



ELEMENT
SUSTAINABILITY

ONE LORD STREET

ENERGY AND CARBON STATEMENT

FEBRUARY 2026

REF: 2025.168



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ELEMENT
SUSTAINABILITY

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ELEMENT SUSTAINABILITY

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1. EXECUTIVE SUMMARY

The purpose of this statement is to summarise the relevant policy background and requirements of Manchester City Council and to demonstrate the ways in which the developer has addressed these aims through their proposals, ensuring all practicable measures have been taken to deliver a sustainable development at this site. This energy statement has been prepared in response to the local and regional planning policy guidance.

The application site is situated at the junction between Fernie Street and Lord Street in Cheetham Hill, Manchester. The proposed development consists of a residential tower providing two-hundred and fifty-one apartments. Eight dwelling types have been chosen based on key design variations to provide a robust representative sample for this energy and carbon appraisal:

- Townhouse Type A, c.82m² floor area
- Ground floor, 2B4P Type B, c.74m² floor area
- Second floor, 1B2P Type D, c.51m² floor area
- Second floor, 2B4P Type D, c.83m² floor area
- Fourteenth floor, 2B4P Type E, c.73m² floor area
- Fifteenth floor, 2B3P Type B, c.61m² floor area
- Sixteenth floor, 2B3P Type F, c.64m² floor area
- Twenty-third floor, 2B3P Type D, c.67m² floor area

The Energy Hierarchy has been used as a framework to guide the energy strategy for this development to achieve practical and cost-effective carbon emission reductions. The form of the dwellings proposed for the scheme is as follows:

- The Townhouses are two storey dwellings; and,
- The remaining apartment types consist of, ground, mid and top floor units.

The calculated form factors for the representative apartment types have been calculated, as follows:

- Townhouse Type A: 0.9
- Level 00, 2B4P Type B: 1.5
- Level 02, 1B2P Type D: 0.6
- Level 02, 2B4P Type D: 0.3
- Level 14, 2B4P Type E: 0.7
- Level 15, 2B3P Type B: 0.3
- Level 16, 2B3P Type F: 0.7
- Level 23, 2B3P Type D: 1.4

The proposed material specification to be incorporated within the scheme will limit heat loss and ensure efficient operation of the houses. In addition, the dwellings will be fitted with highly efficient Mechanical Ventilation with Heat Recovery (MVHR) systems. These systems provide a continuous supply of fresh air while the heat recovery unit significantly reduces space-heating demand.



For the dwelling types listed below representative CIBSE TM54 predictive energy models have been calculated using Design Builder v7.2.0.032 Dynamic Simulation Modelling (DSM) Software, using the internationally approved Energy Plus Simulation Engine. This sample provides a robust indication of the overall performance of the development proposals. The space heating demand for the house types has been calculated, as follows:

- Townhouse Type A = 3.38 kWh/m²/year
- Level 00, 2B4P Type B = 4.36 kWh/m²/year
- Level 02, 1B2P Type D = 6.66 kWh/m²/year
- Level 02, 2B4P Type D = 9.27 kWh/m²/year
- Level 14, 2B4P Type E = 6.81 kWh/m²/year
- Level 15, 2B3P Type B = 5.50 kWh/m²/year
- Level 16, 2B3P Type F = 5.98 kWh/m²/year
- Level 23, 2B3P Type D = 10.23 kWh/m²/year
- Average space heating demand = **6.51 kWh/m²/year**

Both regulated + unregulated energy demand has been assessed for the purposes of the Energy Use Intensity (EUI) calculation. The EUI for the house types has been calculated, as follows:

- Townhouse Type A = 23.43 kWh/m²/year
- Level 00, 2B4P Type B = 28.33 kWh/m²/year
- Level 02, 1B2P Type D = 33.66 kWh/m²/year
- Level 02, 2B4P Type D = 32.47 kWh/m²/year
- Level 14, 2B4P Type E = 31.19 kWh/m²/year
- Level 15, 2B3P Type B = 28.24 kWh/m²/year
- Level 16, 2B3P Type F = 28.05 kWh/m²/year
- Level 23, 2B3P Type D = 33.83 kWh/m²/year
- Average Energy usage intensity = **29.90 kWh/m²/year**

Photovoltaic (PV) arrays have been selected as an appropriate renewable energy technology to contribute to the CO₂ emission reduction target for the development and to support the requirements stipulated within Places for Everyone.

Figure 1.1 – Proposed roof layout for renewable generation

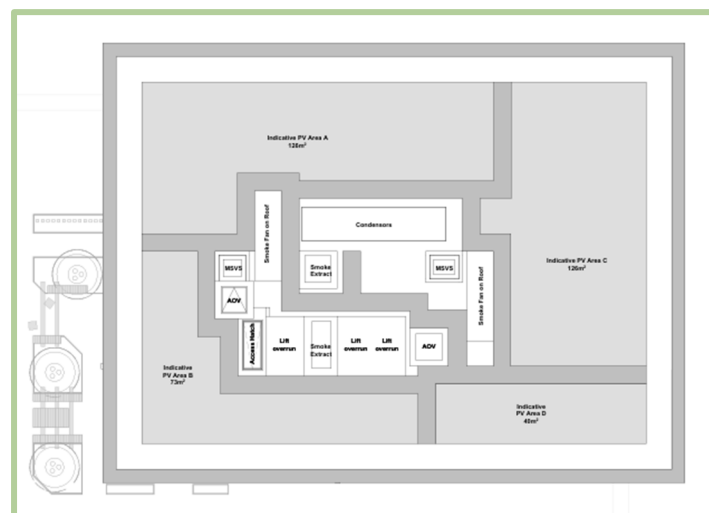


Table 1.1 – Proposed PV area as a percentage of ground floor space

	Solar PV
Ground Floor Area (m ²)	826
Proposed PV Area (m ²)	365
PV Footprint area (% of Ground floor space)	44%

The scheme will be fossil fuel free.

The proposed specification includes an Air Source Heat Pump (Dimplex Edel EDL170-520RF) providing hot water very efficiently to each dwelling within the scheme. This system operates with a COP of 302% efficiency.

The space heating is to be provided electric panel heaters, which are 100% efficient at the point of consumption. Additionally, it generates a reduced overheating potential – electric space heating delivers virtually instantaneous heating at the location where it is required. Unlike a ‘wet system’ associated with communal gas boilers which inherently have a long lag time for the heat to be generated and then dissipated when no longer needed. This lag time can lead to the dwelling overheating as the hot water remains in the radiators for a considerable time after the heat demand is required.

the residential section of the building has been assessed and complies with Building Regulations, Part O and CIBSE’s TM59 assessment of overheating, however, the dwellings require the following measures to do so:

- The solar control g-value of the glazing is to be specified at $g=0.42$.
- MVHR to provide fresh air to apartments, detailed flow rates are specified in Chapter 9 of this report

The proposals will contribute towards making more efficient use of non-renewable materials resources, and to reducing the lifecycle impact of materials used in construction.



2. ENERGY AND CARBON PROFORMA

Figure 2.1 – Energy and Carbon Proforma¹

Energy and Carbon Proforma

Residential

Major development (+10 homes)

Version 1.0

Project Name: One Lord Street

Application ref: TBC

Date: 10/12/2025

GMCA

GREATER
MANCHESTER
COMBINED
AUTHORITY

		Ref. name	One Lord Street
		No. dwellings	251
		Area (m ² GIA)	22,200
		Target values	Building 1
Minimise energy demand	Space heating demand (kWh/m² GIA/yr)	≤ 15 (flats) ≤ 20 (houses)	6.51
	Calculation methodology used to calculate space heating demand and confirmation that this covers all homes/blocks	Predictive energy model	representative CIBSE TM54 calcs
	Form factor per building	≤ 2	0.8
	Average external wall U-value (W/m ² K)	≤ 0.15	0.17
	Average window U-value (W/m ² K)	≤ 1 (triple)	1.2
	Air permeability rate (m ³ /h/m ² @ 50 Pa)	≤ 1	3
Maximise energy efficiency	Energy use intensity (kWh/m² GIA/yr)	≤ 35	29.9
	Calculation methodology used to calculate energy use intensity and confirmation that this covers all homes/blocks	Predictive energy model	representative CIBSE TM54 calcs
Use renewable energy	PV footprint area (% of ground floor space)	≥ 40	44%
	Annual renewable energy generation (kWh/m ² building footprint/yr)	-	47.5
	Renewable energy balance (%)	-	8.18
	Total energy used (kWh/yr)	-	479,805
	Total energy generated on-site (kWh/yr)	-	39,239
Use low carbon energy	Fossil fuel free (yes/no)	Yes	Yes
	Heat source	Electric	Electric
	Low Carbon Heat Appraisal completed	Yes	Yes
	Heat network suitability	-	n/a
	Exemption requested	-	n/a
	Efficiency of heating system (SCOP)	≥ 3.5	1.00 & 3.02
Reduce overheating risk	Have Part O overheating requirements been met without the use of mechanical cooling?	Yes	Yes
	If no, how many homes are cooled?	Yes	None
	Has a CIBSE TM59 assessment been carried out using DSY2 and DSY3 weather files? Have any additional passive measures been included as a result?	Yes	No
Minimise embodied carbon	Upfront embodied carbon (kgCO₂e/m²GIA)	≤ 500-600	
	List top three materials with the highest upfront embodied carbon emissions (kgCO ₂ e/m ² GIA): Material 1	-	143.96
	Material 2	-	81.89
	Material 3	-	44.81
	Lifecycle embodied carbon (kgCO ₂ e/m ² GIA) - for large major developments only	-	593.69
Offsets	Offset contribution (£)	-	

¹ The following assumptions have been made for the PV generation:

- 2m² panels produce 500 watts
- 1 kWp of PV generates 463 kWh, based on SAP10 for south-facing, unshaded panels.



3. INTRODUCTION

Element Sustainability has been commissioned by Linear Living Ltd to review the sustainability and energy performance of the proposed residential development in Manchester.

The purpose of this statement is to summarise the relevant policy background and requirements of Manchester City Council and to demonstrate the ways in which the developer has addressed these aims through their proposals, ensuring all practicable measures have been taken to deliver a sustainable development at this site.

Details of the design attributes, specifications and characteristics of the scheme are appraised in order to demonstrate how the proposals contribute to sustainable development in Manchester and seek to mitigate the environmental impacts of the scheme, providing a sustainability appraisal in support of the planning application.

This report is intended to support the planning application for this development and therefore, establish an approach to the delivery of this scheme which meet the criteria outlined by the council that the developer commits to implement at the site.



4. PROJECT OVERVIEW

4.1 Development Site Description

The site is situated at the junction between Fernie Street and Lord Street in Cheetham Hill, Manchester. Currently, the site comprises of brownfield land which was formerly occupied by a commercial building. The majority of structures on site have since been demolished but a single storey derelict building occupies the south west corner of the site.

The remainder of the site is occupied by hardstanding and vegetation which has encroached onto the site since the demolition of previous structures. Fencing surrounds the northern, western and eastern borders of the site with a metal access gate situated along the eastern border. Off the southern border is a garage forecourt.

The site is situated within Manchester City Centre and is surround by a mix of residential and commercial developments. It is not located within a designated conservation zone.

Figure 4.1 – Site Location Plan



4.2 Development Proposals

Demolition of existing structures and erection of a residential apartment development comprising 251no. dwellings (Use Class C3) with landscaping and associated works.

Eight dwelling types have been chosen based on key design variations to provide a robust representative sample:

- Townhouse Type A
- Ground floor, 2B4P Type B
- Second floor, 1B2P Type D
- Second floor, 2B4P Type D
- Fourteenth floor, 2B4P Type E
- Fifteenth floor, 2B3P Type B
- Sixteenth floor, 2B3P Type F
- Twenty-third floor, 2B3P Type D

Figure 4.2 to 4.13 present the proposed floor plans and elevations for the proposed development:

