Approved document part L2 2021. Local policy EN 6 advises that in all new developments that contain 10 or more units, the carbon emissions must be at least a 15% improvement from the requirements of Part L 2010.

The baseline energy emissions have been developed, producing a preliminary SBEM calculation for the building in accordance with Part L2 2021. A fabric first approach has been prioritised with these passive fabric measures being adopted across the building, including improvements to the thermal performance and air tightness.

Construction Element	2021 Building Regulation Specification	Proposed Development Specification	Improvement over Part L2 Building Regulations
Floor	0.18 W/m²K	0.13 W/m²K	28%
External Wall	0.26 W/m²K	0.15 W/m²K	42%
Roof	0.18 W/m²K	0.10 W/m²K	45%
Window	1.6 W/m²K	1.11 W/m²K	31%
Air Permeability	8 m³/h/m²	3 m³/h/m²	62%

In addition to the Passive design measures, Active Building Services are to be designed to minimise direct energy consumption and CO_2 emissions, with particular emphasis on the following.

- Improved Heating Efficiencies & enhanced heating controls
- Reduced Standing Losses from Pipes and Cylinders.
- Increased Hot Water Generating Efficiencies.
- Energy Efficient LED Lighting & improved lighting controls.
- Low Energy Motors in Pumps and Fans & efficient ventilation systems

Renewable and Low Carbon technologies have been considered and of the available solutions, it is recommended that the proposed scheme implements air source heat pumps for domestic hot water generation and an array of approximately 53.5Kwp of roof mounted photovoltaic (PV) solar panels.

The Energy Model has been calculated to take account the selected renewable energy technologies proposed for this proposed development. Current results are showing a betterment over the 2021 Part L2 baseline of around 2.27%, which means a minimum betterment over 2013 Part L2A of around +25-50%, and therefore exceeding Manchester core strategy development plan.

The initial results indicate the development performs well and is compliant with the new Building Regulations. This will improve over time as the UK electricity grid continues to decarbonise in the future.

Section 2 – Introduction

This report relates to the development at Moss Lane East, Manchester.

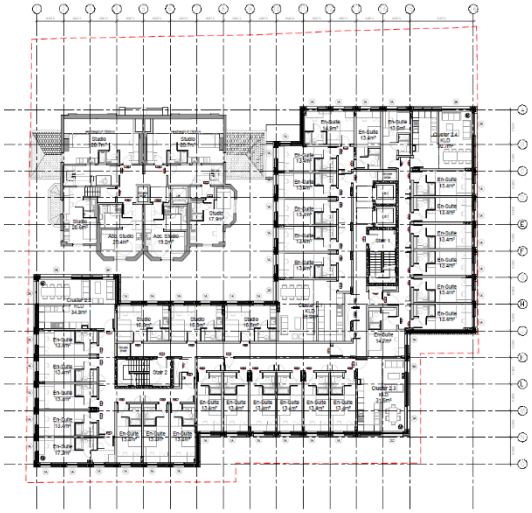
Futureserv Ltd have been appointed by 'CS Moss Lane East Ltd' to produce an Energy Statement to support the planning application for a proposed development on Moss Lane East, Manchester. The proposed development shall consist of the erection of a nine-storey purpose-built student accommodation building (plus basement and rooftop level) including the conversion of and formation of internal link to nos. 466-468 and associated landscaping, following demolition of nos. 470-472.

This Energy Statement addresses the planning requirements of Manchester City Council as set out in Manchester's Local Development Framework, Core Strategy Development Plan Document, adopted July 2012. This is alongside other Manchester strategies including "Manchester: A Certain Future, Climate Change and Low Emissions Implementation Plan" and "The Zero Carbon Framework".

The strategy proposed for this development is the use of a mixture of central and local Energy Systems incorporating renewable and Low Carbon techniques to meet Manchester City Council's desire for carbon reduction using Low or Zero Carbon Technologies.

The strategy is essentially based on the reduction of energy consumption by use of passive construction measures, active energy efficient equipment and Low Carbon technology.

Proposed Development Elevation



Typical Floor Plan

Section 3 – Development Proposals

The development will consist of 261 student accommodation units across 9 storeys with basement, with a mixture of studio apartments complete with kitchenette and cluster apartments of varying size with shared living and kitchen space. The development also includes mezzanine level plant space and cycle store, with extensive amenity space at ground floor including space for:

