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CONSULTING ENGINEERS

Mechanical, Electrical & Energy Consultants

Energy and Carbon Statement

The Trilogy, Manchester

MARCH 2026

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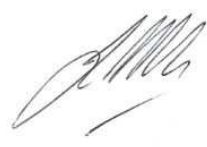
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1. EXECUTIVE SUMMARY

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 Ellesmere Street and Chester Road on the South-western fringe of the St George's area of Manchester City Centre. Currently, the site is occupied by three Build-to-Rent (BrT) apartment blocks comprising two hundred and thirty homes with a mix of one, two and three-bedroom layouts. The proposed development aims to expand the existing amenity provision at the ground and first floor levels of The Trilogy. This increased amenity provision has resulted in the loss of ground-floor apartments. A roof extension at The Trilogy is therefore proposed to provide an additional storey accommodating eight new apartments. Alongside the amenity area, four dwelling types have been chosen based on key design variations to provide a robust representative sample for this energy and carbon appraisal:

- Ninth floor, 1 Bed North facing Corner apartment, c.50m² floor area
- Ninth floor, 1 Bed South facing Mid apartment, c.49m² floor area
- Ninth floor, 2 Bed North facing Mid apartment, c.64m² floor area
- Ninth floor, 2 Bed South facing Corner apartment, c.68m² 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 buildings proposed for the scheme is as follows:

- The proposed additional floor will consist of mid and corner apartments

The calculated form factors for the apartments and amenity area have been calculated as follows:

- Ninth floor, 1 Bed North facing Corner apartment: 1.7
- Ninth floor, 1 Bed South facing Mid apartment: 1.3
- Ninth floor, 2 Bed North facing Mid apartment: 1.4
- Ninth floor, 2 Bed South facing Corner apartment: 1.6
- Amenity Extension: 1.7

The proposed material specification to be incorporated within the scheme will limit heat loss and ensure efficient operation of the houses. Allied to this, both the apartments and amenity area 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 amenity area and 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 calculated space heating and cooling demand for the amenity area and the space heating demand for the representative dwelling types are set out below:

- Ninth floor, 1 Bed North facing Corner apartment = 17.19 kWh/m²/year
- Ninth floor, 1 Bed South facing Mid apartment = 4.07 kWh/m²/year
- Ninth floor, 2 Bed North facing Mid apartment = 10.07 kWh/m²/year
- Ninth floor, 2 Bed South facing Corner apartment = 10.57 kWh/m²/year

- Average dwelling space heating demand = **10.48 kWh/m²/year**

- Amenity area space heating demand = **7.77 kWh/m²/year**
- Amenity area space cooling demand = **14.83 kWh/m²/year**

Both regulated + unregulated energy demand have been assessed for the purposes of the Energy Use Intensity (EUI) calculation. The EUI for the dwellings and amenity area has been calculated, as follows:

- Ninth floor, 1 Bed North facing Corner apartment = 41.77 kWh/m²/year
- Ninth floor, 1 Bed South facing Mid apartment = 28.46 kWh/m²/year
- Ninth floor, 2 Bed North facing Mid apartment = 31.33 kWh/m²/year
- Ninth floor, 2 Bed South facing Corner apartment = 31.05 kWh/m²/year

- Average dwelling Energy Usage Intensity = **33.15 kWh/m²/year**

- Amenity area Energy Usage Intensity = **52.52 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.

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

	Solar PV
Rooftop Extension Floor Area (m ²)	530
Proposed PV Area (m ²)	212
PV Footprint area (% of Ground floor space)	40%

The scheme will be fossil fuel free.

The proposed residential specification is as follows:

- Domestic hot water will be served via a Hot Water Heat Pump (Modutherm Juniper HP Plus/200L) providing hot water very efficiently to the dwellings within the scheme. This system operates with a Coefficient of Performance (COP) of up to 409% efficiency.
- Space heating is to be provided by 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 proposed non-residential specification is as follows:

- Domestic hot water will be served via electric instantaneous point of use water heaters.
- Space heating and cooling to the amenity areas will be provided by a high-efficiency Variable Refrigerant Flow (VRF) system. The system allows independent temperature control to different rooms to meet varying demand requirements. The proposed system has a COP of 4.3 and a Seasonal Energy Efficiency Ratio (SEER) of 6.4, demonstrating a high level of operational efficiency.

An overheating analysis has been carried out to identify the risk of overheating within the development.

- 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 $g=0.45$.
 - MVHR to provide fresh air to apartments, detailed flow rates are specified in Chapter 9 of this report.
- The building’s amenity areas have been assessed for overheating using the CIBSE TM52 methodology. Further details are provided in Chapter 10.

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 (RESIDENTIAL)

Figure 2.1 – Energy and Carbon Proforma (Residential)¹

Energy and Carbon Proforma Residential

Minor development (2-9 homes)
Version 1.0

Project Name: Ellesmere House, Trilogy
Application ref: TBC
Date: 27.02.2026

GMCA

GREATER
MANCHESTER
COMBINED
AUTHORITY

		Ref. name	Rooftop Extension
		No. dwellings	8
		Area (m ² GIA)	530
		Target values	Building 1
Minimise energy demand	Space heating demand (kWh/m²GIA/yr)	≤ 15 (flats) - 20 (houses)	10.48
	Calculation methodology used to calculate space heating demand and confirmation that this covers all homes/blocks	Predictive energy model	representative TM54 calcs
	Form factor per building	≤ 2	1.5
	Average external wall U-value (W/m ² K)	≤ 0.15	0.16
	Average window U-value (W/m ² K)	≤ 1 (triple)	1.2
	Air permeability rate (m ³ /h/m ² @ 50 Pa)	≤ 1	4
Maximise energy efficiency	Energy use intensity (kWh/m²GIA/yr)	≤ 35	33.15
	Calculation methodology used to calculate energy use intensity and confirmation that this covers all homes/blocks	Predictive energy model	representative TM54 calcs
Use renewable energy	PV footprint area (% of ground floor space)	≥ 40	40%
	Annual renewable energy generation (kWh/m ² building footprint/yr)	-	43.85
	Renewable energy balance (%)	-	135.1
	Total energy used (kWh/yr)	-	1897.5
	Total energy generated on-site (kWh/yr)	-	2529.93
Use low carbon energy	Fossil fuel free (yes/no)	Yes	Yes
	Heat source - Where the system for generating space heating and hot water is a heat pump and it achieves a SCOP of 3.5 or higher (then a Low Carbon Heat Appraisal not required)	Electric	Electric
Reduce overheating risk	Have Part O overheating requirements been met without the use of mechanical cooling?	Yes	Yes
Minimise embodied carbon	Confirmation that a summary of the efforts made to design a lean, low carbon structure and building design has been submitted?	Yes	Yes

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

- 2m² panels produce 500 watts
- 1 kWp of PV generates on average 438.5 kWh, based on SAP10 for unshaded panels.
- The PV generation has been calculated at the apartment level and then the average was used.