Figure 4.2 – Proposed Basement Layout

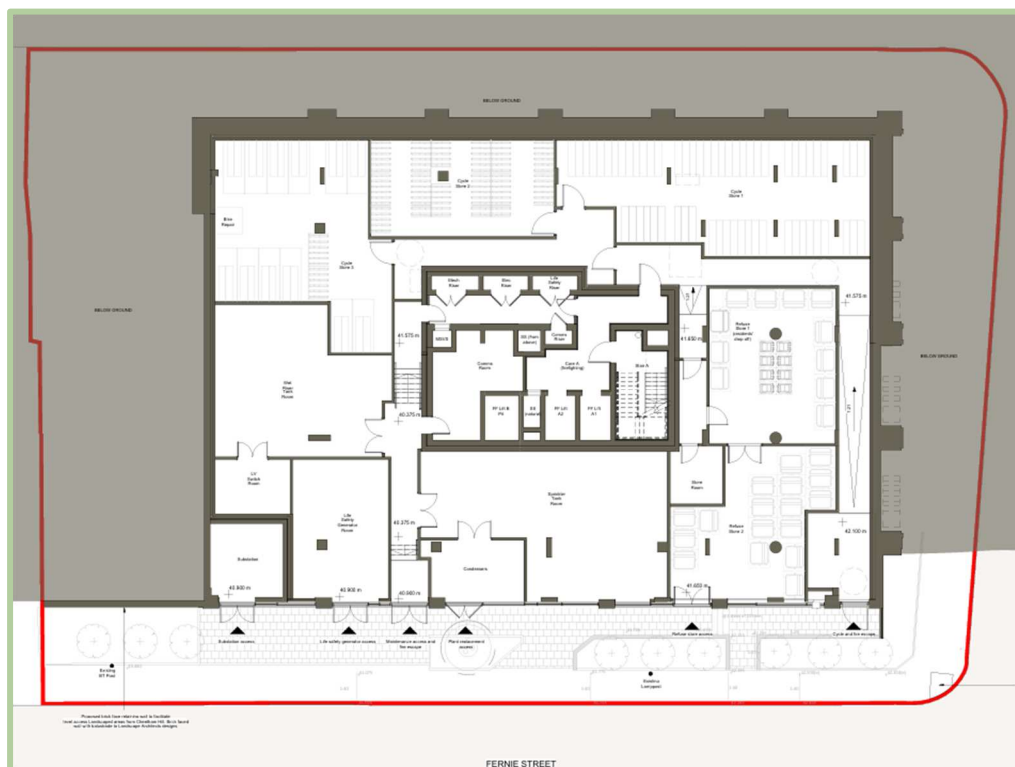


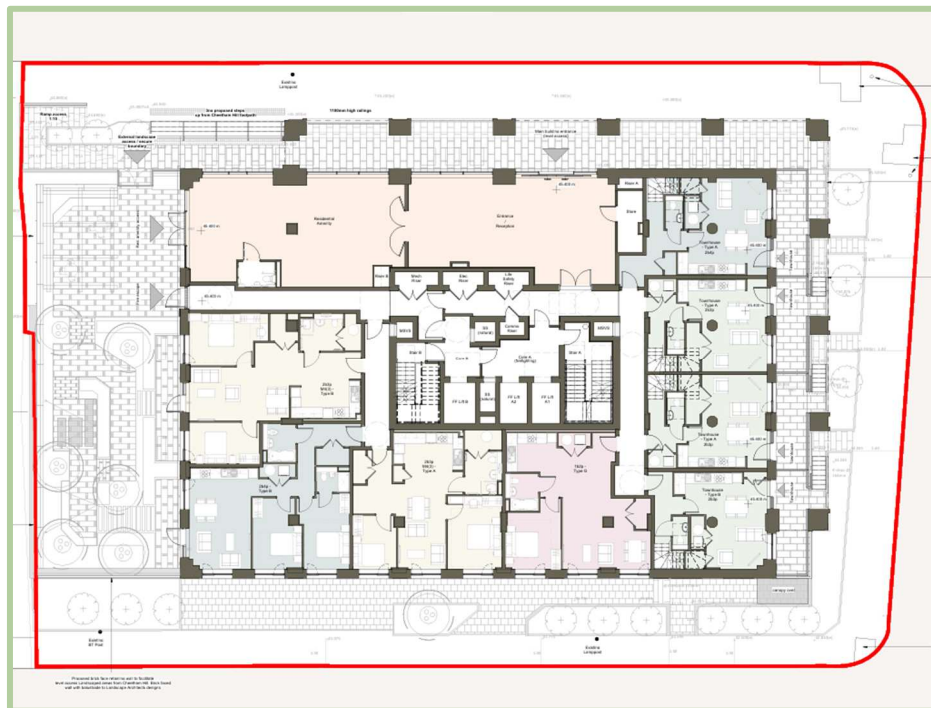
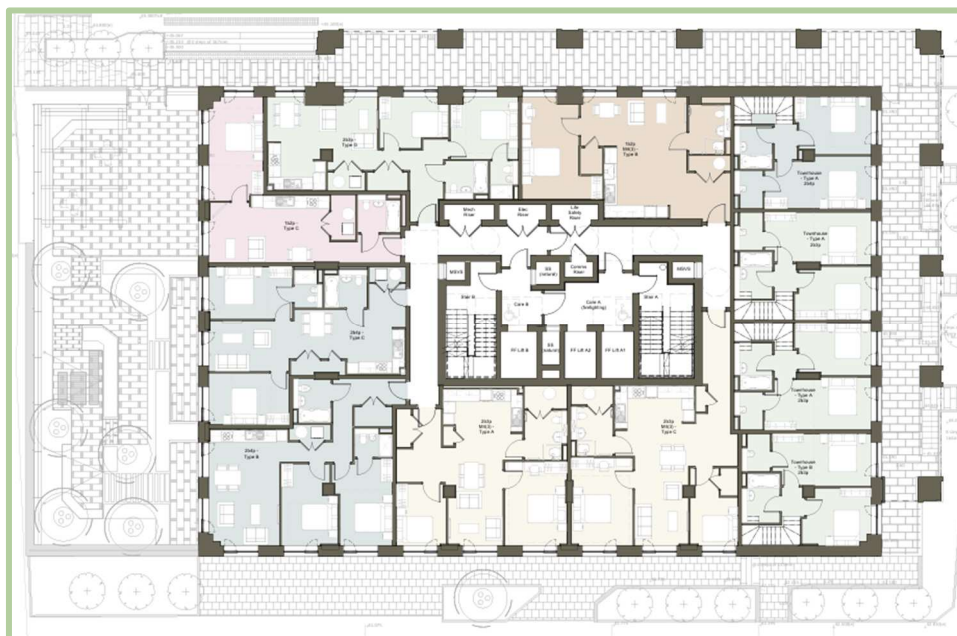
Figure 4.3 – Proposed Ground Floor Layout*Figure 4.4 – Proposed First Floor Layout*

Figure 4.5 – Proposed Second Floor Layout

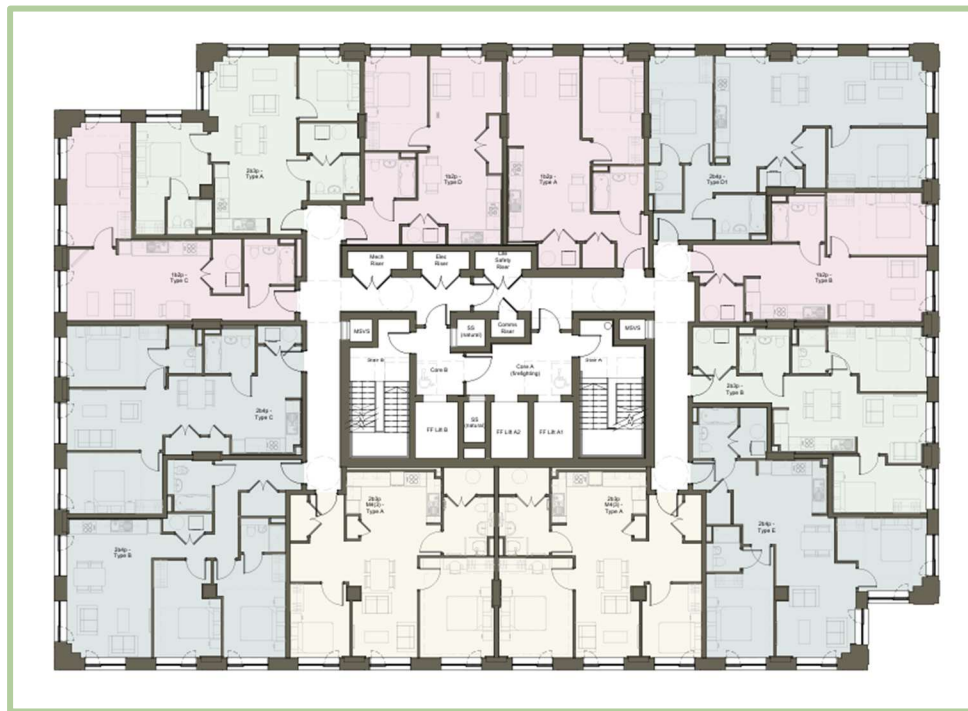


Figure 4.6 – Proposed Third to Fourteenth Floor Layout

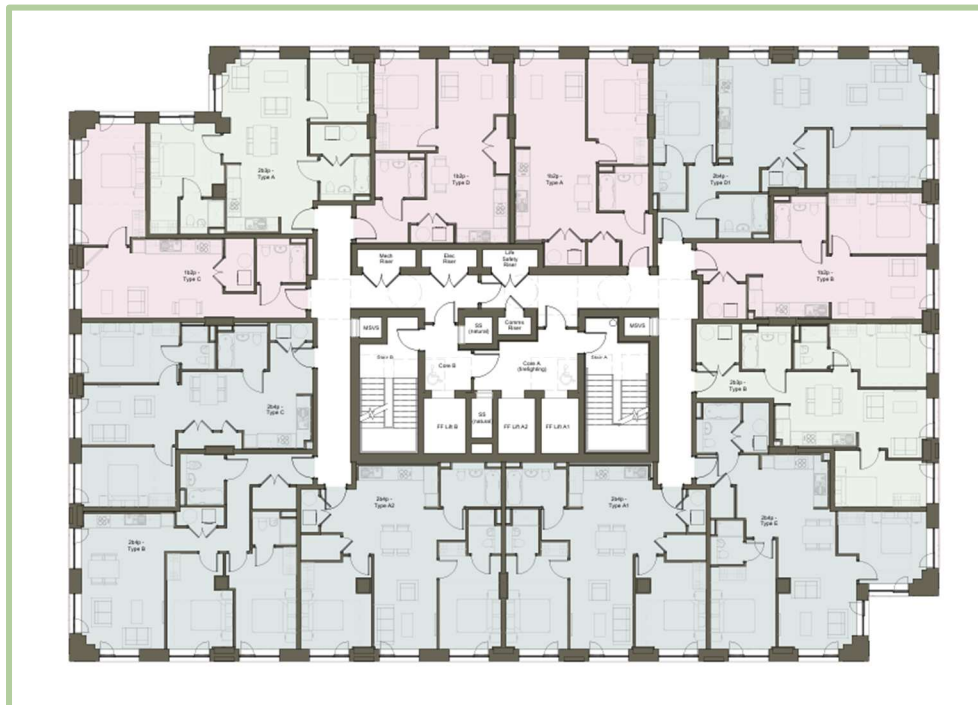


Figure 4.7 – Proposed Fifteenth Floor Layout



Figure 4.8 – Proposed Sixteenth to Twenty-Third Floor Layout

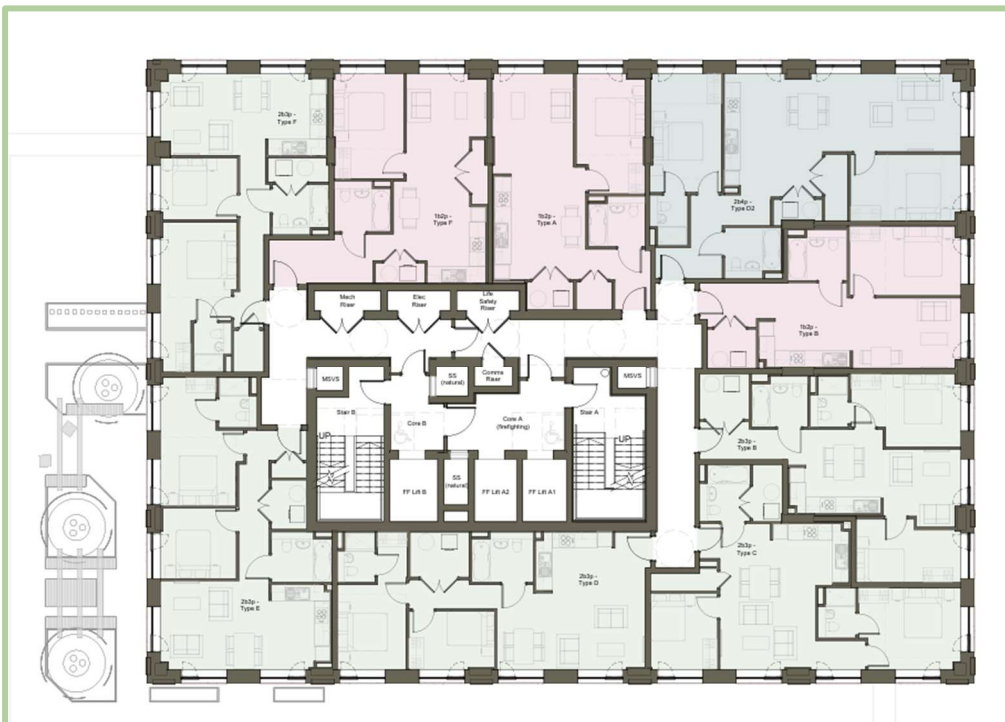


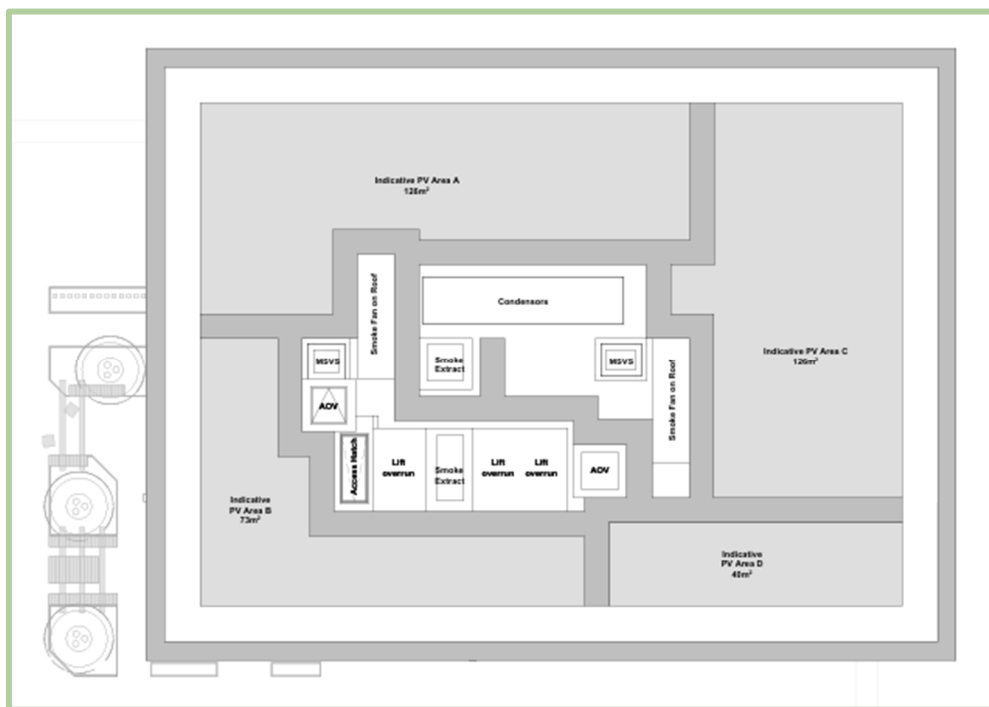
Figure 4.9 – Proposed Roof Layout*Figure 4.10 – Proposed Northern Elevation*

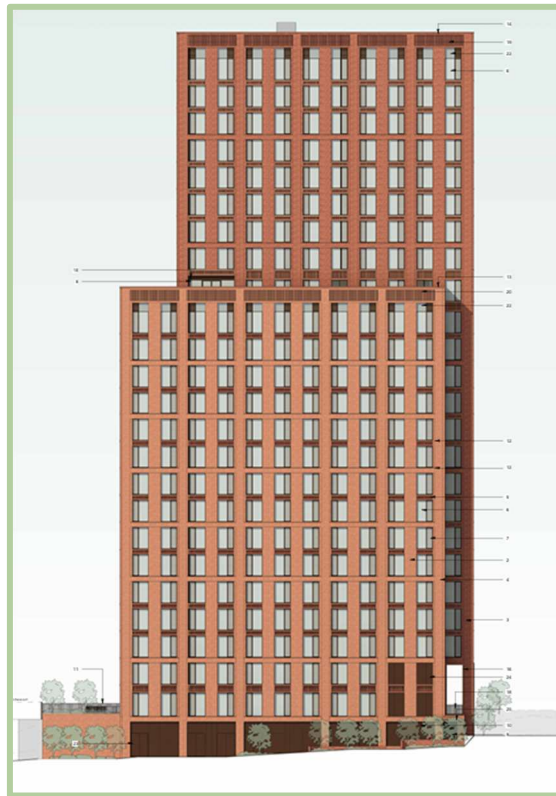
Figure 4.11 – Proposed Eastern Elevation*Figure 4.12 – Proposed Southern Elevation*

Figure 4.13 – Proposed Western Elevation



5. POLICY REVIEW

5.1 National Planning Policy

The National Planning Policy Framework was revised on 12th December 2024 and sets out the government's planning policies for England and how these are expected to be applied.

The purpose of the planning system is to contribute to the achievement of sustainable development. The planning system has three overarching objectives, which are interdependent and need to be pursued in mutually supportive ways, as set out below:

An economic objective – to help build a strong, responsive and competitive economy, by ensuring that sufficient land of the right types is available in the right places and at the right time to support growth, innovation and improved productivity; and by identifying and coordinating the provision of infrastructure;

A social objective – to support strong, vibrant and healthy communities, by ensuring that a sufficient number and range of homes can be provided to meet the needs of present and future generations, and by fostering well-designed, beautiful and safe places, with accessible services and open spaces that reflect current and future needs and support communities' health, social and cultural well-being; and

An environmental objective – to protect and enhance our natural, built and historic environment, including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy.

These objectives should be delivered through the preparation and implementation of plans and the application of the policies in this framework. Planning policies and decisions should play an active role in guiding development towards sustainable solutions, but in doing so should take local circumstances into account, to reflect the character, needs and opportunities of each area.

5.2 Local Planning Policy

5.2.1 Manchester Core Strategy

most of this is not relevant to the energy / carbon appraisal – please review and retain only the policies which relate to this specific report. The rest will be covered off in the ESS.

Manchester's Core Strategy was adopted on the 11th July 2012 and remains the key document in the adopted Manchester Local Plan. It sets out the long-term strategic policies for Manchester's future development and will form the framework that planning applications will be assessed against.

Policy EN 4 - Reducing CO₂ Emissions by Enabling Low and Zero Carbon Development: The council will seek to reduce fuel poverty and decouple growth in the economy, growth in CO₂ emissions, and rising fossil fuel prices, through the following actions:

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 5 - Strategic Areas for Low and Zero Carbon Decentralised Energy Infrastructure: Within Manchester it is considered that the following strategic areas, 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; and,
- 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.

Policy EN 8 – Adaption to Climate Change requires all new development to be adaptable to climate change in terms of the design, layout, siting and function of both buildings and associated external spaces. In achieving developments which are adaptable to climate change developers should have regard to the following, although this is not an exhaustive list:

- Reduction in urban heat island effect using green infrastructure such as green roofs, green walls, increased tree cover and waterways; and,
- The need to control overheating of buildings through passive design; and

Developers will be permitted to use green infrastructure elements such as green roofs, green walls, street trees and waterways to contribute to compliance with CO₂ mitigation under Policy EN6, subject to sufficient evidence to quantify their contribution to compliance.