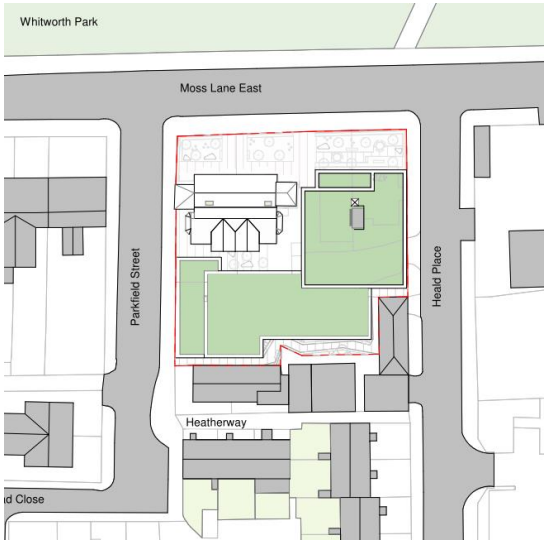
- Cinema
- Gym
- Meeting rooms
- Collaboration space
- Lounge

This Energy Statement has been prepared to illustrate the environmental aspects of the proposed development highlighting the Energy/Carbon emission profile and, assess the options available for reducing energy consumption and associated CO_2 emissions in accordance with Manchester City Council's policies and guidelines.

Futureserv Consulting Engineers have collaborated with the design team in order to provide a holistic solution for the building that will provide an efficient envelope and contain intelligent building services reducing the environmental impact of the development whilst providing comfortable living accommodation.

The existing site has a listed building which will remain and adjoin part of the new build structure.

Existing Site



Proposed site

Section 4 – Policy and Legislation

There are a number of planning policies both national and local that apply to the proposed development.

The UK government has signed up to a legally binding agreement to reduce Carbon emissions by 34% based on 1990 levels before 2020 and by 80% before 2050, this responsibility is being discharged using the Climate Change Act 2008.

The National Planning Policy Framework (NPPF), offers specific guidance which highlights the UK's aspiration to support a transition to a Low Carbon future in a changing climate and in particular, to encourage the use of renewable resources such as Renewable Energy and states;

Planning authorities should ensure that development plans contribute to global sustainability by addressing the causes and effects of climate change through policies which reduce energy use and emissions, promote development of renewable energy resources, and take climate change impacts into account in the location and design of development.

Local Policies

The proposed development is located at Moss Lane East within Manchester City Centre. This means that both the Manchester Local Development Framework/Core Strategy Development Plan apply to this development.

In addition to Building Regulations compliance the performance of the buildings will be such as to provide additional carbon savings in line with Policy EN 4 & EN 6 of the Core Strategy.

Within these documents, specific policies highlight carbon emissions reductions and the impacts of climate change. These are as follows;

Manchester's Local Development Framework

Core Strategy Development Plan Document

Adopted 11th July 2012

Published by Manchester City Council
planningstrategy@manchester.gov.uk

MANCHESTER CITY COUNCIL

Manchester Local Framework

Policy EN 4: Reducing CO2 Emissions

Policy EN 4

Reducing CO_2 Emissions by Enabling Low and Zero Carbon Development

The Council will seek to reduce fuel poverty and decouple growth in the economy, growth in CO_2 emissions, and rising fossil fuel prices, through the following actions:

- 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.

Policy EN 6: Target Framework for CO2 reductions

Policy EN 6

Target Framework for CO_2 reductions from low or zero carbon energy supplies

Applications for residential development of 10 or more units and all other development over 1,000 sq m will be expected as a minimum to meet the target shown in Tables 12.1 or 12.2, unless this can be shown not to be viable. 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 CO_2 emissions for all phases of the development.

Developments smaller than the above threshold, but involving the erection of a building or substantial improvement to an existing building will also be expected to meet the minimum target, where viable, but will not be expected to submit an energy statement.

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

As the application for residential development is of 10 or more units and generally, over 1,000 sqm will, as a minimum, the development will meet the Core Strategy targets shown in Table 12.2 regarding non-domestic CO2 emissions.

Table 12.2

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 (Applies to commercial uses with a high proportion of emissions from electricity use (>45 kg CO2/m2))	+10%increase on Part L 2010
Target 3: Micro generation area	+15% increase on Part L 2010

As above the development will need to have a 15% improvement from 2010 but following the 2013 iteration which improved on the regulation by 9% - our energy model will need to be improved by a further 6% to fall in line with Manchester's local policy. This will be improved further as we are modelling energy to meet Part L 2021.

Development must follow the principles of the Energy Hierarchy, being designed:

- to reduce the need for energy through design features;
- to reduce the need for energy through energy efficient features; and
- to meet residual energy requirements through the use of low or zero carbon energy generating technologies.

New residential development of 10 units or more, to achieve **carbon emissions reduction standards 15% greater than Part L of the Building Regulations (2010)** depending on the type and location of the scheme, unless this can be shown not to be viable.

Policy EN 5: Strategic area for low and zero carbon decentralised energy infrastructure

Policy EN 5

Strategic Areas for low and zero carbon decentralised energy infrastructure

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 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 CO_2 reduction funded by contributions.