3. ENERGY AND CARBON PROFORMA (NON-RESIDENTIAL)

Figure 3.1 – Energy and Carbon Proforma (Non-residential)

Energy and Carbon Proforma Non-residential		GMCA GREATER MANCHESTER COMBINED AUTHORITY	
Minor development (100-999m ²) Version 1.0			
Project Name: Ellesmere House, Trilogy			
Application ref: TBC			
Date: 27.02.2026			
		Ref. name	Amenity Extension
		Area (m ² GIA)	780
		Target values	Building 1
Minimise energy demand	Space heating demand (kWh/m ² GIA/yr)	≤ 15	7.77
	Space cooling demand (kWh/m ² GIA/yr)	≤ 15	14.83
	Calculation methodology used to calculate space heating demand and confirmation that this covers all homes/blocks	Predictive energy model	TM54 calc
	Form factor per building	≤ 2	1.7
	Average external wall U-value (W/m ² K)	≤ 0.15	0.15
	Average window U-value (W/m ² K)	≤ 1 (triple)	1.2
	Air permeability rate (m ³ /h/m ² @ 50 Pa)	≤ 1	4
Maximise energy efficiency	BREEAM Ene 01 rating	Excellent	n/a
	Energy use intensity (kWh/m ² GIA/yr)	-	52.52
	Calculation methodology used to calculate energy use intensity and confirmation that this covers all homes/blocks	Predictive energy model	TM54 calc
Use renewable energy	PV footprint area (% of ground floor space)	-	0
	Annual renewable energy generation (kWh/m ² building footprint/yr)	-	-
	Renewable energy balance (%)	-	-
	Total energy used (kWh/yr)	-	-
	Total energy generated on-site (kWh/yr)	-	-
Use low carbon energy	Fossil fuel free (yes/no)	Yes	Yes
	Heat source - Where the system for generating space heating and hot water is a heat pump and it achieves a SCOP of 3.5 or higher (then a Low Carbon Heat Appraisal not required)	Electric	Electric
Reduce overheating risk	Has CIBSE TM52 been used to calculate overheating and does the building pass?	Yes	Yes
	What percentage of spaces are cooled? (% of GIA)	-	69%
Minimise embodied carbon	Confirmation that a summary of the efforts made to design a lean, low carbon structure and building design has been submitted?	Yes	Yes



4. INTRODUCTION

Beechfield Consulting Engineers have been commissioned by Quartz to review the sustainability and energy performance of the proposed residential development and amenity extension to The Trilogy, which forms part of the Trilogy apartment complex 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 meets the criteria outlined by the council that the developer commits to implement at the site.

5. DEVELOPMENT PROPOSALS

5.1 Development Site Description

The site is situated at the junction between Ellesmere Street and Chester Road on the south-western fringe of the St George's area of Manchester City Centre. Currently, the site is occupied by three Build-to-Rent (BtR) apartment blocks comprising two hundred and thirty-two homes with a mix of one, two and three-bedroom layouts.

The existing building includes a basement level with car parking spaces, a secure cycle store and two designated bin stores. Resident amenities are present on the ground floor, including a reception, communal lounge, gym and parcel/letter box area.

The area surrounding the site is occupied by a mix of commercial and residential buildings.

Figure 2.1 – Site Location Plan



5.2 Development Proposals

The proposed development aims to expand the existing amenity provision at the ground floor and first floor levels of The Trilogy. The ground floor will be reconfigured to incorporate a new reception area, co-working space, gym, postal room, and staff office. At the first-floor level, a new amenity suite is proposed, featuring a private dining room and a terrace above the ground-floor extension. Due to the loss of apartments from this increased amenity provision, a roof extension is proposed on Block A of The Trilogy to provide an additional floor to accommodate 8no. new apartments.

Figures 2.2 to 2.8 present the proposed elevations and floor plans for the development:

Figure 2.2 – Proposed Ground Floor Layout

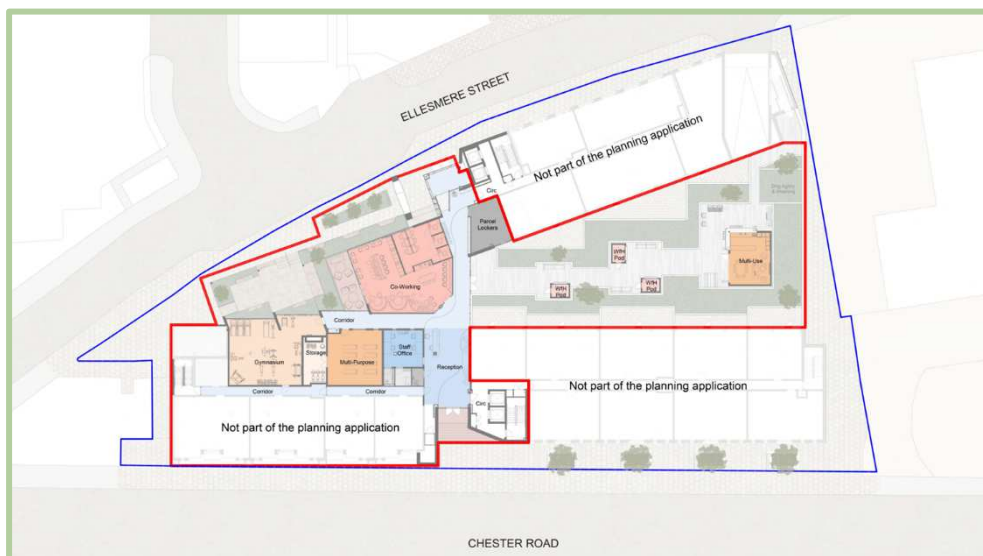


Figure 2.3 – Proposed First Floor Layout



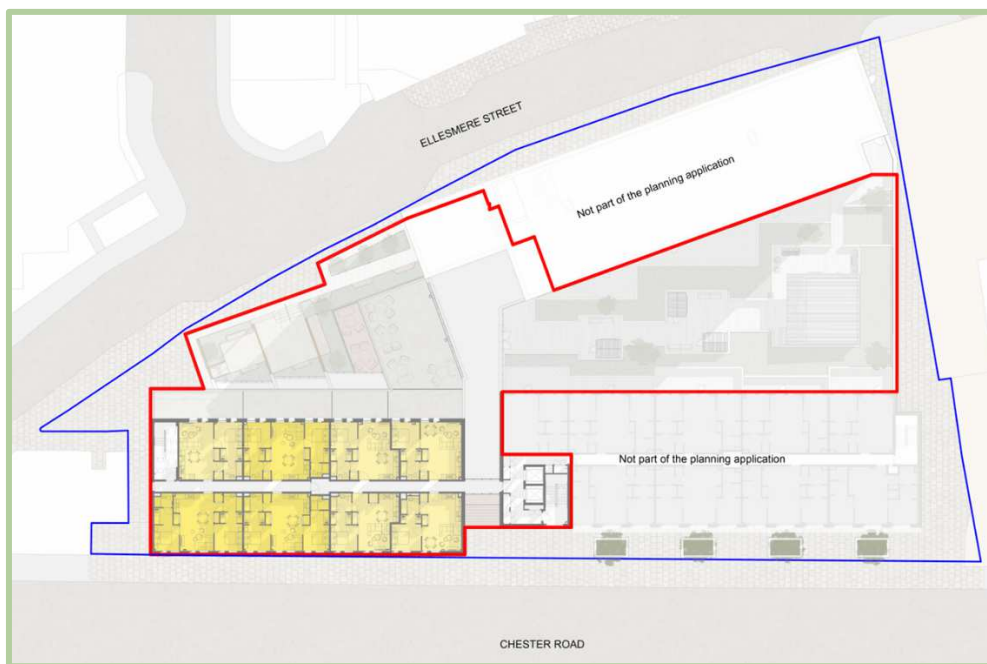
Figure 2.4 – Proposed Ninth Floor Layout*Figure 2.5 – Proposed Western Elevation*

Figure 2.6 – Proposed Eastern Elevation*Figure 2.7 – Proposed Northern Elevation*

Figure 2.8 – Proposed Southern Elevation



6. POLICY REVIEW

6.1 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.

6.2 Local Planning Policy

6.2.1 Manchester Core Strategy

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 – Adaptation 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.

6.2.2 PFE - Addendum to Manchester Core Strategy

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

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.

6.3 Regional Planning Policy

6.3.1 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 stepping stones 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.

6.4 Manchester's Great Outdoors

The Green and Blue Infrastructure Strategy for Manchester aims to invest in the city's green and blue infrastructure over the next ten years (by 2025). Four objectives have been established to enable the vision to be achieved:

1. Improve the quality and function of existing green and blue Infrastructure, to maximise the benefits it delivers.
2. Use appropriate green and blue infrastructure as a key component of new developments to help create successful neighbourhoods and support the city's growth.
3. Improve connectivity and accessibility to green and blue infrastructure within the city and beyond.

4. Improve and promote a wider understanding and awareness of the benefits that green and blue infrastructure provides to residents, the economy and the local environment.

6.5 Climate Emergency

On 10th July 2019, a motion asking Manchester City Council (MCC) to formally declare a **climate emergency** was unanimously agreed. The motion declares that climate change is a serious risk to Manchester's future. Manchester is committed to embedding the issue as an integral part of council decision-making – making sure that all key decisions are taken with the city's target of becoming zero-carbon by 2038 in mind. The council has agreed the following:

- To deliver the 2038 zero carbon target and determine if an earlier target can be possible;
- Make climate breakdown and the environment an integral part of activity throughout the council, including all decision making, ensuring key decisions take into account the impact on achieving the zero-carbon target;
- Investigate and introduce measures to help reach domestic zero carbon levels, including addressing fuel poverty and retrofitting existing homes; and
- Investigate ways to ensure that future local plans place a mandatory requirement for all new development to be net zero carbon by the earliest possible date.

In March 2020 the Executive adopted the Manchester Climate Change Framework 2020-2025. The five-year framework sets out measures that MCC will take in order to reduce carbon emissions from its buildings, energy use and transport. Measures include retrofitting buildings to improve energy efficiency, increasing the use of electric vehicles, and seeking 100% renewable energy. Whilst this has also not been formally adopted into planning policy, it is a key consideration for future development proposals.

6.6 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): Gives guidance on how to comply with Part L of Schedule 1 to the Building Regulations and the energy efficiency requirements for dwellings.

Minimum energy performance requirements shall be approved and expressed in accordance with the methodology for new dwellings in the form of:

- Target carbon dioxide (CO₂) emission rates;
- Target fabric efficiency rates; and,
- Target primary energy rates.

Approved Document Volume 2: Buildings other than dwellings (2021) - Addresses the conservation of fuel and power in non-domestic buildings and provides guidance for building work in both new and existing buildings.

Extensions to and work on existing buildings are required to consider the guidance set out below:

1. Limiting heat gains and losses;
2. Building services;
3. New elements in existing buildings, including replacing a thermal element and constructing an extension;
4. Existing elements in existing buildings, including renovating or retaining a thermal element, material change of use and change to energy status; and,
5. Consequential improvements.