Policy EN9 - Green Infrastructure: New development will be expected to maintain existing green infrastructure in terms of its quantity, quality and multiple function. Where the opportunity arises, and in accordance with current green infrastructure strategies, the council will encourage developers to enhance the quality and quantity of green infrastructure, improve the performance of its functions and create and improve linkages to and between areas of green infrastructure. Where the benefits of a proposed development are considered to outweigh the loss of an existing element of green infrastructure, the developer will be required to demonstrate how this loss will be mitigated in terms of quantity, quality, function and future management.

Policy EN14 – Flood Risk: The council requires developments to:

- Be directed away from sites at the greatest risk of flooding, and towards sites with little or no risk of flooding; this should take account of all sources of flooding identified in the Manchester-Salford-Trafford Strategic Flood Risk Assessment (SFRA).

Policy EN15 – Biodiversity and Geological Conservation: The council will seek to maintain or enhance sites of biodiversity and geological value throughout the city.



Developers will be expected to identify and implement reasonable opportunities to enhance, restore or create new biodiversity, either on-site or adjacent to the site, contributing to linkages between valuable or potentially valuable habitat areas where appropriate, with reference to:

- The Manchester Biodiversity Strategy, which provides further details of priority habitats within Manchester and opportunities for biodiversity enhancement including corridors such as the Mersey, Medlock and Irk River valleys, the canals and disused railway lines, and areas of managed greenspace particularly in parks;
- The Green Infrastructure Framework for Greater Manchester, which encompasses an ecological framework that seeks to guide and inform habitat creation and repair, including identifying large 'biodiversity opportunity areas' including the Moston Brook Corridor and Nutsford Vale;
 - Manchester's Climate Change Action Plan;
 - The Strategic Flood Risk Assessment (SFRA) for Manchester;
 - The River Basin Management Plan for the North West; and,
 - The Manchester Tree Strategy.

Any adverse impacts on biodiversity will need to be justified against the wider benefits of the proposal, assessed against other Local Development Framework policies. Where adverse impacts are unavoidable, developers will be required to provide appropriate mitigation and / or compensation. Development should, wherever possible, seek to maintain, enhance or restore existing geology.

Policy EN16 – Air Quality: The council will seek to improve the air quality within Manchester, and particularly within Air Quality Management Areas. Developers will be expected to take measures to minimise and mitigate the local impact of emissions from traffic generated by the development, as well as emissions created by the use of the development itself.

Policy EN17 – Water Quality: The council require:

- New developments to avoid any adverse impact on water quality, including during the construction phase, and wherever possible should seek to enhance water quality, both chemical and ecological.

Policy EN19 – Waste: The council will:

- Require all developers, including those of new waste management facilities within the district, to demonstrate the proposal's consistency with the principles of the waste hierarchy (prevention, reduction, re-use, recycling/composting, energy recovery, final disposal);
- Require all developers to submit a waste management plan to demonstrate how both construction and demolition waste will be minimised, and recycled on site wherever possible, and how the sustainable waste management needs of the end user will be met; and,
- Encourage communities to take responsibility for the waste they create through the provision of accessible facilities.



Policy DM1 – Development Management: All development should have regard to the following specific issues, for which more detailed guidance may be given within a supplementary planning document:

- Accessibility: buildings and neighbourhoods fully accessible to disabled people, access to new development by sustainable transport modes;
- Community safety and crime prevention;
- Design for health;
- Adequacy of internal accommodation and external amenity space;
- Refuse storage and collection;
- Effects relating to biodiversity, landscape, archaeological or built heritage;
- Green infrastructure including open space, both public and private;
- The use of alternatives to peat-based products in landscaping/gardens within development schemes;
- Flood risk and drainage and,
- Subject to scheme viability, developers will be required to demonstrate that new development incorporates sustainable construction techniques (In terms of energy targets this policy should be read alongside policy EN6 and the higher target will apply).

Policy T1 – Sustainable Transport: To deliver a sustainable, high quality, integrated transport system to encourage modal shift away from car travel to public transport, cycling and walking, to support the needs of residents and businesses and to prepare for carbon free modes of transport, the council will support proposals that:

- Improve choice by developing alternatives to the car;
- Facilitate modes of transport that reduce carbon emissions e.g by incorporating charging points for electric vehicles, subject to their appropriate design and location;
- Would reduce the negative impacts of road traffic, for example, congestion, air pollution and road accident casualties; and,
- Take account of the needs of road users according to a broad hierarchy consisting of, in order of priority:
 1. pedestrians and disabled people,
 2. cyclists, public transport,
 3. commercial access,
 4. general off peak traffic,
 5. general peak time traffic.

5.2.2 Places for Everyone - Addendum to Manchester Core Strategy

Following the adoption of the Places for Everyone (PfE) document, the subsequent Core Strategy (CS) policies have been partially replaced by PfE policies. Any part of the policy that is not replaced remains part of Manchester's Core Strategy.

Review and omit policies as necessary....

CS Policy T1 Sustainable Transport: The following bullet point details what has been replaced:

- Take account of the needs of road users according to a broad hierarchy consisting of, in order of priority:
 - Pedestrians and disabled people



- Cyclists, public transport,
- Commercial access,
- General off-peak traffic,
- General peak time traffic.

This policy was replaced by PfE Policy JP-CA1.

CS Policy EN4 Reducing CO₂ Emissions by Enabling Low and Zero Carbon Development: The following bullet point is what has been replaced:

- All development must follow the principle of the Energy Hierarchy.

This policy was replaced by PfE Policy JP-S2.

CS Policy EN6 Target Framework for CO₂ Reductions from Low or Zero Carbon Energy Supplies: The following aspects of the policy have been replaced:

- The CO₂ emissions reduction targets and the target framework development locations

This policy was replaced by PfE Policy JP-S2.

CS Policy EN8 Adaption to Climate Change: The following bullet point details what has been replaced:

- Minimisation of flood risk by appropriate siting, drainage, and treatment of surface areas to ensure rainwater permeability; and,
- The opportunity to provide linked and diverse green space to enhance natural habitats which will assist species adaptation.

This policy was replaced by PfE Policies JP-S2, JP-S4 and JP-G8.

CS Policy EN14 Flood Risk: The following bullet point details what has been replaced:

- All new development should minimise surface water run-off, including through Sustainable Drainage Systems (SUDS) and the appropriate use of Green Infrastructure. Developers should have regard to the surface water run-off rates in the SFRA User Guide. In CDAs, evidence to justify the surface water run-off approach / rates will be required.

This policy was replaced by PfE Policy JP-S4.

CS Policy EN15 Biodiversity and Geological Conservation: The following aspects of the policy have been replaced:

Development should wherever possible seek to maintain, enhance or restore existing geology.

This policy was replaced by PfE Policy JP-G8.



CS Policy EN17 Water Quality: The following bullet point details what has been replaced:

- Development should minimise surface water run-off from development and associated roads, and maximise the use of appropriate sustainable drainage systems, to minimise groundwater contamination, and to avoid pollutants reaching watercourses.

Replaced by PfE Policy JP-S4

These elements of the above policies have therefore been removed from the previous Local Planning Policy section.

5.3 Regional Planning Policy

5.3.1 Places For Everyone

Places for Everyone (PfE) is the joint development plan of nine Greater Manchester local authorities (Bolton, Bury, **Manchester**, Oldham, Rochdale, Salford, Tameside, Trafford, and Wigan) dealing with strategic planning issues including jobs, homes, transport, and the natural environment.

All nine authorities adopted the PfE Plan on 21st March 2024. Therefore, this document now forms part of the statutory development plan for each of the nine PfE authorities.

As a result, the following policies have been considered as part of the proposed development:

Policy JP-S1: Sustainable Development: To help tackle climate change, development should aim to maximise its economic, social and environmental benefits simultaneously, minimise its adverse impacts, utilise sustainable construction techniques and actively seek opportunities to secure net gains across each of the different objectives.

In bringing forward previously developed sites for development, particular attention will be paid to tackling land contamination and stability issues, ensuring that appropriate mitigation and remediation is implemented to enable sites to be brought back into use effectively.

Addressing Climate Change

Greater Manchester's Vision is to be at the forefront of action on climate change and to make its fair contribution to international commitments by becoming a carbon neutral city region by 2038.

To meet the carbon commitments, the following will be required:

- Be carbon neutral by 2038;
- Hold cumulative carbon dioxide emissions to within the council's carbon budget; and,
- Initiate a programme of mitigation to reduce emissions including by:
 - Significantly upscaling solar photovoltaic energy;
 - Reducing heat demand in homes;
 - Moving away from carbon intensive gas as the primary source of heat; and,
 - Increasing biofuel use.



- In supporting Greater Manchester's ambitions, climate change is a key theme running throughout the plan, rather than being reduced to a single policy, and it is only through this combination of actions that it can be properly addressed. In particular:
 - Methods to de-carbonise the city region through new and existing development, effective land management and through the provision of infrastructure and new technologies Policy JP-S2 'Carbon and Energy'; and,
 - The delivery of renewable and low carbon energy schemes Policy JP-S3 'Heat and Energy Networks'.

Carbon and Energy

- Meeting the 2038 carbon neutrality target will require a radical transformation across a range of sectors to drive carbon reduction. Within this, new development will have a critical role to play and all new homes and commercial/industrial buildings will need to achieve net zero carbon by 2028.
- It is expected that development in the plan area will apply a net zero carbon approach to operational emissions up until 2028, thereafter emissions in construction should be considered. Minimum carbon reduction targets will be set in line with the Future Homes Standard of 80% or until such a time this is superseded.
- From 2025, applicants will need to demonstrate carbon reductions have been maximised with an opportunity to offset any residual carbon to a carbon offset fund. The approach will be reviewed in line with future standards as they are introduced.
- By following the energy hierarchy, new development will need to achieve net zero carbon through the maximisation of on-site measures first. However, circumstances where a development has demonstrated that the hierarchy has been followed and there are no reasonable alternatives to meet the minimum carbon reductions, then payment to offset remaining emissions will also be required. Such payments should be expected to fund other carbon saving programmes within Greater Manchester to help meet the 5 Year Environment Plan targets.

Policy JP-S 2 – Carbon and Energy: The aim of delivering a carbon neutral Greater Manchester no later than 2038, with a dramatic reduction in greenhouse gas emissions, will be supported through a range of measures including:

- Promoting the use of life cycle cost and carbon assessment tools to ensure the long-term impacts from development can be captured;
- Taking a positive approach to renewable and low carbon energy schemes, particularly schemes that are led by, or meet the needs of local communities;
- An expectation that new development will, unless it can be demonstrated that it is not practicable or financially viable;
 - Be net zero carbon which applies:
 - From adoption – to regulated operational carbon emissions;



- From 2025 development should also calculate and minimise carbon emissions from unregulated emissions alongside regulated emissions;
- Development proposals should set out how this has been achieved in an energy statement in accordance with the energy hierarchy, which in order of importance seeks to:
 - Minimise energy demand;
 - Maximise energy efficiency;
 - Use renewable energy;
 - Use low carbon energy; and
 - Utilise other energy sources.
- From 2025 any residual carbon emissions that cannot be fully mitigated onsite should be offset, in agreement with the relevant local planning authority, through a financial contribution to a carbon offset fund;
- As an interim measure, development should be consistent with the 2021 Part L Building Regulations unless superseded by changes to building regulations and/or national or local planning policies.
 - Where practicable, prioritise connection to a renewable energy/heating/cooling network in the first instance or a low carbon energy/heating/cooling network that is adaptable to non-fossil fuels at a later date; and,
- For renewable energy generation priority should be given to PV installation where technically feasible, alternative technologies will be appropriate where the equivalent generation is evidenced;
- For non-residential developments, achieve at least BREEAM excellent standard (or equivalent) for the 'Ene 01 – reduction of energy use and carbon emissions' category rising to 'BREEAM outstanding' equivalent for ENE 01 from 2028;
- Include a detailed energy statement to demonstrate via site relevant evidence how the development has sought to maximize reductions in carbon emissions in line with relevant policy targets, including the minimisation of overheating risks and appropriate measures for post occupancy evaluation. Whole life cycle emissions should be considered where possible.
- Districts Local Plans may set out specific carbon emission reduction and energy demand targets within Local Plans.

Policy JP-STRAT14 - A Sustainable and Integrated Transport Network: New development will have a significant role in delivering a sustainable and integrated transport network in order to reduce car dependency and increase levels of walking, cycling and public transport.

Policy JP-S3 – Heat and Energy Networks: The provision of decentralised energy infrastructure is critical to the delivery of our objectives for low carbon growth, carbon reductions and an increase in local energy generation. The following measures will help to achieve this:

1. Delivery of renewable and low carbon energy schemes will be supported with particular emphasis on the use of decentralised energy networks in areas identified as "Heat and Energy Network Opportunity Areas". These have been identified where:



- a. Existing heat/energy networks are operational or have been commissioned;
 - b. Sufficient density of existing heat demand occurs; and,
 - c. Significant future development is proposed at the strategic development locations.
2. Within the identified “Heat and Energy Network Opportunity Areas”, unless it can be demonstrated that there are more effective alternatives for minimising carbon emissions or such connection is not practicable or financially viable.

Policy JP-S4 - Flood Risk and the Water Environment: An integrated catchment-based approach will be taken to protect the quantity and quality of water bodies with reference to the North West River Basin Management Plan and managing flood risk, by:

- Working with natural processes and adopting a natural flood management approach to slow the speed of water drainage and intercept water pollutants;
- Locating and designing development so as to minimise the impacts of current and future flood risk, including retrofitting or relocating existing developments, infrastructure and places to increase resilience to flooding;
- Expecting developments to manage surface water runoff through sustainable drainage systems and as close to source as possible;
- Development should achieve greenfield run-off rates unless it is demonstrated to be impracticable; and,
- Ensuring that sustainable drainage systems:
 - Are designed to provide multifunctional benefits wherever possible, including for water quality, nature conservation and recreation;
 - Avoid adverse impacts on water quality and any possibility of discharging hazardous substances to ground;
 - Are delivered in a holistic and integrated manner, including on larger sites split into different phases; and
 - Are managed and maintained appropriately to ensure their proper functioning over the lifetime of the development.
- As a minimum, residential development should meet the mandatory water efficiency standard of 125 litres/person/day as set out in Building Regulations. District local plans may and should consider setting a tighter water efficiency standard of 110 litres/person/day where there is a clear local need with reference to national guidance on housing optional technical standards.

Policy JP-S6 - Resource Efficiency: The achievement of a circular economy and a zero-waste economy will play a key role in meeting Greater Manchester’s ambition of becoming a leading green city region by 2038. The following measures will help achieve this:

- Development and implementation of the Zero Waste Strategy for Greater Manchester which promotes overall reduction in the level of waste produced and supports resource efficiency within the Plan area in order to gain the maximum value from the things we produce;
- Recognition of the role of existing infrastructure in managing our waste and protecting such facilities to ensure adequate waste management capacity is maintained; and
- Using sustainable design and construction techniques to reduce carbon emissions, adapt and future proof to the impact of climate change, reduce and recycle waste and minimise water use.



Policy JP-G2 – Green Infrastructure Network: A strategic approach will be taken to the protection, management and enhancement of Greater Manchester’s Green Infrastructure in order to protect and enhance the ecosystem services which the Green Infrastructure Network provides, including flood management, climate change mitigation and adaptation.

Wherever practicable, opportunities to integrate new and existing green infrastructure into new development will be taken to protect, enhance and expand the green infrastructure network.

Policy JP-G6: Urban Green Space: To ensure there is an appropriate scale, type, quality and distribution of accessible urban green space that can support a high quality of life and other important green infrastructure functions:

- Existing urban green space will be protected and enhanced in balance with other considerations; and
- Developers and other stakeholders will be required to deliver new high quality urban green spaces.

Development should be designed to support the positive use of nearby green spaces, such as by offering a high-quality setting, providing natural surveillance, and facilitating easy access by walking and cycling.

Policy JP-G7 - Trees and Woodland: the aims and objectives of the Greater Manchester Tree and Woodland Strategy, aiming to significantly increase tree cover, protect and enhance woodland, and connect people to the trees and woodland around them.