The potential for the proposed development to connect to the existing district heating system is under review and will be investigated further at the next design stage. There are potential limitations for this development which may prohibit the use of a district heating connection due to the vicinity of the development in relation to the network, plus other technicalities around the primary energy usage profiles of the building. This being a residential development has a variable space heating load throughout the year due to seasonal heating demand requirements, leading to a low base load. The domestic hot water demand is higher and fairly constant throughout the year however this does not align with the movement to utilise local decarbonised grid supplied electricity via the incorporation of air source heat pumps over a more traditional fossil fuel heating system.

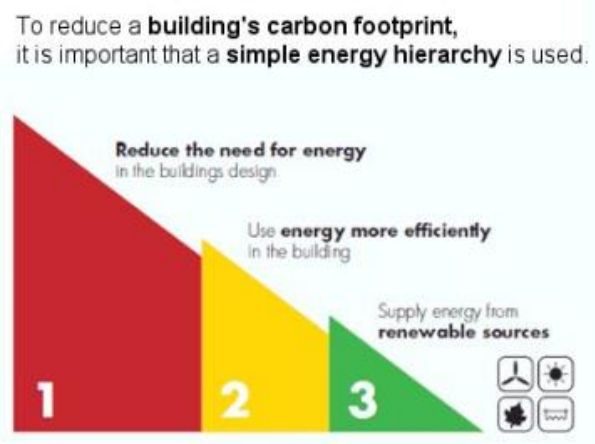
Building Standards

1. New development should be designed and constructed to meet the relevant Building Regulations, as a minimum, with a view to:

   a) Maximising energy efficiency and the use of low carbon energy

2. In meeting the carbon reduction targets set out in Building Regulations, the Council will expect development to be designed in accordance with the following energy hierarchy:

a) Reduce energy demand through energy efficiency measures
b) Supply energy through efficient means (i.e. low carbon technologies)
c) Utilise renewable energy generation



Renewable Energy Generation

1. Proposals for the installation of renewable and low carbon energy technologies, including both building-integrated and standalone schemes will be promoted and encouraged, provided that:

    a) any significant adverse impacts can be mitigated;
    b) where biofuels are to be utilised, they should be obtained from sustainable sources and transportation distances are minimised;
    c) any energy centre is suitably located and designed to a high quality such that it is sympathetically integrated with its surroundings; and
    d) all proposals are consistent with any relevant Policies in this Plan.

Renewable energy can be supplied at a national level from sources such as large offshore wind farms, solar farms or hydroelectric schemes. Although not a source of renewable energy, nuclear power is a major low carbon source. Locally, smaller and on-site renewable energy schemes include solar photovoltaic, solar thermal, ground source and air source heat pumps and, where fuelled by biomass or biogas, district energy schemes and combined heat and power plants (CHP). Due to the lack of large areas of open space within the city, on-site and neighbourhood-scale renewable energy schemes are the most effective way for Manchester to contribute to renewable energy targets set out by the Government.

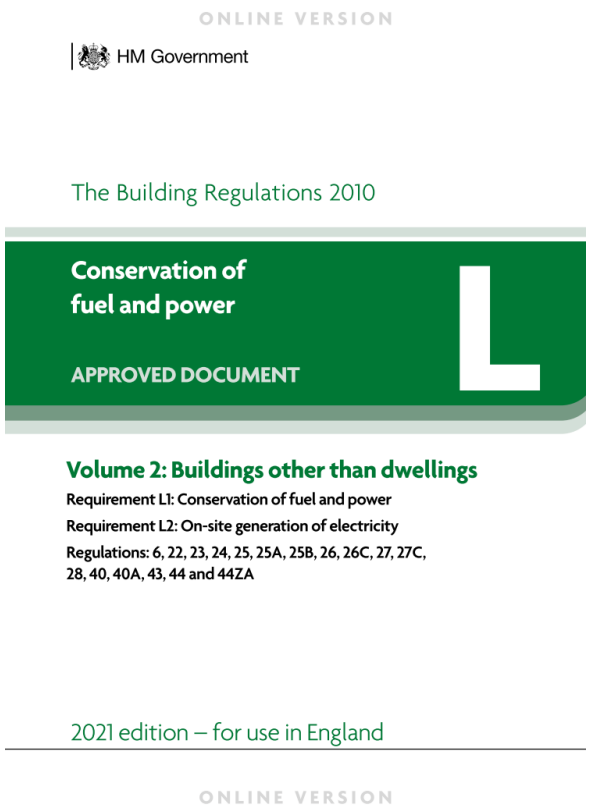
Although wind turbines are a good example of a renewable energy source, around 90% of Manchester is unsuitable for wind turbines due to the density of development.