6.7 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-STRAT14:** A Sustainable and Integrated Transport Network
- **Policy JP-S3:** Heat and Energy Networks
- **Policy JP-S4:** Flood Risk and the Water Environment
- **Policy JP-S6:** Resource Efficiency
- **Policy JP-G2:** Green Infrastructure Network
- **Policy JP-G6:** Urban Green Space
- **Policy JP-G7:** Trees and Woodland
- **Policy JP-G8:** A Net Enhancement of Biodiversity and Geodiversity
- **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 EN9** - Green Infrastructure
- **Policy EN14** – Flood Risk
- **Policy EN15** – Biodiversity and Geological Conservation
- **Policy EN16** – Air Quality
- **Policy EN19** – Waste
- **Policy DM1** – Development Management
- **Policy T1** - Sustainable Transport

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)
- **Approved Document Volume 2:** Buildings other than dwellings (2021 edition)

7. ENERGY HIERARCHY

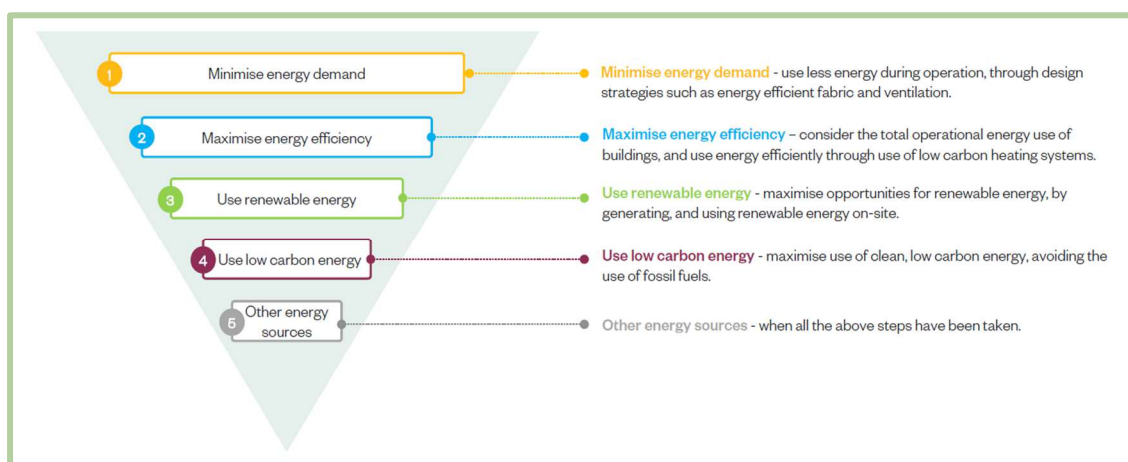
7.1 The Energy Hierarchy

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 PfE 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 8.

8. ENERGY STRATEGY

8.1 CIBSE TM54 Modelling and Energy Demand

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

8.1.1 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.

8.1.2 Geometry and Site Details

Four representative dwellings were chosen to reflect the range of apartment layouts and orientations across the new rooftop extension. These have been listed out in Table 8.1.

Table 8.1 – Representative Dwellings

Reference	Floor area (m ²)	Description	Façade Aspect
1 Bed North facing Corner apartment	49.85	Top floor one bed corner apartment with two exposed façades	Northeast & Northwest
1 Bed South facing Mid apartment	48.87	Top floor one bed mid terrace apartment with one exposed façade	Southeast
2 Bed North facing Mid apartment	64.42	Top floor two bed mid terrace apartment with one exposed façade	Northwest
2 Bed South facing Corner apartment	67.64	Top floor two bed corner apartment with two exposed façades	Southeast & Southwest

Table 8.2 – Communal Amenity

Floor area (m ²)	Description
778.88	The amenity areas on the ground and first floors include a gym, co-working space, multipurpose room, staff office, reception, and, on the first floor, a private dining area and wellness facilities.

The energy demand for these dwellings was calculated in Design Builder, 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 8.1 – 3D Energy Model of Example Apartment

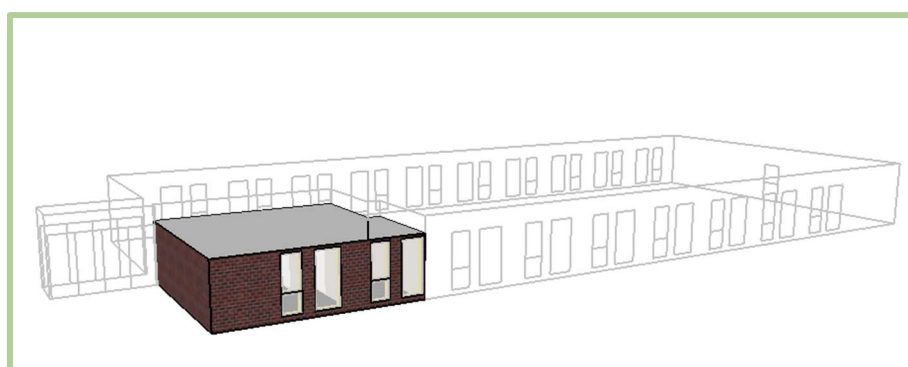
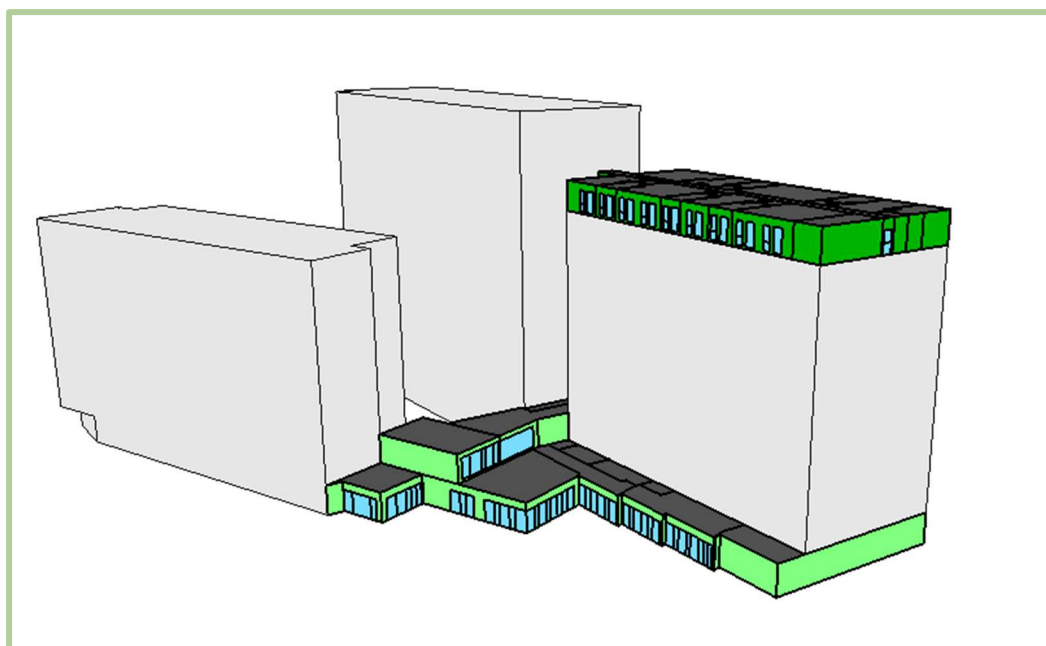