This will be done through local planning and associated activities such as:

- Where development would result in the loss of existing trees, requiring replacement on the basis of two new trees for each tree lost, or other measures that would also result in a net enhancement in the character and quality of the treescape and biodiversity value in the local area, with a preference for on-site provision; and
- Protecting trees and woodland during the construction phase of development.

Policy JP-G8: A Net Enhancement of Biodiversity and Geodiversity: Through local planning and associated activities a net enhancement of biodiversity resources will be sought, including, where relevant, by:

- Increasing the quality, quantity, extent and diversity of habitats, particularly priority habitats identified in national or local biodiversity action plans and those that support priority species;
- Improving connections between habitats, to protect and enhance the provision of corridors, ecological networks (including Nature Recovery Networks) and steppingstones that enable the movement of species, especially as the climate changes;
- Enhancing the management of existing habitats, including through habitat restoration, avoiding habitat fragmentation and combating invasive species;
- Protecting sites designated for their nature conservation and/or geological importance, with the highest level of protection given to international and then national designations;
- Facilitating greater access to nature, particularly within urban areas;
- Supporting the development and implementation of the Great Manchester Wetlands Nature Recovery Network; and
- Safeguarding, restoring and sustainably managing our most valuable soil resources, tackling soil degradation/erosion and recovering soil fertility.



Development will be expected to:

- Follow the mitigation hierarchy of:
 - Avoiding significant harm to biodiversity, particularly where it is irreplaceable, through consideration of alternative sites with less harmful impacts, then
 - Adequately mitigating any harm to biodiversity, then
 - Adequately compensating for any remaining harm to biodiversity.
- Achieve a measurable net gain in biodiversity of no less than 10%; and,
- Development proposals should be informed by the findings and recommendations of the appropriate biodiversity/ecological assessment(s) in the PfE evidence base and/or any updated or appropriate biodiversity/ecological assessments submitted as part of the planning application process.

Policy JP-P1 - Sustainable Places: The aim is to become one of the most liveable city regions in the world, consisting of a series of beautiful, healthy and varied places, each having the following key attributes that all development, wherever appropriate, should be consistent with:

- Distinctive, with a clear identity that:
 - Conserves and enhances the natural environment, landscape features, historic environment and local history and culture;
 - Enables a clear understanding of how the place has developed; and
 - Respects and acknowledges the character and identity of the locality in terms of design, siting, size, scale and materials used.
- Resilient, capable of dealing with major environmental events;
- Adaptable, able to respond easily to varied and changing needs and technologies;
- Durable, being built to last and using robust materials that reflect local character, weather well and are easily maintained;
- Resource-efficient with:
 - A low carbon footprint;
 - Efficient use of land;
 - Minimised use of new materials; and,
 - High levels of recycling,
- Supported by critical infrastructure, such as energy, water and drainage and green spaces; and,
- Functional and convenient, enabling people and uses to act efficiently with minimal effort, and responding to needs relating to servicing, recycling facilities, refuse collection and storage.

The success of the Net Zero Carbon design and construction is measured in Policy JP-S2 through a series of metrics and key performance indicators (KPIs). These metrics and KPIs provide an indication of how the design has influenced the performance of the building.

This project is classified as a large major residential scheme as it is to provide over 150 homes. This triggers a specific set of KPIs the scheme must comply with, these can be seen in Chapter 2, Energy and Carbon Proforma.



5.4 Regulatory Framework

Building Regulations, Part L - Conservation of Fuel and Power sets the compliance standards for energy demand and carbon dioxide emissions from buildings. Guidance on how to meet the requirements of this regulation is provided within a number of approved documents. The relevant document is referenced below:

Approved Document Volume 1: Dwellings (2021 Edition) provides guidance on how to comply with Part L of Schedule 1 to the Building Regulations and the energy efficiency requirements for dwellings.

The minimum energy performance requirements shall be approved and expressed in accordance with the methodology for:

- New dwellings, in the form of target CO₂ emission rates;
- New dwellings, in the form of target fabric efficiency rates; and,
- New dwellings in the form of target primary energy rates.

5.5 Applicable Targets

Based upon a review of relevant planning policy requirements, legislative drivers, and client priorities, the following list provides a brief precis of the key criteria that should be targeted for this development:

Places for Everyone

- **Policy JP-S1:** Sustainable Development
- **Policy JP-S2:** Carbon & Energy
- **Policy JP-S3:** Heat and Energy Networks
- **Policy JP-S6:** Resource Efficiency
- **Policy JP-P1** Sustainable Places

Manchester Core Strategy

- **Policy EN 4** - Reducing CO₂ Emissions by Enabling Low and Zero Carbon Development
- **Policy EN 5** - Strategic Areas for low and zero carbon decentralised energy infrastructure
- **Policy EN 6** - Target Framework for CO₂ Reductions from Low or Zero
- **Policy EN 8** – Adaption to Climate Change
- **Policy EN16** – Air Quality

Guide to Development in Manchester, Supplementary Planning Document

Manchester City Council Climate Emergency Declaration

Building Regulations, Part L

- **Approved Document Volume 1: Dwellings (2021 edition)**



6. ENERGY HIERARCHY

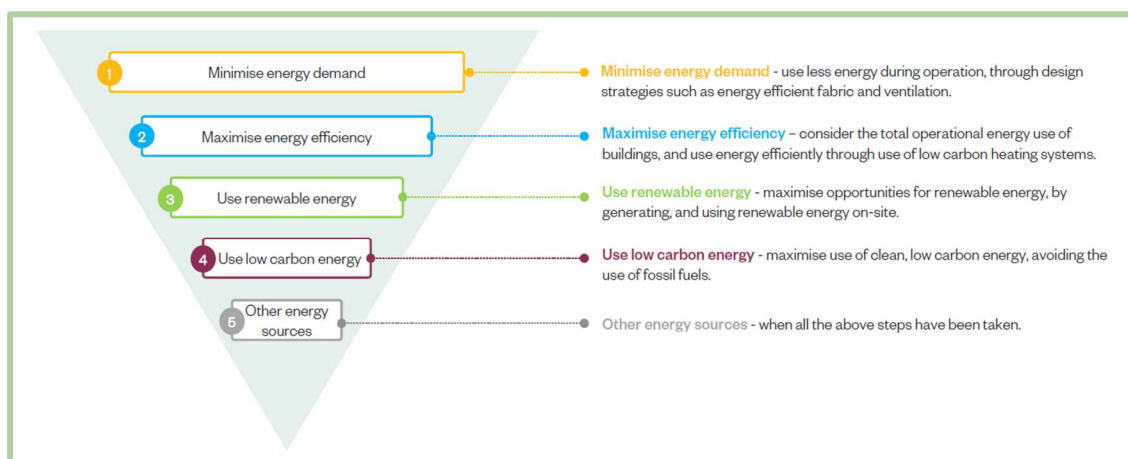
6.1 The Energy Hierarchy

The energy strategy for this development prioritises an enhanced ‘fabric led’ solution coupled with a fossil fuel free (that is, full electric) mechanical and electrical system provision. An enhanced building fabric specification throughout the scheme allied to efficient servicing and controls will achieve compliance with the new build carbon dioxide emission reduction and fabric energy efficiency targets stipulated by Building Regulation Part L, Manchester City Council, and Places for Everyone.

The Energy Hierarchy (see Figure 6.1) provides a framework to guide energy policy and decision making to achieve practical and cost-effective carbon emission reductions. The energy hierarchy is built upon the following guiding principles:

- i. **First Principle**
 - o Reduce the need for energy.
- ii. **Second Principle**
 - o Use energy more efficiently.
- iii. **Third Principle**
 - o Supply energy from renewable sources.
- iv. **Fourth Principle**
 - o Ensure that any continuing use of fossil fuels should use clean technologies and be efficient.

Figure 6.1 – The Energy Hierarchy



Source: GMCA PjE Guidance

The Energy Hierarchy has been used as a framework to guide the energy strategy to achieve practical and cost-effective carbon emission reductions for this building. It is intended that the construction, design and specification proposed for this scheme will deliver dwellings that are inherently efficient and cost-effective during occupation.

The proposed, detailed energy strategy is presented in Section 7.



7. ENERGY STRATEGY

7.1 CIBSE TM54 Modelling and Energy Demand

To demonstrate the energy performance of the proposed development, CIBSE TM54 assessments have been carried out for eight representative dwelling types. The modelling provides a robust indication of the expected space heating and overall energy demand.

7.1.1 Overview

The climate emergency is driving a critical need to deliver high-performance buildings, with operational energy use aligned to net-zero targets. To achieve this, design teams require tools and techniques that can reliably model in-use energy performance based on design proposals and guide the development of more efficient design strategies.

Traditional compliance modelling, such as Part L SAP and SBEM calculations, focus only on regulated energy use and therefore do not provide an accurate prediction of how buildings will perform once occupied. This gap between compliance predictions and real-world energy consumption has led to significant performance shortfalls.

The CIBSE TM54 assessment methodology addresses this issue by providing a structured methodology for producing more realistic estimates of operational energy use. It enables engineers and consultants to account for the factors typically overlooked in compliance modelling, including:

- Unregulated loads (small power, equipment, IT)
- Occupant behaviour (schedules, density, usage patterns)
- Heating, cooling, ventilation and domestic hot water performance
- Lighting and controls
- HVAC efficiencies and part-load operation
- Variations in system assumptions and scenarios

By incorporating these elements, TM54 helps to close the gap between Part L predictions, expected operational performance, and actual in-use energy consumption.



7.1.2 Geometry and Site Details

Eight representative dwellings were chosen to reflect the range of apartment and townhouse layouts across the development. These have been listed out in Table 7.1.

Table 7.1 – Representative Dwellings

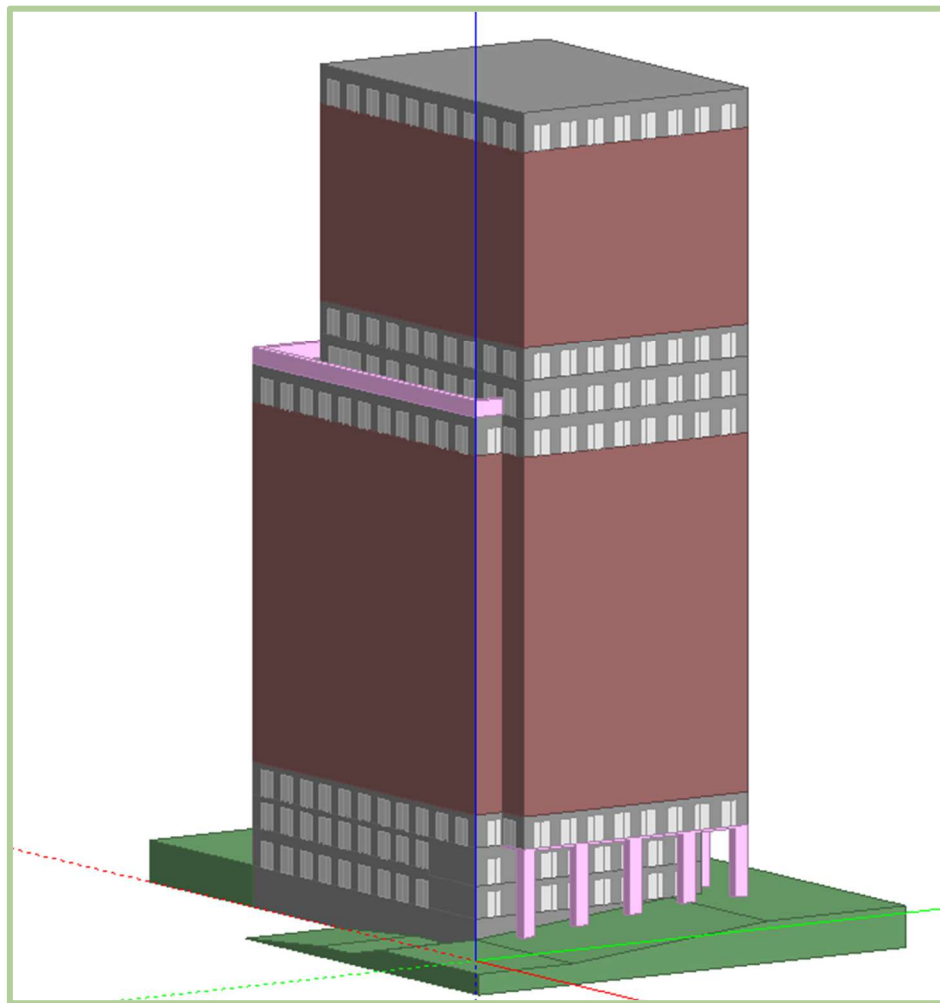
Reference	Floor area (m ²)	Description	Façade Aspect
Ground Floor Townhouse Type A	81.72	Ground floor mid terrace	North
Ground Floor 2B4P Type B	73.91	Ground floor corner apartment	South & East
Second Floor 2B4P Type D	78.03	Mid floor corner apartment	North & west
Second Floor 1B2P Type D	51.22	Mid floor mid terrace apartment	West
Fourteenth Floor 2B4P Type E	73.20	Mid floor corner apartment with partially exposed roof.	North & East
Fifteenth Floor 2B3P Type B	60.81	Mid floor mid terrace apartment	North
Sixteenth Floor 2B3P Type F	62.49	Mid floor corner apartment	South & West
Twenty-Third Floor 2B3P Type D	66.40	Top floor mid terrace apartment	East

The energy demand for these dwellings was calculated in DesignBuilder, a dynamic building simulation modelling (DSM) software package widely used for TM54 assessments. This software allows detailed modelling of building fabric, ventilation, internal gains and heating system performance to produce predictions of regulated energy use.

Figure 7.1 – Example Apartment 3D Energy Model



Figure 7.2 – 3D Energy Model



7.1.3 Data Inputs and Internal Gains

Tables 7.2 to 7.4 present the proposed specifications and data inputs used within the dynamic simulation modelling calculations, which underpin the energy performance results in Table 7.5.

Table 7.2 – Proposed Fabric Specification

Item	Proposed Specification
Exposed Floor	$U=0.12 \text{ W/m}^2\text{K}$
External Wall	$U=0.17 \text{ W/m}^2\text{K}$
Windows	$U=1.20 \text{ W/m}^2\text{K}$
Roof	$U=0.12 \text{ W/m}^2\text{K}$
Air Permeability	$3.00\text{m}^3/\text{hm}^2 \text{ (@}50\text{Pa.)}$
Cold Bridge	$\gamma=0.09$



Table 7.3 – Proposed Mechanical and Electrical Specification

Item	Proposed Specification
Lighting	100% LEDs
Ventilation	MVHR <i>Heat recovery efficiency: 89%</i>
Space Heating	Electric Panel Heaters <i>CoP 1.00</i>
Water Heating	Hot Water Heat Pump <i>CoP 3.02</i>

Table 7.4 – Internal Gains

Item	Description	Note
Occupancy	Internal heat gains from people, based on occupancy density, activity level, and operational schedules.	Model inputs for density and schedules are defined on a zone-by-zone basis. Occupancy density has been based off the number of assumed residents, for example a 2 bed four-person apartment is to house four people.
Lighting	Heat gains from fixed lighting systems, estimated using defined lighting loads, control strategies, and operating hours. Lighting schedules should be aligned with occupancy patterns.	The building has been specified with efficient LEDs. The lighting in the apartments has been modelled with a power density of 1.5 W/m ² -100 Lux.
Small Power	Heat gains from plug loads and equipment, which can be highly variable and are often difficult to predict, particularly when future occupiers are unknown. For this TM54 encourages the use of benchmark data.	Power density of the equipment varies between room type, for bedrooms this has been set to 2 W/m ² with a radiant fraction of 0.20 and for the kitchen living spaces this has been set to 10 W/m ² with a radiant fraction of 0.50.



7.1.4 Results

Table 7.5 presents the predictive energy demand results.