The indications from the evidence base identify there will be a greater need to encourage and support a wider spectrum of renewable energy technologies to help deliver the energy supply that would be placed on the grid as a result of the levels of growth planned for the city. Therefore, as part of the strategic sites detailed in this Plan, any proposed development schemes will be expected to consider and incorporate, where viable, renewable energy generation technologies as part of the overall suite of energy supply.

Building Regulations Part L2 (2021) Compliance

The proposed development is being designed to comply with the Building regulations approved document Part L2A, 2021 edition. This approved document took effect from 15th June 2022.

The scheme will comply with the criteria of Building Regulations Part L2 (2021) for the development.


ONLINE VERSION

HM Government

The Building Regulations 2010

Conservation of fuel and power

APPROVED DOCUMENT

L

Volume 2: Buildings other than dwellings

Requirement L1: Conservation of fuel and power

Requirement L2: On-site generation of electricity

Regulations: 6, 22, 23, 24, 25, 25A, 25B, 26, 26C, 27, 27C, 28, 40, 40A, 43, 44 and 44ZA

2021 edition – for use in England

ONLINE VERSION

The main changes in these approved documents from the previous revisions are:

- There are higher performance targets – CO2 emissions are reduced by at least 31% for dwellings and 27% for other buildings – and a new emphasis on low carbon heating systems. These are an interim step towards the Future Homes Standard and Future Buildings Standard that will arrive in 2025.
- Part L has been slimmed down from four parts into two volumes: Volume 1: Dwellings and Volume 2: Buildings other than dwellings.

Changes to the SAP methodology

- The SAP methodology has been retained for all newly built dwellings in the UK, but in a new version: SAP 10.2. The carbon factors have been changed in the TER (Target Emissions Rate) calculations: electricity now has a lower carbon factor than gas.
- Grid electricity is now considered by the model as producing 136 grams CO2e/kWh; whereas gas remains unchanged at 210 grams. This has been changed in anticipation of the decarbonisation of the grid.

The Target Primary Energy Rate

- There is a new metric for new homes: primary energy. This metric specifies the maximum primary energy use for a dwelling in a year, expressed as kWhPE/(m^2·year).
- SBEM will continue to be used for non-residential buildings, using the National Calculation Methodology (NCM) version 6.1.

A fabric-first approach

- A fabric-first approach should be prioritised, seeking to improve insulation and airtightness wherever possible.
- New U-values. For residential buildings, the limiting factors have improved, but the notional building values have not significantly increased apart from roofs (which have changed from 0.13 to 0.11) and windows and doors (from 1.4 to 1.2).

- Renewables are factored into the new Part L, meaning that adding PV panels, for example, will not offset poor U-values in an external wall nearly as much as it would have previously. This lesser degree to which PV can offset U-values will drive increased thicknesses of cavity walls and the amount of insulation in them.

- The increase in window U-values to 1.2 W/(m2k) in the notional building means that triple-glazed/high performance windows will become more regular, limiting the choice of manufacturers.

- For non-residential buildings, the limiting factors have improved and are now similar to the previous notional values.

Provision of photographic evidence and reports

- Every dwelling will need to be air tested (rather than a test sample in a development), and onsite evidence of installation will be required – a Building Regulations England Part L (BREL) report and photographic evidence.

Section 5 – Energy Strategy

Futureserv have conducted analysis for this stage of the development on the current design of the building, to show compliance with the Building Regulations Part L2A:2021, therefore setting a reference baseline. This was carried out in order to understand the development's Carbon emissions without any Carbon Emission mitigation measures.

This baseline energy assessment has been developed, producing a preliminary Simplified Building Energy Model (SBEM) calculation for the building. The baseline model has been created to provide Target Emission rates (TER). The SBEM calculations then in turn produce Building Emission rates (BER) which are equal to or lower than that of the TER.

SBEM is the standard assessment method for the carbon emission levels of a building. This considers the fabric properties of the building, the method of heating/cooling/ventilating/hot water etc and produces an estimate of carbon emissions.

If the building does not pass the Part L2A criteria, then it is an iterative process to add renewable/low carbon technologies, to lower the overall carbon emissions.

The notional energy assessment produced the buildings Target Emission Rates (TER) and this became the benchmark for which each of the remaining assessments was calculated against.

For this development, the carbon emissions for the BER exceed the actual TER.

5.1 – Baseline Energy Assessment

Futureserv Ltd have conducted analysis to show compliance with the Building Regulations Part L2:2021 therefore setting a reference baseline.

This baseline energy assessment has been developed, producing preliminary sbem calculations for the building. The baseline model has been created to provide Target Emission rates (TER). The calculations then in turn produce Building Emission rates (BER) which are equal to or lower than that of the TER.

Sbem is the government's standard procedure for calculating the energy aspects of a non-residential building.