Figure 8.2 – 3D Energy Model of the Site



8.1.3 Data Inputs and Internal Gain

Tables 8.2 to 8.4 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 8.2 – Proposed Fabric Specification

Item	Proposed Residential Specification	Proposed Non-Residential Specification
External Wall	$U=0.16 \text{ W/m}^2\text{K}$	$U=0.15 \text{ W/m}^2\text{K}$
Ground Floor	n/a	$U=0.11 \text{ W/m}^2\text{K}$
Roof	$U=0.11 \text{ W/m}^2\text{K}$	$U=0.11 \text{ W/m}^2\text{K}$
Glazing	$U=1.20 \text{ W/m}^2\text{K}$	$U=1.20 \text{ W/m}^2\text{K}$
Air Permeability	$4.00\text{m}^3/\text{hm}^2 \text{ (@}50\text{Pa.)}$	$4.00\text{m}^3/\text{hm}^2 \text{ (@}50\text{Pa.)}$

Table 8.3 – Proposed Mechanical and Electrical Specification

Item	Proposed Residential Specification	Proposed Non-Residential Specification
Lighting	100% LEDs	Circulation: $2.51 \text{ W/m}^2 - 100 \text{ lux}$ Co-working: $1.25 \text{ W/m}^2 - 100 \text{ lux}$
Ventilation	MVHR Heat recovery efficiency: 92%	MVHR Heat recovery efficiency: 75%
Space Heating	Electric Panel Heaters CoP 1.00	VRF Heating SCOP: 4.3 Cooling SEER: 6.4
Water Heating	Hot Water Heat Pump CoP 4.09	Electric instantaneous at POU

Table 8.4 – Internal Gains

Item	Description	Note
Occupancy	Internal heat gains from people, based on occupancy density, activity level, and operational schedules.	Model inputs for occupancy density and schedules are defined on a zone-by-zone basis. For residential areas, occupancy density is determined by the assumed number of residents based on the number of bedrooms. Within the building's amenity areas, occupancy densities have been set based on typical people-per-square-metre values for each space type, with higher densities in the gym and co-working spaces, and lower densities in private dining and multipurpose areas.
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.	All dwellings have been specified with 100% low-energy lighting. Apartment lighting has been modelled with a power density of 2 W/m² per 100 lux. Within the building's amenity areas, lighting power densities have been set to 2.51 W/m² per 100 lux for circulation areas and 1.25 W/m² per 100 lux for office, co-working, multipurpose, and private dining spaces.
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 by space type. For residential areas, bedrooms have been set to 2 W/m² with a radiant fraction of 0.20, while kitchen and living spaces have been set to 10 W/m² with a radiant fraction of 0.50. For amenity areas, the gym has been set to 15 W/m² and the office, co-working, multipurpose, and private dining areas have been set to 10 W/m² with a radiant fraction of 0.20.

8.1.4 Results

Table 8.5 presents the predictive energy demand results for the residential rooftop extension.

Table 8.5 – TM54 Predictive Energy Demand Results (Residential)

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)
1 Bed North facing Corner apartment	17.19	3.66	18.06	2.86	41.77
1 Bed South facing Mid apartment	4.07	3.84	17.69	2.86	28.46
2 Bed North facing Mid apartment	10.07	3.92	14.44	2.90	31.33
2 Bed South facing Corner apartment	10.57	3.77	13.91	2.80	31.05

Table 8.6 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 8.6 – TM54 Predictive Energy Demand Results

	Space Heating Demand	Energy Use Intensity
Average of representatives (kWh/m ² /year)	10.48	33.15
Places for Everyone Target (kWh/m ² /year)	15	35

Table 8.7 presents the predictive energy demand results for the non-residential aspect of the scheme.

Table 8.7 – TM54 Predictive Energy Demand Results (Non-residential)

Reference	Space Heating (kWh/m ² /year)	Space Cooling (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)
Amenity areas	3.87	2.32	12.07	25.98	8.28	52.52

Table 8.8 presents the modelled space heating and cooling demand for the communal amenity areas, benchmarked against the Places for Everyone (PfE) targets. The figures reflect the zone thermal loads before the application of system efficiencies

Table 8.8 – TM54 Predictive Energy Demand Results

	Space Heating Demand	Space Cooling Demand
Amenity Areas (kWh/m ² /year)	7.77	14.83
Places for Everyone Target (kWh/m ² /year)	15	15

8.2 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.

8.2.1 Building Form and Heat Loss Envelope

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

- The proposed new floor apartments will consist of mid and corner top floor apartments

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

- Ninth floor, 1 Bed North facing Corner apartment: 1.7
- Ninth floor, 1 Bed South facing Mid apartment: 1.3
- Ninth floor, 2 Bed North facing Mid apartment: 1.4
- Ninth floor, 2 Bed South facing Corner apartment: 1.6
- Amenity Extension: 1.7

8.2.2 Elevation Design and Window Proportions

The building is of bespoke architectural design with a range of high specification design features and materials palette, allied to generous proportions and detailing.

8.2.3 Heated Spaces

The ground floor amenity area has an exposed floor to an unheated car park. This exposed floor will be well insulated to minimise heat loss.

8.2.4 Building Fabric Specifications and Air Permeability

The proposed material specification that will be incorporated within the building to limit heat loss and ensure efficient operation is presented in Table 8.2 above.

8.2.5 Ventilation System

Both the amenity zones and dwellings will benefit from 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.

8.2.6 Space Heating Demand

CIBSE TM54 assessments have been undertaken for four representative dwelling types and the amenity extension in order to demonstrate the environmental performance of the proposed development. This sample provides a robust and reliable indication of the overall expected performance of the development.

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

- Ninth floor, 1 Bed North facing Corner apartment = 17.19 kWh/m²/year
- Ninth floor, 1 Bed South facing Mid apartment = 4.07 kWh/m²/year
- Ninth floor, 2 Bed North facing Mid apartment = 10.07 kWh/m²/year
- Ninth floor, 2 Bed South facing Corner apartment = 10.57 kWh/m²/year

- Average dwelling space heating demand = **10.48 kWh/m²/year**

- Amenity area space heating demand = **7.77 kWh/m²/year**
- Amenity area space cooling demand = **14.83 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 10.48 kWh/m²/year, well below these targets.