Table 7.5 – TM54 Predictive Energy Demand Results

Reference	Space Heating (kWh/m ² /year)	Lighting (kWh/m ² /year)	Small Power (kWh/m ² /year)	DHW (kWh/m ² /year)	Total (kWh/m ² /year)
Ground Floor Townhouse Type A	3.38	3.01	12.66	4.38	23.43
Ground Floor 2B4P Type B	4.36	2.73	17.94	3.30	28.33
Second Floor 2B4P Type D	9.27	2.64	18.40	3.35	33.66
Second Floor 1B2P Type D	6.66	2.74	19.68	3.39	32.47
Fourteenth Floor 2B4P Type E	6.81	3.29	17.80	3.29	31.19
Fifteenth Floor 2B3P Type B	5.50	2.97	16.51	3.26	28.24
Sixteenth Floor 2B3P Type F	5.98	2.81	15.98	3.28	28.05
Twenty-Third Floor 2B3P Type D	10.12	2.92	17.50	3.29	33.83

Table 7.6 presents the averaged space heating demand and total energy usage intensity (EUI) for the representative dwellings, benchmarked against the Places for Everyone (PfE) targets.

Table 7.6 – TM54 Predictive Energy Demand Results

	Space Heating Demand	Energy Use Intensity
Average of representatives (kWh/m ² /year)	6.51	29.90
Places for Everyone Target (kWh/m ² /year)	15	35

7.2 Part L Calculations

Approved SAP 10 software has been used to generate a representative energy demand model for the development. SAP software calculates the regulated energy demand and associated carbon dioxide emissions in accordance with the requirements of Building Regulations, Part L Approved Document Volume 1 (2021) that this development will be constructed in compliance with.

The SAP outputs have not been used to demonstrate compliance with the policy targets; instead, they have been used to confirm Part L compliance and to ensure the dwellings achieve an EPC rating of 'B'.

Block compliance of representative apartments:

- % Dwelling emission rate over AD: Volume 1 (2021): 68.96
- % Dwelling fabric energy efficiency reduction over AD: Volume 1 (2021): 0.26
- % Dwelling primary energy reduction over AD: Volume 1 (2021): 40.59

All representative apartments are achieving EPC 'B' ratings.



7.3 Building Fabric and Ventilation

The standard measurement of heat transfer through a given building material or construction type is the U-value ($\text{W/m}^2\text{K}$). The lower the U-value, the more slowly heat transfers and is lost out of a building. In buildings, heat loss generally occurs through the following main areas and elements of the construction:

- Ground floor;
- External walls;
- Roofs;
- Doors and windows;
- Thermal bridging; and,
- Uncontrolled ventilation.

This development will benefit from a material and design specification that is aligned with Building Regulation standards and will include numerous efficiency measures designed to reduce heat losses and minimise energy demand in accordance with the first principle of the energy hierarchy, including:

- ✓ High performance U - values;
- ✓ Reduced thermal bridge heat losses;
- ✓ Efficient form of construction; and,
- ✓ Low design air permeability target.

This 'fabric led' approach to minimising energy demand and associated carbon dioxide emissions through the performance of the thermal envelope is aligned with the first principle of the energy hierarchy, which states that reduction in energy demand should be achieved initially by energy efficiency.

7.1.1 - Building Form and Heat Loss Envelope

The form of the dwellings proposed for the scheme is as follows:

- The Townhouses are two storey dwellings; and,
- The remaining apartment types consist of, ground, mid and top floor units.

The calculated form factors for the representative apartment types have been calculated, as follows:

- Townhouse Type A: 0.9
- Level 00, 2B4P Type B: 1.5
- Level 02, 1B2P Type D: 0.6
- Level 02, 2B4P Type D: 0.3
- Level 14, 2B4P Type E: 0.7
- Level 15, 2B3P Type B: 0.3
- Level 16, 2B3P Type F: 0.7
- Level 23, 2B3P Type D: 1.4

7.1.2 - Elevation Design and Window Proportions

The dwellings are of bespoke architectural design with a range of high specification design features and materials palette, allied to generous proportions and detailing. Based on a typical elevation the glazing ratio has been calculated to be approximately 45.8%.



7.1.3 Heated Spaces

The apartment block has an unheated, partially exposed basement. The exposed floor to ground floor apartments and townhouses will be well insulated to minimise heat loss.

7.1.4 Building Fabric Specifications and Air Permeability

The proposed material specification that will be incorporated within the dwellings to limit heat loss and ensure efficient operation is presented in Table 7.2 above.

7.1.5 Ventilation System

The apartments and townhouses will benefit from whole house balanced mechanical ventilation with heat recovery. This system will maintain a healthy living environment and further reduce the heat losses and energy demand of the dwellings.

MVHR systems can recover up to 90% of heat from the extracted stale air from the dwelling by using a counter flow heat exchanger which 'pre-heats' cool incoming, fresh air. The outgoing and incoming air pass next to each other, but do not mix.

7.1.6 Space Heating Demand

To demonstrate the environmental performance of the proposed new-build dwellings, CIBSE TM54 assessments have been undertaken for eight representative dwelling types. This sample provides a robust and reliable indication of the overall expected performance of the development.

The space heating demand for the dwelling types has been calculated, as follows:

- Townhouse Type A = 3.38 kWh/m²/year
- Level 00, 2B4P Type B = 4.36 kWh/m²/year
- Level 02, 1B2P Type D = 9.27 kWh/m²/year
- Level 02, 2B4P Type D = 6.66 kWh/m²/year
- Level 14, 2B4P Type E = 6.81 kWh/m²/year
- Level 15, 2B3P Type B = 5.50 kWh/m²/year
- Level 16, 2B3P Type F = 5.98 kWh/m²/year
- Level 23, 2B3P Type D = 10.12 kWh/m²/year

- Average space heating demand = **6.51 kWh/m²/year**

From 2025, the Places for Everyone policy sets maximum space-heating demand thresholds of 15 kWh/m²/year for flats and 20 kWh/m²/year for houses. The representative dwellings in this development have been calculated to perform with an average space-heating demand of 6.51 kWh/m²/year, well below these targets.



7.4 Maximise Energy Efficiency

7.4.1 Energy Use Intensity

Representative CIBSE TM54 models have been calculated for eight dwelling types. This provides the regulated energy demand of the house types within the scheme.

The energy use intensity (EUI) of a home or building is the total amount of energy (regulated and unregulated) it uses for all purposes in kWh/year, divided by the gross internal floor area (GIA) in m². The EUI has been calculated prior to the inclusion of the PV array.

Both regulated plus unregulated energy demand have been calculated for the purposes of the Energy Use Intensity (EUI) calculation. The EUI for the representative dwelling types has been calculated, as follows:

- Townhouse Type A = 23.43 kWh/m²/year
- Level 00, 2B4P Type B = 28.33 kWh/m²/year
- Level 02, 1B2P Type B = 33.66 kWh/m²/year
- Level 02, 2B4P Type D = 32.47 kWh/m²/year
- Level 14, 2B4P Type E = 31.19 kWh/m²/year
- Level 15, 2B3P Type B = 28.24 kWh/m²/year
- Level 16, 2B3P Type F = 28.05 kWh/m²/year
- Level 23, 2B3P Type D = 33.83 kWh/m²/year
- Average Energy usage intensity = **29.90 kWh/m²/year**

The updated *Places for Everyone* guidance sets a target for Truly Affordable Net Zero (TANZ) social rent homes to achieve a maximum energy use intensity of 35 kWh/m²/year.

We understand that the intent of the Energy Use Intensity target is to set out, for all developments (excluding small minor developments) the EUI value of 35kWh/m²GIA.yr as a target through which applicants can demonstrate compliance with the 'Maximise energy efficiency' element of policy JP-S2 (which applies to all new development).

The One Lord Street scheme has been demonstrated to improve upon this key performance indicator.

7.4.2 Efforts to Reduce Energy Use of Equipment

In order to limit energy demand and carbon dioxide (CO₂) emissions from the operation of the building, a number of design features will be integrated that will collectively contribute towards emission reductions for the scheme.

Detailed measures are presented in Chapter 7 of this report, but in essence, the energy strategy focuses on a holistic approach to improving the buildings' performance by applying a fabric-led strategy, allied to renewable and low carbon technology.



The reduction in energy demand to meet the carbon reduction targets will be achieved through the following design measures and low carbon technology:

- High performance thermal insulation;
- Low air permeability;
- Hot Water Heat Pumps;
- Mechanical Ventilation with Heat Recovery;
- Solar photovoltaic array;
- Sophisticated heating controls;
- Appliances and white goods specified will be highly energy efficient; and,
- Each dwelling will be specified with a smart meter to enable occupant to effectively monitor and manage their energy consumption.

The proposed specification will improve upon the metrics and key performance indicators stipulated within Greater Manchester Combined Authority, Places for Everyone documents.

7.5 Renewable Energy Generation

The operational efficiency of the development will be optimised via the use efficient mechanical and electrical (M&E) systems allied to low carbon and renewable energy generation.

The proposed building services that will be incorporated in the development to ensure efficient servicing is presented in Table 7.7. The exact M&E specification will be refined further into the development cycle at the technical design stage (RIBA Stage 4), post planning approval.

Table 7.7 – Proposed Mechanical and Electrical Specification

Item	Specification
Lighting	100% LED (120lm/cW)
Ventilation	Mech. Vent. Heat Recovery <i>Nuaire MRXBOX ECO 5</i>
Space Heating	Electric Panel Heaters
Water Heating	Hot Water Heat Pump <i>Dimplex EDEL EDL170-520RF</i>
Heating Controls	Time and Temperature zone control
Renewables	Photovoltaic Array

7.5.1 Proposed Renewable Energy Generation System

Photovoltaic Array

Photovoltaic (PV) arrays have been selected as an appropriate renewable energy technology to contribute to the CO₂ emission reduction target for the development and to support the requirements stipulated within Places for Everyone. PV arrays are relatively straightforward to install, benefit from



low maintenance costs and will reduce the operational cost of the building. The use of PV in general at this site would provide the following benefits:

- Reducing the buildings electrical energy grid load;
- Simple installation and commissioning;
- Low maintenance; and,
- Reliable, proven technology.

Proposed System Details –

- It is proposed that PV panels will be mounted on the roof.

Figure 7.3 presents the proposed PV layout on the roof of the scheme which demonstrates alignment with the Places for Everyone policy criteria.

Figure 7.3 – Proposed Roof Layout for Renewable Generation

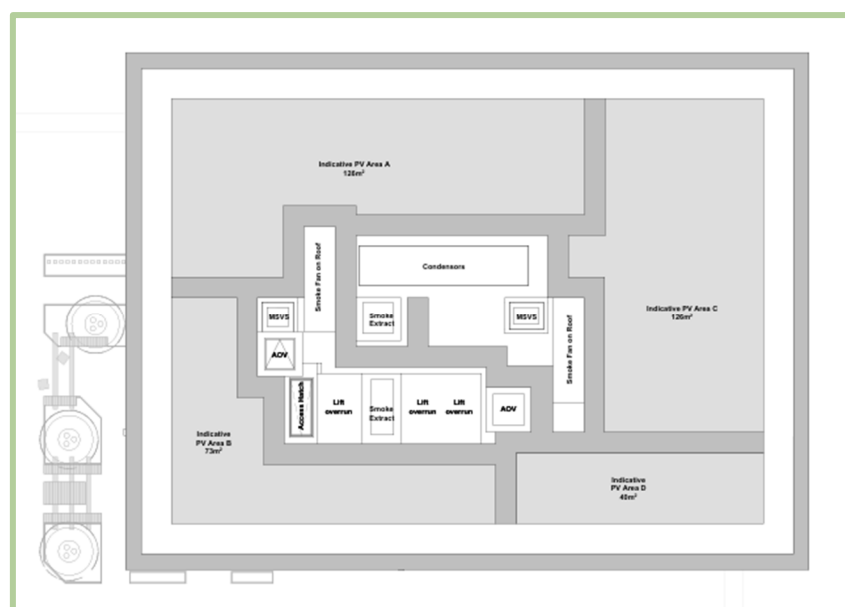


Table 7.8 – Proposed PV Area

	Solar PV
Ground Floor Area (m²)	826
Proposed PV Area (m²)	365
PV Footprint area (% of ground floor area)	44%

Land Use –

- There are no land use issues associated with PV technology at this site;
- The development has sufficient roof area to accommodate the PV arrays; and,
- The PV arrays can be installed as part of the roof system in order to minimise the visual impact.



Local Planning Issues –

- There are no planning policy issues associated with this technology and this type of technology is favoured under the PfE requirements.

Noise Issues –

- PV is silent in operation.

Whole life cost and lifecycle impact –

- Current installed costs for PV are approximately £1,500 / kWp installed.
- Additional costs throughout the system's thirty-year lifecycle are limited to:
 - o Cleaning of the arrays; and,
 - o Replacement of the DC / AC inverter unit which typically have a lifespan of around ten years.

Air Source Heat Pumps

The proposed Air Source Heat Pump (ASHP) system is a highly energy efficient means of meeting the dwellings' hot water demand. The system comprises a hot water storage cylinder with an integrated heat exchanger and a compact heat pump unit that extracts heat from the surrounding air. Designed specifically for domestic hot water production, it efficiently transfers ambient heat to the water, reducing energy consumption compared to conventional electric or gas water heating systems.

The proposed packaged hot water heat pump cylinder system provides the following benefits:

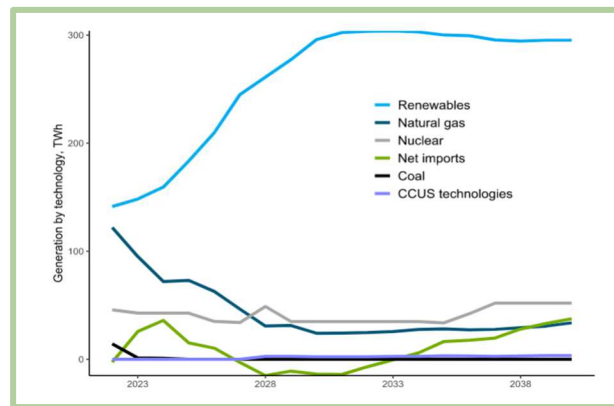
- Highly energy-efficient system, thus limiting electrical energy demand and associated carbon dioxide (CO₂) emissions;
- This technology benefits from a low 'carbon footprint' due to the inherent efficiency of the heat pump process. It is a well-established technology with an anticipated long lifespan - with proper care they can be operational for up to twenty years;
- Omission of fossil fuel connection from the proposed scheme will enable the development to track the decarbonisation of the UK electricity grid over time and reduce operational carbon emissions as a consequence; and,
- ASHPs primarily consume grid mix electricity which is, in part (albeit diminishing) sourced from a mix of fossil fuels / LZC and nuclear.

7.6 Low Carbon Heating**7.6.1 Fossil Fuel Free**

The scheme will be fossil fuel free. As the UK electricity grid's CO₂ footprint continues to improve, so too would the carbon dioxide emissions associated with the operational phase of the proposed scheme, which benefits from highly efficient systems.



Figure 7.4 - Electricity Generation by Fuel Source, TWh



Source – BEIS, Energy and Emissions Projections (2022)

UK grid mix electricity carbon emissions will decrease significantly by 2035, with the carbon intensity of electricity generation falling by 93% between 2020 and 2035. This is due to the progressive shift away from fossil fuels as demonstrated in Figure 7.4.

The energy strategy proposed for the scheme uses a combination of air source heat pumps and photovoltaics. The air source heat pumps are highly efficient systems that utilise grid electricity to provide water heating. The use of heat pumps will ensure that fossil fuels converted and distributed through the National Grid as electrical energy will be consumed cleanly and efficiently.

Therefore, this will further support the schemes move towards operational net zero carbon in accordance with the Places for Everyone requirements.

7.6.2 Proposed Heating and Hot Water System

The proposed specification includes a Hot Water Heat Pump (*Dimplex EDEL EDL170-520RF*) providing hot water. This system operates with a COP of 302% efficiency. Space heating will be provided by electrical panel heating which is 100% efficient at the point of consumption.

7.6.3 Proposed Cooling System

There will be no active cooling measures within the properties. Purge ventilation will be provided by openable windows. Compliance has been demonstrated with Building Regulations Approved Document O: Overheating and CIBSE TM59: Design Methodology for the Assessment of Overheating Risk in Homes without the requirement of active cooling.