5.2 – Passive Design Measures

On the completion of the model and establishment of the Target Emission Rates (TER), the building emissions have been reduced through judicious passive design. This has involved an assessment of non-energy consuming design decisions to create a fabric first approach to energy efficiency.

Passive fabric measures across all the building include improvements to the thermal performance and air tightness above Part L requirements of the Building Regulations and this effectively allows the building envelope to attenuate external conditions without recourse to active Building Services.

5.2.1 – Fabric First Approach

A **'fabric first'** approach to building design involves maximising the performance of the components and materials that make up the building fabric itself, before considering the use of mechanical or electrical building services systems. This can help reduce capital and operational costs, improve energy efficiency and reduce carbon emissions. A fabric first method can also reduce the need for maintenance during the building's life.

Buildings designed and constructed using the fabric first approach aim to minimise the need for energy consumption through methods such as:

- Maximising air-tightness.
- Using Super-high insulation.
- Optimising solar gain through the provision of openings and shading.
- Optimising natural ventilation.

Focussing on the building fabric first, is generally considered to be more sustainable than relying on energy saving technology, or renewable energy generation, which can be expensive, can have a high embodied energy and may or may not be used efficiently by the consumer.

Having energy efficiency integrated into the building envelope can mean occupants are required to do less to operate their building and not have to adjust their habits or learn about new technologies. This can result in less reliance on the end user regarding the buildings energy efficiency.

Fabric first building systems can be constructed off site, resulting in higher quality and so better performance, reduced labour costs and an increased speed of build.

5.2.2 - Fabric Values

The table below shows the proposed material specification that will be incorporated within the building design to limit heat losses and ensure efficient operation of the proposed development.

An airtightness of 3 $m^3/hr/m^2$ @50Pa is targeted for this development in order to minimise uncontrolled ventilation. An improved air tightness reduces heat losses and energy demand of the development.

Construction Element	2021 Building Regulation Specification	Proposed Development Specification	Improvement over Part L2 Building
Floor	0.18 W/m^{2}K	0.13 W/m^{2}K	28%
External Wall	0.26 W/m^{2}K	0.15 W/m^{2}K	42%
Roof	0.18 W/m^{2}K	0.10 W/m^{2}K	45%
Window	1.6 W/m^{2}K	1.11 W/m^{2}K	31%
Air	8 m^3/h/m^2	3 m^3/h/m^2	62%

5.3 – Energy Efficiency Improvements

In addition to the Passive design measures described in the preceding Section to improve the building envelope performance, the Active Building Services are to be designed to minimise direct energy consumption and CO_2 emissions, with particular emphasis on the following;

- Reduced Standing Losses from Pipes and Cylinders.
- Increased Hot Water Generating Efficiencies
- Energy Efficient LED Lighting.
- Improved Lighting Controls.
- Efficient Ventilation.
- Low Energy Motors in Pumps and Fans.
- Efficient Heat Recovery in other systems
- Enhanced panel heater controls

It is currently proposed that the heat energy for the domestic hot water will be generated using external air to water heat pumps and centralised hot water storage plant which will be distributed to each individual student accommodation unit.

The space heating will be via electric panel heaters complete with thermostatic and time controllers.

The ventilation to each student accommodation unit will be via whole dwelling Continuous Mechanical Extraction Ventilation units (MEV) in each studio and cluster kitchens, and cluster bedrooms where applicable. These will provide extract ventilation to kitchens and bathrooms and utilise opening windows in accordance with AVO restricted hours to all occupied rooms for fresh air ventilation and mitigate overheating. Purge ventilation will be via natural openings within the façade via the opening windows, giving the occupants the final control over the environment in their homes.

Communal and general areas of the building will be ventilated and potentially cooled as required by detailed calculations, with dedicated mechanical ventilation heat recovery units or air handling units.

All internal lighting installations will make use of low energy technologies and a high efficacy through use of LED - 100% low energy lighting provision will be included within the development. Photo switching and automatic dimming will be specified to the communal areas of the building in order to improve the efficiency of the lighting system.

All fans, motors and pumps shall be specified to incorporate ECA accredited technology and appropriate controls.

These efficiency specifications will make a further improvement to the energy performance of the development.

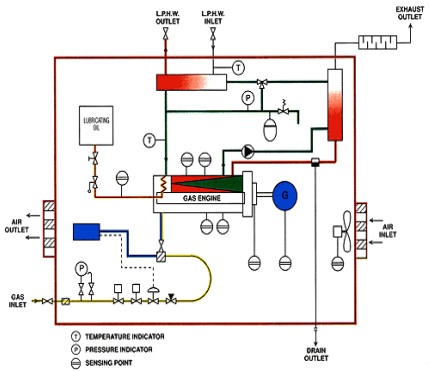
Construction Element	Specification
Ventilation	Natural Ventilation supplemented with MEV
Lighting	100% low energy fittings
Space Heating	Electric Panel Heaters
Heating Control	Thermostatic and time controlled
Water Heating	Air source heat pumps with central DHW storage
PV solar panels	53.5KWp System

5.4 –Renewable Technologies

In order to comply with Manchester's Local Plan, which aims to utilise renewable or low carbon technologies, there are a number of options to consider. All currently acknowledged and commercially available technologies have been considered and assessed with the conclusions summarised below.