For non-residential developments, a space heating and cooling demand target of 15 kWh/m²/year applies. The proposed amenity extension achieves a modelled space heating demand of 7.77 kWh/m²/year and a space cooling demand of 14.83 kWh/m²/year, demonstrating compliance with the targets

8.3 Maximise Energy Efficiency

8.3.1 Energy Use Intensity

The representative CIBSE TM54 models provide the regulated energy demand of the dwelling types and amenity zone 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:

- Ninth floor, 1 Bed North facing Corner apartment = 41.77 kWh/m²/year
- Ninth floor, 1 Bed South facing Mid apartment = 28.46 kWh/m²/year
- Ninth floor, 2 Bed North facing Mid apartment = 31.33 kWh/m²/year
- Ninth floor, 2 Bed South facing Corner apartment = 31.05 kWh/m²/year

- Average dwelling Energy Usage Intensity = **33.15 kWh/m²/year**

- Amenity area Energy Usage Intensity = **52.52 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 (EUI) of 35 kWh/m²/year.

It is understood that the purpose of this EUI target is to establish a benchmark of 35 kWh/m² GIA/year for all qualifying developments (excluding minor developments), against which applicants can demonstrate compliance with the “Maximise energy efficiency” requirement of Policy JP-S2.

The Trilogy scheme has demonstrated to improve upon this key performance indicator.

8.3.2 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.

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.

8.4 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 8.9.

Table 8.9 – Proposed Mechanical and Electrical Specification

Item	Proposed Residential Specification	Proposed Non-Residential Specification
Lighting	100% LEDs	Circulation: 2.51 W/m ² - 100 lux Co-working: 1.25 W/m ² - 100 lux
Ventilation	MVHR <i>Heat recovery efficiency: 92%</i>	MVHR <i>Heat recovery efficiency: 75%</i>
Space Heating	Electric Panel Heaters <i>CoP 1.00</i>	VRF Heating SCOP: 4.3 Cooling SEER: 6.4
Water Heating	Hot Water Heat Pump <i>CoP 4.09</i>	Electric instantaneous at POU
Renewables	Photovoltaic Array	n/a

The exact M&E specification will be refined further into the development cycle at the technical design stage (RIBA Stage 4), post planning approval.

8.4.1 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.

Table 7.8 – Proposed PV Area

	Solar PV
Rooftop Extension Floor Area (m ²)	530
Proposed PV Area (m ²)	212
PV Footprint area (% of Ground floor space)	40%

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:
 - Cleaning of the arrays; and,
 - 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. Additionally, the Variable Refrigerant Flow (VRF) system will be utilising the same technology to provide space heating to the amenity areas.

The proposed air source heat pump technology provides the following benefits:

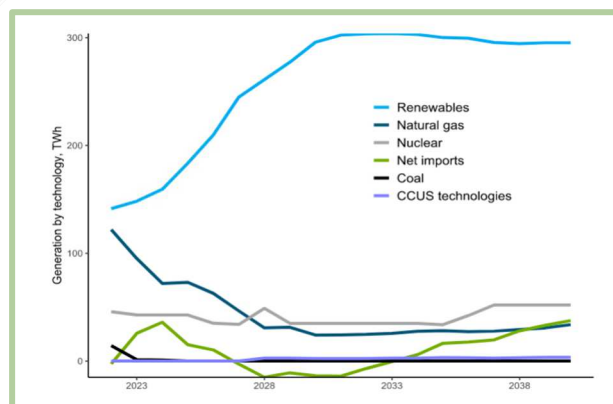
- Highly energy-efficient system, thus limiting electrical energy demand and associated carbon dioxide (CO₂) emissions;
- This technology benefits from a low 'carbon footprint' due to the inherent efficiency of the heat pump process. It is a well-established technology with an anticipated long lifespan - 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.

8.5 Low Carbon Heating

8.5.1 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 8.4 - 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 8.4.

The energy strategy proposed for the scheme uses a combination of air source heat pumps and photovoltaics. 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.

8.5.2 Proposed Heating and Hot Water System

The proposed residential specification includes a Hot Water Heat Pump (*Modutherm Juniper HP Plus/200L*) providing hot water. This system operates with a COP of up to 409% efficiency. Space heating will be provided by electrical panel heating which is 100% efficient at the point of consumption.

The proposed non-residential specification includes electric instantaneous point of use water heaters and a VRF system providing space heating and cooling. The proposed system has a COP of 4.3 and a SEER of 6.4, demonstrating a high level of operational efficiency.

8.5.3 Proposed Cooling System

There will be no active cooling measures within the dwellings. 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.

9. OVERHEATING RISK (RESIDENTIAL)

9.1 Overheating Risk Assessment

An overheating analysis has been undertaken for the new build rooftop extension containing eight apartments, covering four representative dwellings 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 dwellings have been assessed, incorporating apartments of differing design and orientation:

- Ninth floor, 1 Bed North facing Corner apartment
- Ninth floor, 1 Bed South facing Mid apartment
- Ninth floor, 2 Bed North facing Mid apartment
- Ninth floor, 2 Bed South facing Corner apartment

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

Item	Proposed Specification
External Wall	U=0.16 W/m ² K
Ground Floor	n/a
Roof	U=0.11 W/m ² K
Glazing	U=1.20 W/m ² K (g-value of 0.45)
Air Permeability	4.00m ³ /hm ² (@50Pa.)