8. ENHANCED LOW CARBON HEAT APPRAISAL

This Enhanced Low-Carbon Heat Appraisal has been prepared to support the planning application for the proposed development.

It assesses the predicted performance of a number of potentially suitable heating system options, against the required Key Performance Indicators (KPIs) for major-large scale developments such as this.

The development falls under Places for Everyone **Location Case 3**, which applies to sites located within a low carbon heat network opportunity area. This appraisal includes consideration of a notional **low-carbon heat network** in addition to building-level options.

As this scheme is to provide over 150 homes it is considered a Large Major application. This triggers the need for an enhanced Low Carbon Heat Appraisal comparing different systems against a set of Key Performance Indicators (KPIs) and identifying the proposed system. This can be seen in Table 8.1.

For Major applications, the energy carbon requirements, are as follows:

1. Non fossil fuel based system proposed
2. The carbon content of heat (delivered) is less than 100gCO₂/kWh

The appraisal also addresses broader technical, operational, infrastructure, and carbon-related considerations as recommended for large major applications. The proposed heating options for this appraisal are as follows:

- Option 1 – Electric panel heaters and Hot water heat pump
- Option 3 – Communal Air Source Heat Pump (direct electric)
- Option 2 – Electric storage heaters and Electric immersion
- Option 4 – Exhaust Air Heat Pump

Policy JP-S3 is clear that there is an expectation that connection to a low carbon heat network is proposed 'unless it can be demonstrated that there are more effective alternatives for minimising carbon emissions or such connection is not practicable or financially viable'.

There are four key grounds for exemption, these are as follows:

1. **Carbon Grounds:** An alternative on-site heating system would be lower carbon than the carbon content of heat (delivered) of the low carbon heat network.
2. **Heating costs grounds:** Connection to the low carbon heat network would lead to heating costs for the residents which are more than 10% higher than an on-site heating system with an equal or lower carbon content of heat.
3. **Cost effectiveness grounds:** Connection to the low carbon heat network (and the installation of on-site interim heating plant if needed) would not be as cost effective as installing an on-site heating system with an equal or lower carbon content of heat.
4. **Technical/practical grounds:** There are significant technical/practical reasons why the development cannot connect.



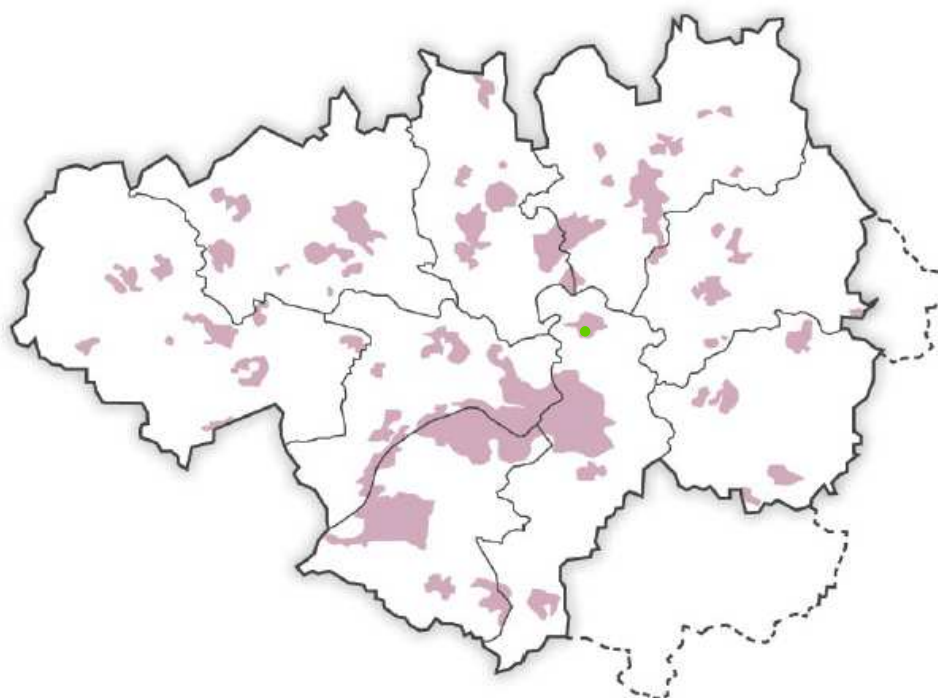
An initial investigation was undertaken to determine whether the site lies within a District Heat Network, in accordance with the Places for Everyone guidance for Manchester. It was determined that the site is not located within 500 m of an existing or planned low-carbon heat network; however, it does fall within a low-carbon heat network opportunity area and is therefore classified as Case 3, as noted above.

As the development falls under the Case 3 classification, there is no requirement to connect to a future district heat network due to the uncertainty surrounding if or when such a network will be installed. However, because the development is categorised as a Large Major scheme, it is still necessary to assess four different heating options (including a district heat network).

From the four different heating options as mentioned above, Option 1 electric panel heaters with a hot-water heat pump was selected as the most feasible and cost-effective solution for the development. Factors such as running costs, installation costs, practicality, carbon intensity of heat, and the use of fossil-fuel-free technology contributed to its selection. Another reason for selecting Option 1 is that there are currently no planned heat networks in the area, and there is uncertainty regarding if or when one will become available. As a result, a heating solution is required that can be implemented and fully operational when the development is completed.

Figure 8.1 – Map of Heat and Energy Network Opportunity Areas

The green dot in Figure 8.1 below shows the approximate site location in relation to the heat and energy network opportunity areas.



Map of Heat and Energy Network Opportunity Areas

(created from GMCA Places for Everyone Joint Development Plan Document, March 2024)



8.1 KPI Assessment Summary

Table 8.1 below summarises the required key performance indicators (KPIs) for each heating option.

Table 8.1 – KPI Performance Assessment formatting

Performance Area	Key Performance Indicator	Direct Electric & Heat Pump	Direct Electric	Communal Air Source Heat Pump	EAHP ²
Environmental Performance	1. Fossil Fuel	No	No	No	No
	2. Carbon Content of Heat (gCO ₂ /kWh)	142.50	177.00	53.15	64.78
	3. Local Pollution	None, system is 'full electric'	None, system is 'full electric'	None, system is 'full electric'	None, system is 'full electric'
Impact on residents / users	4. Estimated Running Costs for heating & Hot water (£/yr/apartment)	£377.94	£557.02	£289.22	£306.60
	5. Estimated maintenance costs £/yr ³	0	0	0	0
	6. Estimated replacement costs £/yr/apartment ⁴	£208.50	£287.33	£480.00	£400.00
	7. Additional costs compared to benchmark low carbon heating system +/- %	-47.88%	-28.17%	+20%	-
Impact on Viability	8. Estimated capital cost £/Building	£1,282,610	£429,210	£3,012,000 ⁵	£2,510,000
	9. Additional cost compared with benchmark low carbon heating system +/- %	-95.70%	-484.80%	+16.67%	-
Infrastructure development	10. Connection to low carbon Heat network	No	No	Yes	No
	11. Scale of application GIA m ²	22,200	22,200	22,200	22,200

² The Exhaust Air Heat Pump has been selected as a 'benchmark' low carbon heating system.

³ The maintenance cost for direct electric heaters and heat pumps has been set to zero, as any required upkeep can be carried out by residents and is limited to basic tasks such as general cleaning and replacing heat pump air filters.

⁴ The estimated replacement cost has been calculated by dividing the current system cost by its expected lifetime. For the communal air source heat pump, the capital cost has been divided by its expected lifetime and apportioned equally between the apartments.

⁵ The capital cost for the communal air source heat pump has been based on the indicative capital costs in the GMCA *Places for Everyone* guidance document.



8.2 Option 1 (Proposed): Direct Electric & Heat Pump

8.2.1 Overview

Space heating and domestic hot water (DHW) are provided as separate systems. This setup is “full electric” and therefore fossil fuel free.

Assume that you have cross referenced to the PfE tech guidance docs for these descriptions and notes? If not, pls review and add as required.

Space Heating:

- Delivered via electric panel heaters
- Is 100% efficient at the point of consumption.
- Generates a reduced overheating potential – electric space heating delivers virtually instantaneous heating at the location where it is required. Unlike a ‘wet system’ associated with communal gas boilers which inherently have a long lag time for the heat to be generated and then dissipated when no longer needed. This lag time can lead to the dwelling overheating as the hot water remains in the radiators for a considerable time after the heat demand is required.
- More flexible demand management compared to storage heaters due to their diversified electrical load.

Domestic Hot Water (DHW):

- Supplied through a packaged hot water heat pump installed inside the dwelling.
- The heat pump is ducted to the outside, drawing in ambient air and expelling air after heat extraction.
- Low-grade heat from internal air is passed over the integrated heat exchanger and recovered energy is upgraded by the heat pump to provide very low carbon potable hot water.
- The proposed Dimplex Edel heat pump that this analysis is based upon has a high operating efficiency of 302%.
- Hot water is stored locally in an individual tank for each apartment.
- DHW systems are independent and not interconnected between dwellings.

Installation Considerations:

- **Space Constraints:** Hot water heat pumps require sufficient internal space and should ideally be located close to an external wall to allow ducting for air intake and exhaust.
- **Suitability:** This configuration is well-suited to high-density apartment buildings where outdoor space is limited, and space heating loads are relatively low.
- **Energy Efficiency:** The systems can be integrated with energy-demand reduction technologies (e.g., smart thermostats, photovoltaic array or energy storage) to optimise performance, support low carbon transition plans, and reduce operational costs.
- **Space planning:** makes efficient use of the building’s floor area and does not require a dedicated plant room or internal riser.

8.2.2 Operation and Maintenance

Sophisticated heating controls including appliance programmer and appliance thermostats will ensure the efficient delivery of heat from electric panel heaters to further reduce the dwellings’ energy demand.

Maintenance considerations include minimal servicing requirements of electric panel heaters and the standard annual checks needed for the hot-water heat pump. Maintenance arrangements can be incorporated into a range of management models, such as council, build-to-rent, owner-occupier, or third-party providers. Although the exact approach will depend on the final management structure of the development. Supply chain



availability for replacement components is currently assessed as low to medium risk, but this remains subject to change based on market conditions and manufacturer availability at the time of procurement.

Table 8.2 – Estimated Running Cost⁶

Estimated heating demand (Space & Water) kWh/year	Standing Charge £/year	Day rate cost £/year	Estimated running Cost £/year/typical apartment
828.18	195.93	182.01	377.94

8.2.3 Carbon Emissions

This option is considered fossil-fuel-free as it is fully electric, resulting in no local pollution at the point of use. Unlike gas boilers, which burn fossil fuels within the dwelling, producing local emissions. Furthermore, as the UK electricity grid's CO₂ footprint continues to improve, so too would the carbon dioxide emissions associated with the operational phase of the proposed scheme, which benefits from highly efficient systems.

The carbon content⁷ of the proposed heating strategy is specified below:

Electric Panel heaters:

- Efficiency of system 100% (SCOP of 1.0)
- Carbon content of delivered heat: 177 gCO₂/kWh

Hot Water Heat Pump (Dimplex EDEL):

- Efficiency of system 302% (SCOP of 3.02)
- Carbon content of delivered heat: 58.61 gCO₂/kWh

Weighted average of Carbon content:

- Space heating is 71% of heating demand
- Water heating is 29% of heating demand
- Carbon content of the proposed system is 142.50 gCO₂/kWh

Furthermore, the refrigerant used in the proposed Dimplex Edel hot-water heat pump is R290, which has a very low global warming potential, contributing only 0.06 kgCO₂e and having a GWP rating of just 3, well below the F-Gas Regulation target of 750. Combined with the relatively low carbon intensity of electricity, the use of this low-GWP refrigerant reinforces the suitability of this option as a genuinely low-carbon hot water solution for the development.

⁶ The estimated running cost is based on the average space heating and hot water demand derived from the representative CIBSE TM54 predictive energy calculations, multiplied by the average electricity prices for July to September 2025 as published by the House of Commons Library. These figures can be seen below:

- Average Standing charge: £0.5368/day
- Average Day rate: £0.2635/kWh

⁷ According to the 2025 Government Greenhouse Gas (GHG) Conversion Factors published by DESNZ, the carbon content of grid electricity is 0.177 kgCO₂ per kWh. This emission factor has been used to estimate the operational carbon performance of the proposed full electric heating system.



8.3 Option 2: Direct Electric

8.3.1 Overview

Space heating and domestic hot water (DHW) are provided as separate systems. This setup is “full electric” and therefore fossil fuel free.

Space Heating:

- Delivered via electric storage heaters
- Operate at close to 100% efficiency at the point of use.
- Reduce overheating risk, as heat is delivered directly where required without the residual heat associated with wet systems served by communal boilers, which can continue emitting heat long after demand has ceased.
- Provide straightforward, predictable operation with no reliance on pumps, pipework, or circulating hot water.

Domestic Hot Water (DHW):

- Supplied via an electric immersion heater within the water calorifier located inside each dwelling.
- Simple, robust technology with minimal servicing requirements and no refrigerants or external plant.
- Hot water is stored locally in an individual cylinder for each unit, ensuring systems are independent and not interconnected between dwellings.
- Performance is predictable and unaffected by external temperatures.

Installation Considerations:

- **Suitability:** This configuration is well-suited to high-density apartment buildings where outdoor space is limited, and heating loads are relatively low.
- **Energy Efficiency:** Can be paired with energy-demand reduction technologies (e.g., smart controls, photovoltaic systems, or battery storage) to optimise electricity use, particularly during off-peak periods for storage heaters.
- **Space planning:** makes efficient use of the building’s floor area and does not require a dedicated plant room or internal riser.
- **Electrical Load Constraints:** Storage heaters typically charge during a fixed off-peak window, resulting in all units drawing power simultaneously. This lack of load diversification can create a concentrated electrical demand that may exceed the building’s available connection capacity and increase strain on the local network.

8.3.2 Operation and Maintenance

Sophisticated heating controls including appliance programmer and appliance thermostats will ensure the efficient delivery of heat from electric panel heaters to further reduce the dwellings’ energy demand.

Maintenance considerations for electric storage heaters and electric immersion units are minimal, as these technologies require little more than basic user checks and occasional component replacement. Maintenance arrangements can be integrated into any management model, whether council-led, build-to-rent, owner-occupier, or third-party providers. Although the chosen approach will depend on the final management structure of the development. Replacement components for storage heaters and immersion units are generally widely available, so supply-chain risk is assessed as low to medium, subject to normal market fluctuations and manufacturer availability.



Table 8.3 – Estimated Running Cost

Estimated heating demand (Space & Water) kWh/year	Standing Charge £/year	Day rate cost £/year	Estimated running Cost £/year/typical apartment
1507.80	195.93	361.09	557.02

8.3.3 Carbon Emissions

This option is considered fossil-fuel-free as it is fully electric, resulting in no local pollution at the point of use. Unlike gas boilers, which burn fossil fuels within the dwelling, producing local emissions. Furthermore, as the UK electricity grid's CO₂ footprint continues to improve, so too would the carbon dioxide emissions associated with the operational phase of the proposed scheme, which benefits from highly efficient systems.

The delivered heat carbon content of the direct electric heating strategy is specified below:

Direct Electric heating:

- Efficiency of system 100% (SCOP of 1.0)
- Carbon content of delivered heat: 177 gCO₂/kWh

8.4 Option 3: Communal Heat Pump

8.4.1 Overview

Space heating and domestic hot water (DHW) are provided via a roof mounted communal air source heat system. This setup is “full electric” and therefore fossil fuel free.

Space Heating and Domestic Hot Water (DHW):

- Supplied via a communal air-source heat pump (ASHP) system.
- The ASHP extracts heat from the outdoor air and upgrades it to provide low-temperature water, which is distributed via a heat loop to heat interface units (HIUs) within each apartment, providing both space heating and DHW.
- Centralised heat generation allows coordinated management of overall building energy demand, but local control is limited to the HIU settings.
- Efficiency is high at the plant level, but pipework can lead to significant distribution losses.
- Each HIU provides space heating and instantaneous hot water to the dwelling.
- Delivery is effective, though response times can be slower than fully independent systems due to distribution lag and thermal inertia in the communal network.