Combined Heat and Power (CHP)

On-site generation of electricity and the utilisation of waste heat from this process within a building can create a beneficial arrangement whereby the transmission losses of grid supplied electricity can be omitted. The use of CHP tends to require a steady and continuous heat demand therefore the large quantities of domestic hot water associated with residential studio accommodation would satisfy this requirement.



Diagrammatic layout of CHP unit

However, the integration of Combined Heat and Power technology has been discounted due to the city centre location and clean air act implications with the flue discharge alongside the movement to utilise decarbonised grid electricity over traditional fossil fuel heating systems.

Solar Thermal Collectors

The use of flat plate & evacuated tube thermal panels has been identified as a potential method of harnessing renewable solar energy by pre-heating domestic hot water provision.

The introduction of the renewable Heat Incentive may further improve the financial viability for the technology.

Example of Solar Thermal unit

However, there is a conflict between the use of air source heat pumps and a central solar thermal collector array. Furthermore, the restricted flat roof areas available negate the inclusion of a panel system offering any significant contributions. Therefore, without being able to offer a good contribution of renewable energy alongside the logistic and strategy issues, the installation of solar thermal panels has been discounted for the development.

Solar Photovoltaic Panels

The option to utilise roof mounted or Building Integrated Photovoltaic panels to generate electrical energy is a renewable energy method of generating Carbon free electrical power.

Due to the density in occupancy within the development, there is likely to be a fairly constant base electrical load prevalent on the building which may be mitigated in part by the use of Solar PV.

PV System components

The flat roof areas of the building could be used to accommodate such systems would support a considerable array system. Therefore, being able to offer a good contribution of renewable energy the installation of photovoltaics has been included for the development.

Wind Turbines

Wind energy can be a cost-effective method of renewable power generation and turbines can produce Carbon neutral electricity with outputs ranging from watts to megawatts.

The most common design is for three blades mounted on a horizontal axis, which is free to rotate into the wind on a tall tower. The blades drive a generator either directly or via a gearbox (generally for larger machines) to produce electricity.

The electricity can either link to the grid or charge batteries. An inverter is required to convert the electricity from direct current (DC) to alternating current (AC) for feeding into the grid.

There are a variety of wind turbines on the market ranging from smaller turbines that can be attached directly to a buildings structure to larger stand-alone turbines.

City centre and sub-urban locations generally experience poorer yields for electricity output from small and medium scale wind turbines, due to obstructions and variations in local topography.

Wind Turbine Installation

Also taking into account the visual impact and unwanted noise in an environment with sleeping accommodation the use of wind turbines is discounted from inclusion at this development.

Ground Source Heat Pumps

The ground below buildings remains at a constant temperature of around 10°C to 12°C offering the ability to extract energy in the winter and discharge energy in the summer from cooling with the energy exchange being achieved via open or closed loop systems linked to heat pumps.

Ground Source Heat Pump Installation

The footprint of the development and the surrounding site conditions do not have the potential to deliver an element of space available for closed loop heat exchange, due to this, the likely yield, peak load demand and cost feasibility, we have discounted Ground Source Heat Pumps at this development in favour of better performing suitable technologies.

Air Source Heat Pumps

Air source heat pumps provide an accepted solution for using renewable energy taken from ambient air to heat a building in the winter and discharge heat from cooling in the summer.

Typical External Air to Water Heat Pump

The use of air source heat pumps in order to provide domestic hot water heating to the development would complement the proposed servicing strategy for the building which utilises a centralised hot water plant solution. Air Source Heat Pump external condensers are over 3 times more efficient than gas fired boilers.

For this reason, the use of water based air source heat pumps is considered suitable for this development.

Biomass

Some success on other projects has been made with the implementation of wood fuelled energy equipment forming a Carbon Neutral heat source however these projects have tended to be light density Sub-Urban or even rural in their location. The relatively constrained nature of this site, together with limited storage space and potential delivery issues, due to the city centre location, reduces the opportunity to take advantage of a Biomass solution for this development.

Plantroom Biomass Installation

In addition, flue emissions and the requirements the Clean Air Act has led to a dismissal of this technology for this particular scheme.

Total Assessments

The Building Services Systems will be supplemented by Renewable and Low Carbon technologies to further reduce the associated Carbon emissions.