The application is situated at the junction between Ellesmere Street and Chester Road on the South-western fringe of the St George's area of Manchester City Centre. The proposed development consists of a roof extension to Block A of The Trilogy to provide an additional storey accommodating eight new 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 Figure 9.1 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 – Representative apartments assessed

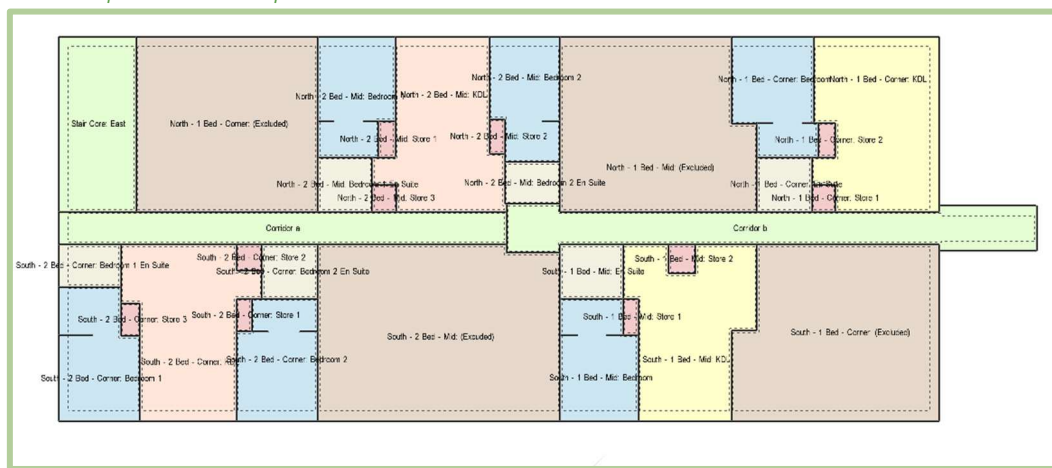
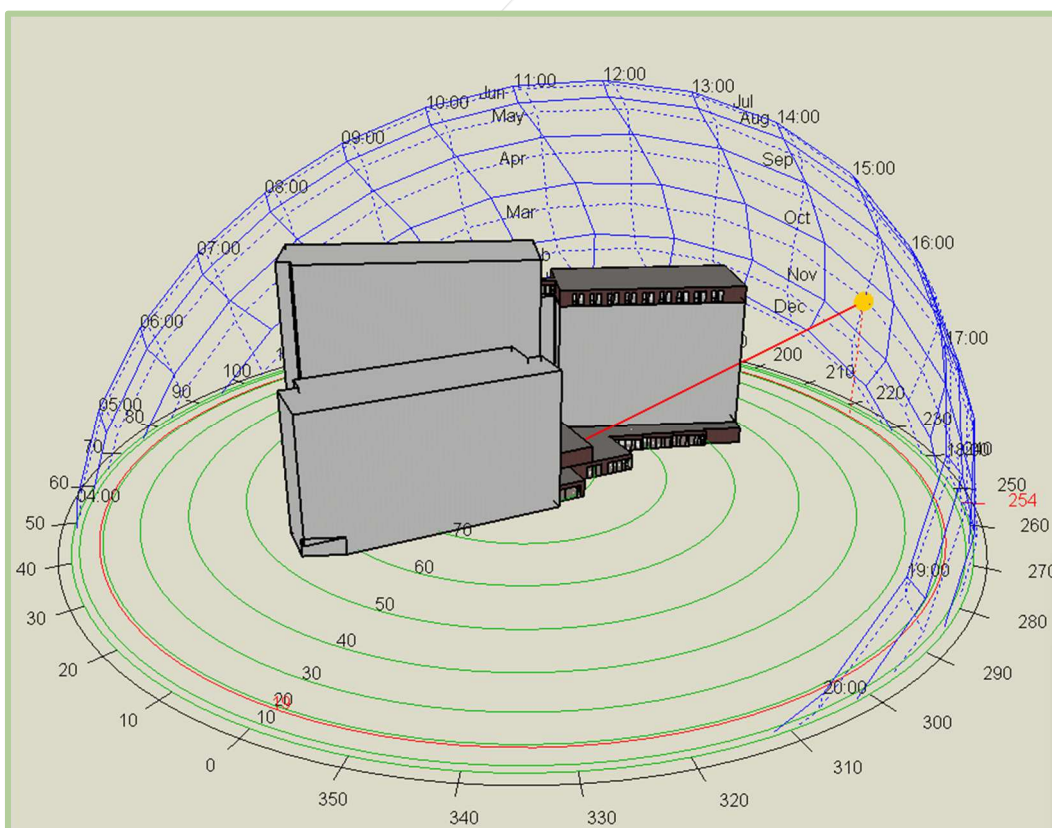


Figure 9.2 – 3D model of the site



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	Not Openable	Openable
Living / kitchen	Openable	Openable

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 09 - Ninth Floor	1 Bed North Corner	BEDROOM	0.09	19.17	Pass
		KITCHENLIVING	0.01	n/a	Pass
	2 Bed North Mid	BEDROOM1	0.20	24.17	Pass
		BEDROOM2	0.24	24.00	Pass
		KITCHENLIVING	0.68	n/a	Pass
	1 Bed South Mid	BEDROOM	0.59	30.17	Pass
		KITCHENLIVING	1.50	n/a	Pass
	2 Bed South Corner	BEDROOM1	0.25	29.00	Pass
		BEDROOM2	0.64	31.50	Pass
		KITCHENLIVING	1.56	n/a	Pass

Overheating Mitigation Strategy

- The g-value for the apartments is **0.45**.
- MVHR to achieve the flowrates set out below:
 - North facing apartments
 - Bedroom: 15 l/s
 - Living/Kitchen: 15 l/s
 - South facing apartments
 - Bedroom: 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 0.45 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**.



10. OVERHEATING RISK (NON-RESIDENTIAL)

An overheating assessment has been undertaken for the amenity area in accordance with CIBSE TM52: (The Limits of Thermal Comfort – Avoiding Overheating). The methodology evaluates thermal performance based on adaptive comfort principles and is particularly suited to naturally ventilated or mixed-mode spaces.

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.

10.1 Assessment Categories

CIBSE TM52 defines categories of occupant expectation (I to IV) to reflect the varying levels of thermal comfort required in different spaces. Higher expectation categories assume that occupants require stricter comfort conditions, while lower expectation categories allow greater tolerance for elevated temperatures. Table 10.1 below details the different categories:

Table 10.1 – TM52 Assessment Categories

Category	Description
I	High level of expectation only used for spaces occupied by very sensitive and fragile persons
II	Normal expectation (for new buildings and renovations)
III	Moderate expectation (used for existing buildings)
IV	Values outside the criteria for the above categories (only acceptable for limited periods of time)

The amenity spaces without mechanical cooling, including circulation areas, toilets, and store rooms, are considered **Category II**, reflecting typical occupant expectations for comfort in non-domestic communal spaces.