Installation Considerations:

- **Plant Space:** Requires a central plant room to house the communal heat pump, buffer tanks, pumps, and controls.
- **Infrastructure:** Demands well-insulated pipework and risers throughout the building to deliver heat efficiently to each apartment.
- **Energy Efficiency:** Can integrate with demand management technologies and renewable generation; however, heat storage in the network may reduce responsiveness to dynamic control.
- **Overheating Risk:** The combination of stored heat in communal pipework and limited local modulation through HIUs increases the potential for apartments to overheat, particularly in low-load periods



8.4.2 Operation and Maintenance

Centralised plant controls and individual apartment HIU thermostats, enabling local regulation of space heating and hot water. While centralised control allows optimisation of plant efficiency, the system carries less flexibility than independent electric heaters, and the stored heat in the network can increase the risk of overheating in dwellings, particularly during low-load periods.

Maintenance requirements for the communal heat pump are relatively low but more complex than individual electric heaters, as the central plant requires periodic inspections, pump servicing, and system checks. HIUs within apartments require minimal servicing, typically limited to annual checks and occasional component replacement. Supply chain availability for replacement components in the communal heat pump system is considered medium to high risk due to the complexity of the plant and specialised HIU components. Availability may vary depending on market conditions and manufacturer lead times at the time of procurement.

Table 8.4 – Estimated Running Cost

Estimated heating demand (Space & Water) kWh/year	Standing Charge £/year	Day rate cost £/year	Estimated running Cost £/year/typical apartment
390.83	195.93	93.29	289.22

8.4.3 Carbon Emissions

This option is considered fossil-fuel-free as it is fully electric, resulting in no local pollution at the point of use. Unlike gas boilers, which burn fossil fuels within the dwelling, producing local emissions. Furthermore, as the UK electricity grid's CO₂ footprint continues to improve, so too would the carbon dioxide emissions associated with the operational phase of the proposed scheme, which benefits from highly efficient systems.

A communal heat-pump system would typically employ a modern refrigerant in line with current industry practice, all of which are required to comply with the latest F-Gas Regulation standards and generally offer a much lower global warming potential than older refrigerants. Although the specific refrigerant cannot be identified at this stage, communal heat-pump systems typically use lower-GWP refrigerants that help to minimise embodied carbon impacts. Coupled with the relatively low carbon intensity of electricity, such systems are generally considered to provide an effective and robust low-carbon heating approach.

The carbon content of the communal heat pump heating strategy is specified below:

Communal Heating:

- Efficiency of system 350% with delivery efficiency of 95% (SCOP of 3.33)
- Carbon content of heat: 53.15 gCO₂/kWh

8.5 Option 4: Exhaust Air Heat Pump

8.5.1 Overview

Space heating and domestic hot water (DHW) are provided by the same local unit. This setup is “full electric” and therefore fossil fuel free.



Space Heating and Domestic Hot Water (DHW):

- Supplied via individual exhaust air heat pumps (EAHPs) installed in each apartment.
- Each EAHP extracts heat from the dwelling's exhaust air via a heat exchanger, upgrading low-grade energy to provide space heating and hot water efficiently.
- Space heating is delivered via low-temperature radiators or underfloor heating connected to the EAHP. Where exhaust air alone is insufficient, a direct electric top-up ensures demand is met.
- Heat delivery is on-demand and modulated, reducing the risk of overheating compared with centralised wet systems, which may continue to radiate heat after demand has ceased.
- Hot water is stored locally in an individual tank for each dwelling, ensuring each apartment has independent DHW supply.
- High efficiencies are achievable, typically 250–300% COP, depending on usage patterns and internal/external conditions.
- The system is self-contained per apartment, with no interconnection between dwellings, providing flexible and responsive control for both space heating and DHW.

Installation Considerations:

- **Space Constraints:** EAHP units are quite large internal and need to be installed relatively close to an external wall
- **Single point of failure:** if the air outlets and/or filters are not maintained, both ventilation and heating system performance could be affected.
- **Higher ventilation rates:** The heat pump may require higher ventilation rates to operate efficiently, which could necessitate several ducts and facade penetrations, fans, or overall ventilation capacity to meet the system's heating and hot water demands.

8.5.2 Operation and Maintenance

Advanced heating controls such as integrated heat-pump programmers, weather-compensated flow regulation, and room thermostats optimise the performance of exhaust air heat pumps to ensure efficient recovery and utilisation of warm, extract air. These controls help to maximise heat-pump efficiency, maintain stable indoor comfort levels, and reduce the overall energy demand of the dwelling.

Maintenance requirements for exhaust air heat pumps are relatively modest, typically involving annual inspections to assess refrigerant integrity, ventilation airflow rates, filter cleanliness, and general unit performance. Routine filter replacement is essential to maintain ventilation efficiency and protect the heat-pump components. Maintenance responsibilities can be incorporated into a variety of management structures, including local authority housing, build-to-rent portfolios, owner-occupied homes, or arrangements with specialist third-party maintenance suppliers. The precise model adopted will depend on the operational strategy and long-term management approach of the development. Supply chain resilience for EAHP units and key components such as fans, filters, and compressor parts is generally considered medium risk due to the still-maturing UK and European market. Availability may vary with manufacturer lead times and wider market conditions, so procurement should be monitored throughout design and delivery.

Table 8.5 – Estimated running cost for electric panel heaters & hot water heat pump

Estimated heating demand (Space & Water) kWh/year	Standing Charge £/year	Day rate cost £/year	Estimated running Cost £/year/typical apartment
469.28	195.93	110.67	306.60



8.5.3 Carbon Emissions

This option is considered fossil-fuel-free as it is fully electric, resulting in no local pollution at the point of use. Unlike gas boilers, which burn fossil fuels within the dwelling, producing local emissions. Furthermore, as the UK electricity grid's CO₂ footprint continues to improve, so too would the carbon dioxide emissions associated with the operational phase of the proposed scheme, which benefits from highly efficient systems.

Exhaust air heat pumps typically utilise refrigerants that align with current industry standards, all of which must comply with the latest F-Gas Regulation requirements and generally exhibit significantly lower global warming potential than older refrigerant types. Although the exact refrigerant cannot be confirmed at this stage, exhaust air heat pumps are commonly designed to operate with lower-GWP refrigerants, resulting in only a limited embodied carbon impact. When paired with the relatively low carbon intensity of electricity, exhaust air heat-pump systems are regarded as an effective and robust low-carbon solution for providing space heating and hot water.

The carbon content of the exhaust air heat pump heating strategy is specified below:

Heat pump space heating:

- Efficiency of system 250% (SCOP of 2.50)
- Carbon content of heat: 70.8 gCO₂/kWh

Heat pump water heating:

- Efficiency of system 300% (SCOP of 3.00)
- Carbon content of heat: 59 gCO₂/kWh

Weighted average of Carbon content:

- Space heating is 49% of heating demand
- Water heating is 51% of heating demand
- Carbon content of the proposed system is 64.78 gCO₂/kWh

8.6 Viability of Heating Strategy Options

Tables 8.6 & 8.7 below demonstrate a comprehensive comparison of the considered heating options. The results show how each option performs in terms of carbon emissions, running costs, maintenance considerations, and overall capital investment, providing a clear rationale for selecting the preferred system.

Table 8.6 – Summary of Key Performance Indicators

KPI	Direct electric & heat pump	Direct electric	Communal heat pump	EAHP (Benchmark)
Carbon Content of Delivered Heat (gCO ₂ /kWh)	142.5	177	53.15	64.78
Annual Running Cost (£/year/apartment)	£414.16	£593.24	£298.92	£319.59
Annual Maintenance Cost	Minimal	Minimal	Minimal	Minimal
Annual Replacement (£/year/apartment)	£208.50	£287.33	£480.00	£400.00
Capital Cost (£/Building)	£1,282,610	£429,210	£3,012,000	£2,510,000
Relative to Benchmark (capital cost as %)	-95.7%	-484.8%	+16.7%	Benchmark (0%)



Table 8.7 – Viability Assessment Summary

Criterion	Direct Electric & DHW Heat Pump	Direct Electric	Communal Heat Pump	EAHP (Benchmark)	Notes
Carbon Performance vs Benchmark	Moderate	Poor	Best	Good	Communal heat pump performs best but very high upfront CAPEX cost
Resident Running Cost	Low	Highest	Very Low	Low	Proposed option balances operational cost & performance
Maintenance requirements	Minimal	Minimal	Minimal	Minimal	Communal system requires specialist servicing
Replacement Costs	Moderate	Moderate	Highest	High	EAHP has more complex components
Upfront Cost	Low	Lowest	Very High	High	Communal heat pumps require large plantrooms & infrastructure
Cost-benefit analysis	Strong	Weak	Weak	Moderate	Proposed option balances operational cost & performance
Overall Viability	High (recommended)	Low	Low	Medium	Proposed option provides best combined outcome

The tables above demonstrate that the **proposed system offers the most balanced solution, combining low capital cost, competitive running costs, minimal maintenance, and acceptable carbon performance.**

While communal and EAHP systems achieve lower operational carbon dioxide emissions, their significantly higher capital cost and operational complexity reduce overall scheme viability. Direct electric systems offer low capital cost but perform poorly for residents and in carbon terms.

On balance, the proposed energy strategy (hot water heat pump allied to electric panel space heating) provides the most feasible and cost-effective outcome for the development.



9. OVERHEATING RISK

9.1 Overheating Risk Assessment

An overheating analysis has been undertaken for this apartment block containing two-hundred and fifty-one apartments, covering six representative floorplates in accordance with Building Regulations Approved Document O: Overheating and CIBSE TM59: Design Methodology for the Assessment of Overheating Risk in Homes. The dynamic thermal modelling method for demonstrating compliance with requirement O1 has been followed as stipulated within the Places for Everyone guidance and Approved Document O.

Design Builder v7.2.0.032 Dynamic Simulation Modelling (DSM) Software has been used to assess the overheating risk, using the internationally approved Energy Plus Simulation Engine and the following guidance has been followed:

- CIBSE's TM59 methodology for predicting overheating risk;
- The limits on the use of CIBSE's TM59 methodology; and,
- The acceptable strategies for reducing overheating risk.

The following floorplates have been assessed, incorporating multiple apartments of differing design, opening restrictions and orientations:

- Ground floor
- First Floor
- Second Floor
- Fourteenth Floor
- Fifteenth Floor
- Sixteenth Floor
- Twenty-third floor

9.2 Data Inputs and Building Model

Table 9.1 below summarises the building fabric specification which has been applied to the thermal simulation model for the dwellings. This specification is based on the fabric performance figures agreed with the design team and includes the solar transmission g-value of the glazing, which is fundamental to the results.

Table 9.1 – Thermal Fabric Performance Levels

Building Element	U-Value (W/m ² K)
Walls (external)	0.17
Ground Floor	0.12
Roof	0.12
Glazing (Standard)	1.20 (g-value of 0.42)
Air Permeability m ³ /hm ² (@50Pa.)	3.00



The application site is situated at the junction between Fernie Street and Lord Street in Cheetham Hill, Manchester. The proposed development consists of a residential tower providing two-hundred and fifty-one apartments.

The weather data used in this study is **the CIBSE DSY1 2020's, high emissions 50th percentile for Manchester** as this is the most applicable to the site.

The key floorplates that have been assessed are highlighted in Figures 9.1 & 9.2 below. These have been selected as they align with the predictive energy appraisal and provide a robust representation of the entire scheme in terms of apartment size, exposure, orientation, and location within the building.

Figure 9.1 – North & East Elevations

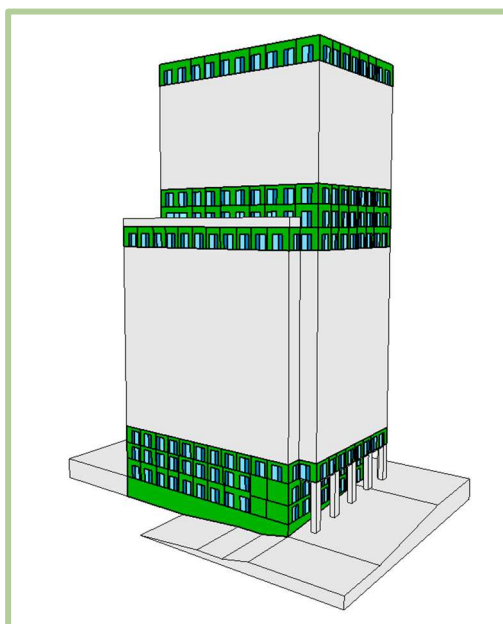
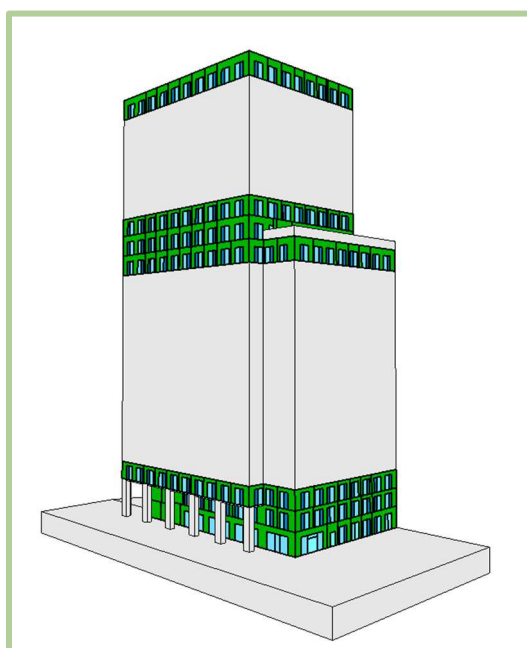


Figure 9.2 – South & West Elevations



9.3 Ventilation Strategy

The dwellings will be ventilated using Mechanical Ventilation with Heat Recovery (MVHR). MVHR is a whole-house ventilation system that continuously supplies fresh, filtered air to living spaces while extracting stale, moisture-laden air from wet rooms such as kitchens and bathrooms. MVHR is recognised as a low-energy ventilation solution suitable for the Future Homes Standard, as its balanced system configuration supports the specification of low-air-permeability dwellings.