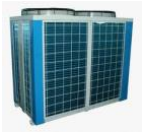
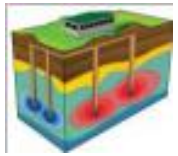
Of the available solutions considered, it is therefore recommended that the proposed scheme implements the following renewable energy technologies:

- Solar Photovoltaic Panels
- Air Source Heat Pump

Air source heat pumps are a very efficient method of producing heat for the domestic hot water.

Solar Photovoltaic Panels are a 100% on site renewable energy source, and the nature of the development represents a good opportunity to utilise these.

The Energy Model has been calculated to take account of the selected renewable energy technologies proposed for this development.

Renewable Technology	Image	Comments
Combined Heat and Power **DISCOUNTED**		The integration of Combined Heat and Power technology is not suitable for this development, due to a lack of constant heat demand.
Solar Photovoltaic **SELECTED**		The flat roof areas of the building are relatively exposed to the sunlight and the continuous electrical demand makes this a good renewable energy option.
Air Source Heat Pumps **SELECTED**		Air Source Heat Pump will be utilised to deliver domestic hot water to the building by incorporating external condensers which are over 3 times more efficient than gas fired boilers.
Solar Thermal **DISCOUNTED**		There is potential to include flat panel solar thermal collector located at roof level. However, for the same reason as discounting CHP, there is not a constant heat demand.
Wind Turbines **DISCOUNTED**		Wind turbines have been discounted due to the resulting visual/noise impact from the equipment, and relatively poor performance of the solution when used within Urban and Sub-Urban locations.
Ground Source Heat Pump **DISCOUNTED**		The inclusion of Ground Source Heat Pumps has been discounted within this development due to system cost viability and also the site constraints.

5.5 - Energy Generation and Distribution Systems

The case for renewable energy systems is clear and Manchester City Council's current energy policy requires developments to make the fullest contribution to the mitigation of climate change, and to minimise Carbon Dioxide emissions.

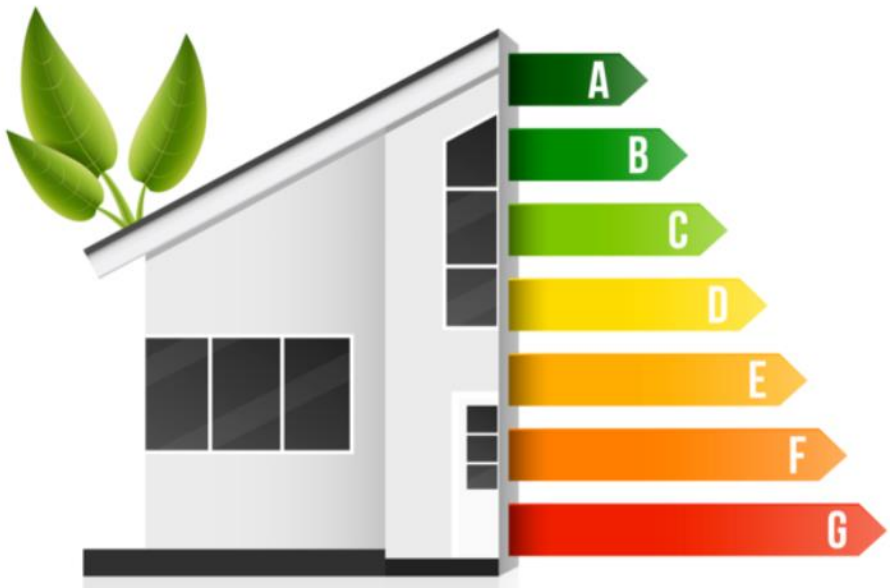
As a consultant, Futureserv has an over-arching philosophy delivering design of truly sustainable energy systems, employing the widely recognised hierarchy;

- Be Lean – **Fabric First Approach** - Reduce demand wherever possible utilising passive measures.
- Be Clean - Where energy is used, then it should be optimised to operate at the highest efficiencies practical.
- Be Green - Take advantage of renewable options to reduce fossil fuel energy sources.

The proposed development will be designed to be served by electric heating throughout, utilising the ever-increasing clean electricity provided from the grid. This will be supplemented by the electricity generated from the roof mounted PV panels.

The domestic hot water will be provided by centralised air source heat pump plant which are over 3 times more efficient than gas fired boilers.

All plant and equipment would be equipped with energy control measures incorporating variable speed drives, with low energy motors provided on ventilation fans and hydraulic pumps.



5.6 - Energy Performance Calculations

To enable demonstration that the environmental benefits associated with our energy hierarchy approach to energy demand and emission reductions for Moss Lane East, approved SBEM software has been used to generate energy demand calculations for the building.