All other amenity areas are fully mechanically cooled via the VRF system. These cooled zones are therefore **not included in the TM52 adaptive comfort assessment**, which primarily applies to naturally ventilated or non-cooled spaces.

The zones cooled by the VRF system are designed to maintain internal temperatures within setpoints during occupied hours, ensuring that overheating risk is effectively managed throughout these areas.

10.2 Assessment Criteria

CIBSE TM52 assesses overheating in non-domestic buildings using three key criteria:

Criterion 1 – Hours of Exceedance

- Measures the number of occupied hours during which the operative temperature exceeds the adaptive comfort limit by 1°C or more.
- Purpose: Determines how frequently occupants are likely to experience thermal discomfort during normal occupancy.

Criterion 2 – Daily Weighted Exceedance

- Evaluates the severity of overheating on a given day by combining the magnitude and duration of temperatures above the adaptive comfort threshold.
- Purpose: Captures how intense or prolonged overheating is, rather than just whether it occurs.

Criterion 3 – Upper Limit Temperature

- Records the absolute maximum operative temperature in the space.
- Purpose: Ensures short-term spikes in temperature do not exceed acceptable comfort levels, even if total hours of exceedance are low.

A space is considered to fail TM52 if two or more of these criteria are exceeded.

10.3 Data Inputs and Building Model

Table 10.1 below summarises the building fabric specification which has been applied to the thermal simulation model for the amenity zones. 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 10.1 – Thermal Fabric Performance Levels

Item	Proposed Non-Residential Specification
External Wall	U=0.15 W/m ² K
Ground Floor	U=0.11 W/m ² K
Roof	U=0.11 W/m ² K
Glazing	U=1.20 W/m ² K (g-value of 0.45)
Air Permeability	4.00m ³ /hm ² (@50Pa.)

The application is situated at the junction between Ellesmere Street and Chester Road on the South-western fringe of the St George's area of Manchester City Centre. Therefore, 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.

Figures 10.1 and 10.2 illustrate the amenity areas that have been assessed in accordance with CIBSE TM52.

Figure 10.1 – Ground floor amenity area

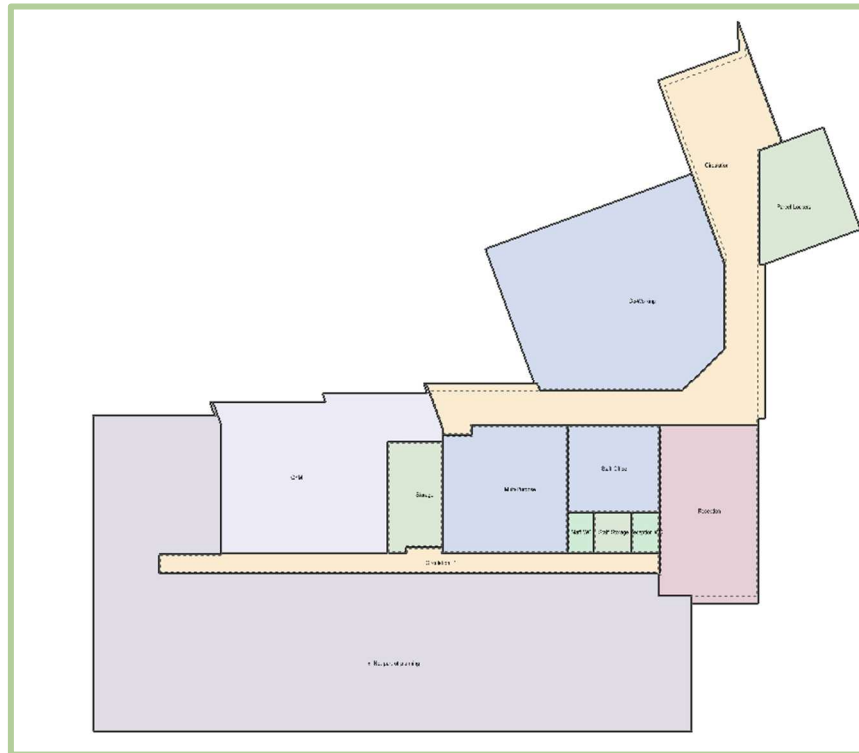
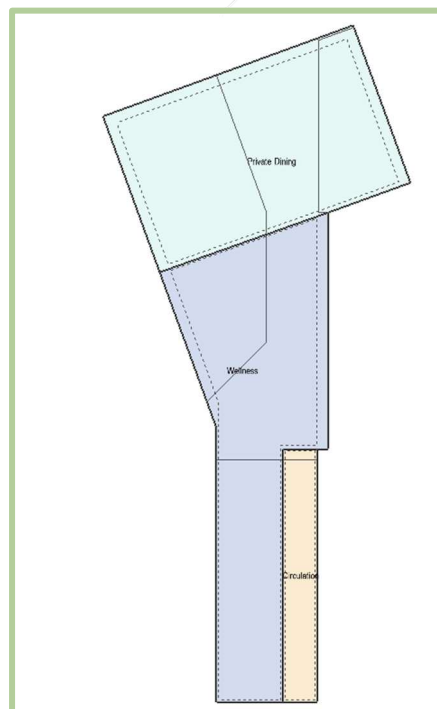


Figure 10.2 – First floor amenity area



10.4 Ventilation strategy

The amenity areas are ventilated using a mechanical ventilation with heat recovery (MVHR) system, providing controlled fresh air while recovering heat from the extract air to improve energy efficiency. MVHR is incorporated in all areas to maintain indoor air quality and support thermal comfort.

10.5 TM52 Results

Level	Zone	Category II			
		Criterion 1 (%)	Criterion 2 (K.hr)	Criterion 3 (hr)	Pass/Fail
Level 00	CIRCULATION	1.36	7.17	0.00	Pass
	CIRCULATION1	0.36	13.00	0.00	Pass
	PARCELLOCKERS	0.00	0.00	0.00	Pass
	RECEPTIONWC	0.00	1.67	0.00	Pass
	STAFFWC	0.00	8.83	0.00	Pass
Level 01	CIRCULATION	0.11	6.00	0.00	Pass

The results above indicate that all **non-cooled amenity areas**, achieve a pass rating under CIBSE **TM52**, meeting the adaptive comfort criteria for Category II spaces.

Fully mechanically cooled zones, served by the VRF system, are maintained within design setpoints during occupied hours and are therefore **not included in the TM52 assessment**.