Additionally, the apartments will be equipped with openable purge vents. In accordance with Building regulation Part O and Manchester City Council's Acoustic Ventilation Overheating (AVO) guidance, the following restrictions have been applied to these vents:

Table 9.2 – Opening Restrictions

Room Reference	Part O Nighttime Opening (23:00-07:00)	MCC AVO Guidance (07:00-23:00)
Bedroom Levels 0-2	Not Openable	Limited to 12.5hr per day
Living / kitchen Levels 0-2	Openable (No limitation on opening)	Limited to 12.5hr per day
Bedroom Levels 3+	Not openable (exception of terrace floors)	Openable (No limitation on opening)
Living / kitchen Levels 3+	Openable (No limitation on opening)	Openable (No limitation on opening)

9.4 TM59 Results

This assessment has determined the thermal comfort performance of occupied areas against the performance requirements of CIBSE TM59 for predominantly naturally ventilated homes. The results obtained from the Part O assessment of overheating risk can be seen in Table 9.3. below:

Table 9.3 – Results

Level	Reference	Zone	Criterion A (%)	Criterion B (hr)	Pass/Fail
Level 00 - Ground Floor	TH Type A (2B3P)	LIVING/KITCHEN	0.00	n/a	Pass
	TH Type B	LIVING/KITCHEN	0.00	n/a	Pass
	TH Type A (2B4P)	LIVING/KITCHEN	0.00	n/a	Pass
	1B2P Type G	BEDROOM	0.00	11.50	Pass
		LIVING/KITCHEN	0.00	n/a	Pass
	2B3P Type B	BEDROOM 1	0.49	31.83	Pass
		BEDROOM 2	0.99	31.67	Pass
		LIVING/KITCHEN	1.82	n/a	Pass
	2B3P Type A	BEDROOM 1	0.00	21.33	Pass
		BEDROOM 2	0.31	20.50	Pass
		LIVING/KITCHEN	0.11	n/a	Pass
	2B3P Type B	BEDROOM 1	0.31	25.17	Pass
		BEDROOM 2	0.40	23.83	Pass
		LIVING/KITCHEN	1.02	n/a	Pass



Level	Reference	Zone	Criterion A (%)	Criterion B (hr)	Pass/Fail
Level 01 - First Floor	TH Type A (2B3P)	BEDROOM 1	0.00	1.33	Pass
		BEDROOM 2	0.00	1.67	Pass
	TH Type B	BEDROOM 1	0.00	5.67	Pass
		BEDROOM 2	0.00	5.17	Pass
	TH Type A (2B4P)	BEDROOM 1	0.00	1.33	Pass
		BEDROOM 2	0.00	0.67	Pass
	2B3P Type C	BEDROOM1	0.70	21.00	Pass
		LIVING/KITCHEN	0.45	n/a	Pass
	2B3P Type C	BEDROOM1	0.00	8.17	Pass
		BEDROOM2	0.05	19.00	Pass
		LIVING/KITCHEN	0.00	n/a	Pass
	1B2P Type B	BEDROOM	0.12	14.67	Pass
		LIVING/KITCHEN	0.24	n/a	Pass
	2B3P Type G	BEDROOM 1	0.12	28.33	Pass
		BEDROOM 2	0.32	29.00	Pass
		LIVING/KITCHEN	0.60	n/a	Pass
	2B4P Type C	BEDROOM 1	0.36	27.00	Pass
		BEDROOM 2	0.60	18.83	Pass
		LIVING/KITCHEN	0.17	n/a	Pass
	2B3P Type A	BEDROOM 1	0.00	18.67	Pass
		BEDROOM 2	0.05	19.00	Pass
		LIVING/KITCHEN	0.00	n/a	Pass
	2B4P Type B	BEDROOM 1	0.09	21.33	Pass
		BEDROOM 2	0.16	20.67	Pass
		LIVING/KITCHEN	0.45	n/a	Pass
Level 02 - Second Floor	1B2P Type D	BEDROOM	0.71	15.67	Pass
		LIVING/KITCHEN	0.05	n/a	Pass
	1B2P Type B	BEDROOM	0.00	5.00	Pass
		LIVING/KITCHEN	0.00	n/a	Pass
	1B2P Type C	BEDROOM	0.63	19.17	Pass
		LIVING/KITCHEN	0.23	n/a	Pass
	2B3P Type A	BEDROOM 1	0.42	20.50	Pass
		BEDROOM 2	1.15	21.33	Pass
		LIVING/KITCHEN	0.80	n/a	Pass
	2B3P Type B	BEDROOM 1	0.00	7.67	Pass
		BEDROOM 2	0.00	8.67	Pass
		LIVING/KITCHEN	0.00	n/a	Pass
	2B3P Type A	BEDROOM 1	0.00	23.83	Pass
		BEDROOM 2	0.00	20.83	Pass
		LIVING/KITCHEN	0.00	n/a	Pass
	2B4P Type B	BEDROOM 1	0.06	24.00	Pass
		BEDROOM 2	0.14	20.50	Pass
		LIVING/KITCHEN	0.33	n/a	Pass



Level	Reference	Zone	Criterion A (%)	Criterion B (hr)	Pass/Fail
Level 02 - Second Floor	2B4P Type C	BEDROOM 1	0.41	24.50	Pass
		BEDROOM 2	0.55	16.83	Pass
		LIVING/KITCHEN	0.15	n/a	Pass
	2B4P Type D1	BEDROOM 1	0.72	31.33	Pass
		BEDROOM 2	0.80	28.83	Pass
		LIVING/KITCHEN	0.70	n/a	Pass
	2B4P Type E	BEDROOM 1	0.05	7.50	Pass
		BEDROOM 2	0.00	12.83	Pass
		LIVING/KITCHEN	0.00	n/a	Pass
Level 14 - Fourteenth Floor	1B2P Type D	BEDROOM	0.22	8.83	Pass
		LIVING/KITCHEN	0.00	n/a	Pass
	1B2P Type B	BEDROOM	0.00	1.17	Pass
		LIVING/KITCHEN	0.00	n/a	Pass
	1B2P Type C	BEDROOM	0.46	14.17	Pass
		LIVING/KITCHEN	0.10	n/a	Pass
	2B3P Type A	BEDROOM 1	0.30	16.50	Pass
		BEDROOM 2	0.42	10.67	Pass
		LIVING/KITCHEN	0.22	n/a	Pass
	2B3P Type B	BEDROOM 1	0.00	0.50	Pass
		BEDROOM 2	0.00	1.00	Pass
		LIVING/KITCHEN	0.00	n/a	Pass
	2B4P Type A1	BEDROOM 1	0.00	12.33	Pass
		BEDROOM 2	0.00	11.00	Pass
		LIVING/KITCHEN	0.00	n/a	Pass
	2B4P Type B	BEDROOM 1	0.00	15.17	Pass
		BEDROOM 2	0.00	15.00	Pass
		LIVING/KITCHEN	0.03	n/a	Pass
	2B4P Type C	BEDROOM 1	0.28	20.67	Pass
		BEDROOM 2	0.40	14.33	Pass
		LIVING/KITCHEN	0.08	n/a	Pass
	2B4P Type D1	BEDROOM 1	0.25	18.00	Pass
		BEDROOM 2	0.35	14.50	Pass
		LIVING/KITCHEN	0.12	n/a	Pass
	2B4P Type E	BEDROOM	0.00	0.17	Pass
		LIVING/KITCHEN	0.00	10.17	Pass
		BEDROOM	0.00	n/a	Pass
Level 15 - Fifteenth Floor	1B2P Type D	BEDROOM	0.26	5.83	Pass
		LIVING/KITCHEN	0.00	n/a	Pass
	1B2P Type B	BEDROOM	0.00	1.50	Pass
		LIVING/KITCHEN	0.00	n/a	Pass
	1B2P Type E	BEDROOM	0.34	8.33	Pass
		LIVING/KITCHEN	0.65	n/a	Pass
	2B3P Type B	BEDROOM 1	0.00	1.17	Pass
		BEDROOM 2	0.00	1.50	Pass
		LIVING/KITCHEN	0.00	n/a	Pass



Level	Reference	Zone	Criterion A (%)	Criterion B (hr)	Pass/Fail
Level 15 - Fifteenth Floor	2B3P Type C	BEDROOM 1	0.00	0.33	Pass
		BEDROOM 2	0.00	3.33	Pass
		LIVING/KITCHEN	0.00	n/a	Pass
	2B3P Type D	BEDROOM 1	0.00	7.50	Pass
		BEDROOM 2	0.00	8.17	Pass
		LIVING/KITCHEN	0.00	n/a	Pass
	2B4P Type D2	BEDROOM 1	0.28	18.00	Pass
		BEDROOM 2	0.35	14.33	Pass
		LIVING/KITCHEN	0.12	n/a	Pass
Level 16 - Sixteenth Floor	1B2P Type F	BEDROOM	0.39	6.83	Pass
		LIVING/KITCHEN	0.00	n/a	Pass
	1B2P Type B	BEDROOM	0.00	1.67	Pass
		LIVING/KITCHEN	0.00	n/a	Pass
	2B3P Type B	BEDROOM 1	0.00	1.83	Pass
		BEDROOM 2	0.00	1.50	Pass
		LIVING/KITCHEN	0.00	n/a	Pass
	2B3P Type C	BEDROOM 1	0.00	1.33	Pass
		BEDROOM 2	0.00	5.83	Pass
		LIVING/KITCHEN	0.00	n/a	Pass
	2B3P Type D	BEDROOM 1	0.00	7.83	Pass
		BEDROOM 2	0.00	10.33	Pass
		LIVING/KITCHEN	0.00	n/a	Pass
	2B3P Type E	BEDROOM 1	0.43	14.67	Pass
		BEDROOM 2	0.66	13.83	Pass
		LIVING/KITCHEN	0.08	n/a	Pass
	2B3P Type F	BEDROOM 1	0.39	16.17	Pass
		BEDROOM 2	0.64	15.50	Pass
		LIVING/KITCHEN	0.90	n/a	Pass
	2B4P Type D2	BEDROOM 1	0.39	20.17	Pass
		BEDROOM 2	0.44	15.67	Pass
		LIVING/KITCHEN	0.18	n/a	Pass
Level 23 - Twenty-third Floor	1B2P Type F	BEDROOM	0.49	18.33	Pass
		LIVING/KITCHEN	0.05	n/a	Pass
	1B2P Type B	BEDROOM	0.00	7.00	Pass
		LIVING/KITCHEN	0.00	n/a	Pass
	2B3P Type B	BEDROOM 1	0.00	8.83	Pass
		BEDROOM 2	0.00	7.50	Pass
		LIVING/KITCHEN	0.00	n/a	Pass
	2B3P Type C	BEDROOM 1	0.00	4.17	Pass
		BEDROOM 2	0.00	12.50	Pass
		LIVING/KITCHEN	0.08	n/a	Pass
	2B3P Type D	BEDROOM 1	0.00	14.17	Pass
		BEDROOM 2	0.14	14.17	Pass
		LIVING/KITCHEN	0.07	n/a	Pass



Level	Reference	Zone	Criterion A (%)	Criterion B (hr)	Pass/Fail
Level 23 - Twenty-third Floor	2B3P Type E	BEDROOM 1	0.43	21.17	Pass
		BEDROOM 2	0.52	15.33	Pass
		LIVING/KITCHEN	0.08	n/a	Pass
	2B3P Type F	BEDROOM 1	0.43	29.67	Pass
		BEDROOM 2	0.70	30.17	Pass
		LIVING/KITCHEN	0.96	n/a	Pass
	2B4P Type D2	BEDROOM 1	0.41	30.67	Pass
		BEDROOM 2	0.49	31.50	Pass
		LIVING/KITCHEN	0.17	n/a	Pass

Overheating Mitigation Strategy

- The g-value for the apartments is **0.42**.
- MVHR to achieve the flowrates set out below:
 - 1 Bed apartments
 - Bedroom: 40 l/s
 - Living/Kitchen: 30 l/s
 - Level 00 2B3P Type B
 - Bedroom 1: 33 l/s
 - Bedroom 2: 17 l/s
 - Living/Kitchen: 20 l/s
 - Level 02 2B4P Type D1
 - Bedroom 1: 27 l/s
 - Bedroom 2: 23 l/s
 - Living/Kitchen: 20 l/s
 - Level 23 2B4P Type D2
 - Bedroom 1: 30 l/s
 - Bedroom 2: 20 l/s
 - Living/Kitchen: 20 l/s
 - All other 2 Bed apartments and Townhouses
 - Bedroom 1: 25 l/s
 - Bedroom 2: 25 l/s
 - Living/Kitchen: 20 l/s

The results above indicate that all assessed building areas achieve a 'pass' rating when a g-value of 0.42 is applied across all plots. Additionally, MVHR has been confirmed to achieve the flow rates specified above.

With these measures in place, the dwellings are considered **compliant with CIBSE TM59**.

To Note:

Enhanced mechanical ventilation will be prioritised as the primary mitigation measure. However, where site-specific constraints make this solution impracticable, peak-logging cooling units will be used as the alternative approach.



10. MATERIALS

10.1 Whole Life Cycle Assessment & Upfront Embodied Carbon

An LCA has been prepared to show compliance with Greater Manchester Combined Authority 'Places for Everyone' (PfE) Design Guidance for Net Zero requirements. This assessment aims to show compliance with the net zero design and carbon reporting requirements set out in the 2025 guidance.

The purpose of this assessment is to assess the whole life carbon impact of the proposed scheme, in line with the Royal Institute of Chartered Surveyors (RICS) Professional Statement 2nd Edition (incorporating all life cycle modules), and to separately report on the upfront embodied carbon (lifecycle modules A1–A5), whole life cycle carbon (lifecycle modules A-C, excluding B6, B7 and D), and life cycle module D.

The Places for Everyone guidance outlines various metrics and key performance indicators (KPIs). These are used to measure success of Net Zero Carbon design and construction to provide an indication of how design decisions have influenced the carbon performance of the building.

Below are the upfront embodied carbon ($\text{kgCO}_2\text{e}/\text{m}^2$) targets outlined for residential developments in section 2: Energy and Carbon requirements of the Design Guidance for Net Zero, Places for Everyone policies.

Table 10.1 – Places for Everyone, Upfront Embodied Carbon Targets

	Minor development		Major development	
	Small minor Single home and XL extensions	Minor 2-9 homes	Major 10-149 homes	Large major +150 homes
Upfront embodied carbon ($\text{kgCO}_2\text{e}/\text{m}^2_{\text{GFA}}$) Minimise embodied carbon				

As the proposed One Lord Scheme has 251 dwellings it is classified as a 'Large Major' development under PfE and therefore has the upfront embodied carbon target of $\leq 600 \text{ kgCO}_2\text{e}/\text{m}^2$. Which as shown in Table 10.1 the One Lord Street development improves upon with a total of $593.69 \text{ kgCO}_2/\text{m}^2$.

The purpose of the Life Cycle Assessment is to quantify the environmental impacts of the proposed One Lord Street scheme in accordance with the methodology expressed within the RICS Professional Statement – 2nd Edition (2021), and to benchmark the results against the PfE Design Guidance for Net Zero targets.



The total global warming potential for the scheme has been calculated as follows:

Table 10.2 – Results Summary

	Total – kgCO ₂ e	kgCO ₂ e/m ²
Upfront Carbon	15,420,604.25	593.69
Whole Life Carbon Assessment	20,601,528.04	699

	Targets	
	PfE Benchmark - kgCO ₂ e/m ²	One Lord Street - kgCO ₂ e/m ²
Upfront	<600 (Residential Major Developments Targets)	593.69
Whole life	n/a	699

Table 10.3– Top Three Materials with Highest Embodied Carbon

	Upfront embodied carbon (kgCO ₂ e/m ² GIA)	≤500-600
Minimise embodied carbon	Material 1: Ready-mix concrete, normal-strength, generic, C40/50	143.96kg CO ₂ e/m ²
	Material 2: Precast hollow core concrete flooring	81.89kg CO ₂ e/m ²
	Material 3: Aluminium metal ceiling system	44.81kg CO ₂ e/m ²

Table 10.3 shows the top three materials with the highest upfront embodied carbon emissions (kgCO₂e/m²GIA) being: Ready-mix concrete, normal-strength, generic, C40/50, Precast hollow core concrete flooring, and Aluminium metal ceiling system which together contribute to around 54.5% of the cradle to gate (A1-A3) CO₂e.

When compared to the targets stipulated within Places for Everyone Design Guidance for Net Zero (March 2025), it is evident that **the One Lord Street scheme improves upon the Places for Everyone Residential Major Development: Flats target for upfront embodied carbon.**

10.2 Efforts Made to Minimise Embodied Carbon

The proposals will contribute towards making more efficient use of non-renewable materials resources, and to reducing the lifecycle impact of materials used in construction. This is demonstrated by:

- A key consideration in materials selection will their environmental performance, alongside commercials and aesthetics. Indirect carbon emissions will therefore be taken into account, including those involved in the extraction/cultivation, manufacture and handling processes; and subsequent, in-life emissions resulting from the use of those materials in development;



- Materials with a low environmental impact throughout their life cycle will be prioritised within the new buildings. Plus, materials with associated Environmental Performance Declarations (EPD's) will be favoured;
- Responsibly sourced materials from suppliers operating an Environmental Management System and procuring timber verified by either the Forest Stewardship Council (FSC) or Programme for the Endorsement of Forest Certification standard (PEFC) will be prioritised;
- Material selection will be carefully considered to avoid the use of toxic materials, such as Volatile Organic Compounds (VOCs) and contribute towards creating a healthy indoor environment; and,
- Local sourcing of construction materials where feasible and viable will minimise the impact of carbon dioxide emissions associated with the transportation of materials.

Linear Living undertake to ensure the following measures are implemented at this site:

- Recycle materials on site from demolition removal of hardstandings;
- Use crushed recycled materials as standard for areas such as bases for hardstandings, beneath roads etc.;
- All labour is sourced from within the northwest, therefore reducing journeys;
- Wherever feasible all materials are sourced locally;
- Materials and plant / fixtures and fittings are selected for longevity; and,
- Site Waste is segregated at source to facilitate recycling.