This baseline energy assessment has been developed, producing a preliminary Simplified Building Energy Model (SBEM) calculation for the building. The baseline model has been created to provide Target Emission rates (TER). The SBEM calculations then in turn produce Building Emission rates (BER) which are equal to or lower than that of the TER. The below tables present the current results.

Assessment	TER	BER	Betterment over Part L 2021
Improved U Values, Space Heating: Direct Electric, DHW: ASHP / 53.5Kwp PV Array	**6.60**	**6.45**	**2.3%**

Initial iterations indicate that improved fabric values, use of air source heat pumps for domestic hot water, direct electric space heating and a PV array provide betterment over Part L 2021, equating to a minimum of a 25% improvement over Part L 2013 and exceeding Manchester City Council core strategy. This will improve over time as the UK electricity grid continues to decarbonise in the future.

Project name

Moss Lane East As designed

Date: Thu Aug 08 11:01:00 2024

Administrative information

Building Details
Address: Manchester,

Certification tool
Calculation engine: Apache
Calculation engine version: 7.0.26
Interface to calculation engine: IES Virtual Environment
Interface to calculation engine version: 7.0.26
BRUKL compliance module version: v6.1.e.1

Certifier details
Name: Futureserv
Telephone number:
Address: , ,

Foundation area [m²]: 574.2

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

Target CO_2 emission rate (TER), $kgCO_2/m^2$annum	6.6	
Building CO_2 emission rate (BER), $kgCO_2/m^2$annum	6.45	
Target primary energy rate (TPER), kWh_{ho}/m^2annum	68.55	
Building primary energy rate (BPER), kWh_{ho}/m^2annum	66.14	
Do the building's emission and primary energy rates exceed the targets?	BER =< TER	BPER =< TPER

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

Fabric element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.17	0.25	0_000023:Surf[7]
Floors	0.18	0.13	0.13	0_000004:Surf[0]
Pitched roofs	0.16	-	-	No pitched roofs in building
Flat roofs	0.18	0.1	0.1	04000001:Surf[0]
Windows** and roof windows	1.6	1.11	1.11	0_000023:Surf[1]
Rooflights***	2.2	-	-	No roof lights in building
Personnel doors^	1.6	1.6	1.6	0600001B:Surf[1]
Vehicle access & similar large doors	1.3	-	-	No vehicle access doors in building
High usage entrance doors	3	-	-	No high usage entrance doors in building

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [W/(m²K)] $U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [W/(m²K)]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m²K)]
* Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.
** Display windows and similar glazing are excluded from the U-value check. *** Values for rooflights refer to the horizontal position.
^ For fire doors, limiting U-value is 1.8 W/m²K
NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air permeability	Limiting standard	This building
m³/(h.m²) at 50 Pa	8	3

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SBEM - Assessment

Section 6 - Conclusion

This energy statement has summarised the energy hierarchy requirements for Moss Lane East to respond to emission reduction aspirations set out within the Manchester City Council Core Strategy Plan, in particular policies EN4 and EN6, to implement the use of low carbon and/or renewable technologies.

The proposed development will incorporate a fabric first approach using passive energy techniques available in the construction industry to reduce its ongoing requirement to consume energy to heat, ventilate and light the building, this is achieved by improved highly efficient fabric design in excess of the thermal properties set out within the Building Regulations.

The proposed development will incorporate energy efficiency measures in its Building Services to reduce the carbon footprint of the site below the passive improvement stage, using highly efficient heat generation plant, energy efficient and highly controllable lighting.

The approach adopted is to implement energy saving options which reduce the requirement for regulated energy, such as a more efficient building envelope, and utilising those high efficiency low carbon technologies which are feasible and appropriate for this type of building.

Net-zero energy is an ambitious goal for any building, however like the related goal of creating a carbon-neutral building, any net-zero carbon building has to first achieve significant load reductions and system efficiencies. This is the "lean", "clean", "green" approach as mentioned earlier in the document. The measures adopted by this development do follow this principle. The regulated energy sources are targeted for reduction by means of both passive and active measures in terms of highly improved u-values, reduced air tightness, and energy efficiency MEP systems.

The proposed development will make use of renewable and Low Carbon energy techniques, comprising of air source heat pumps to generate domestic hot water and solar PV panels. This will ensure that the development meets Manchester City Council's aspirations to utilise renewable energy generation wherever possible and far exceed the improvement as required by the planning policy documents.

Overall, the Carbon emissions from the proposed development show potential for a total reduction in emissions from baseline set by current Building Regulations Part L2 2021, by 2.3%. This equates to a minimum 25-50% increase over Part L2a 2013 and is in excess of the improvement as required by the planning policy documents.

The strategy improves on the fundamental principles of the Building Regulations and will make a significant contribution to reducing the annual CO_2 emissions of the proposed development.