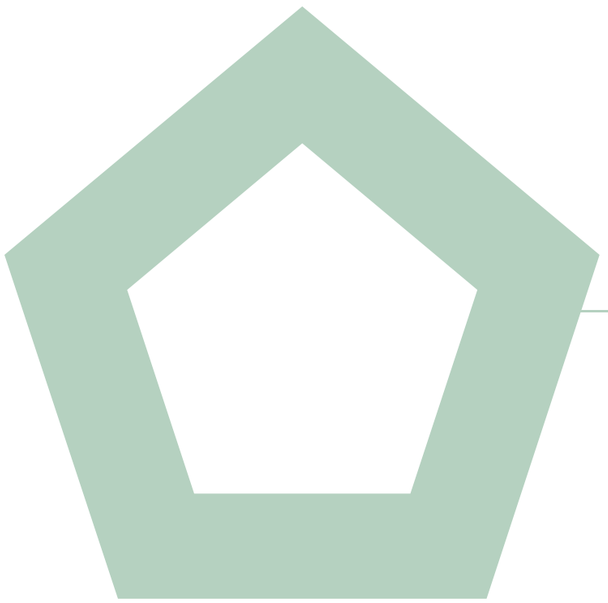
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Arundel Street.
Manchester.
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SUSTAINABILITY
STAGE 3 REPORT – STAGE 2 REPORT
ENERGY STRATEGY
REVISION 03 – 08 AUGUST 2024



STAGE 3

Audit sheet.

Rev.	Date	Description of change / purpose of issue	Prepared	Reviewed	Authorised
01	28/03/2024	Stage 2 issue for Part L and Part O	C. MacGillivray	R. Palmer	J. Nuttall
02	26/07/2024	Stage 3 Update	R. Palmer	J. Allcock	J. Nuttall
03	08/08/2024	Stage 3 Update based on planning consultant comments	R. Palmer	J. Allcock	J. Nuttall

This document has been prepared for Logik Developments only and solely for the purposes expressly defined herein. We owe no duty of care to any third parties in respect of its content. Therefore, unless expressly agreed by us in signed writing, we hereby exclude all liability to third parties, including liability for negligence, save only for liabilities that cannot be so excluded by operation of applicable law. The consequences of climate change and the effects of future changes in climatic conditions cannot be accurately predicted. This report has been based solely on the specific design assumptions and criteria stated herein.

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Executive summary.

This report is an addendum to supplement the submission of the s.73 application to amend the existing planning permission on site. Proposals have been updated to meet the updated building regulation changes since previous permission was granted. Therefore, this report details how the proposals meet Approved Document Part L 2021 and Approved Document Part O 2021 as now applicable to the scheme.

1.1 Development description

This energy strategy has been prepared on behalf Logik Developments in support of the residential elements of the proposed Arundel Street development in Manchester - hereafter referred to as the Proposed Development.

This strategy summarises the relevant regulatory and planning policies and sets out how the development will address and achieve the relevant policy targets. The strategy responds to the UK planning and regulatory framework, and specifically to the Manchester Core Strategy policy documentation.

1.2 Energy strategy summary

Passive design and energy efficiency measures will provide the cornerstone to the energy demand and CO_2 emission reduction achieved for the Proposed Development.

A representative sample of apartments have been assessed against Approved Documents Part L1 Conservation of Fuel and Power, using approved software packages (Appendix A) with the performance parameters as stated within this report.

1.3 Part O strategy summary

The risk of overheating within the simulated dwellings has been assessed using the thermal comfort criteria and methodology set out in CIBSE Technical Memorandum 59 (TM59): Design methodology for the assessment of overheating risk in homes.

The proposed development was modelled in a virtual environment with the assigned parameters and then assessed against criteria within the CIBSE TM59 methodology.

1.4 National drivers - Approved Document Part L of the Building Regulations

Part L of the Building Regulations is the mechanism by which government is driving reductions in the regulated CO_2 emissions from new buildings. The assessment of the Proposed Development against policy targets has been carried out using Building Regulations Part L (2021) methodology.

1.5 Planning Policy

The Manchester Core Strategy Policy EN6 states that residential development of 10 or more units and all other non-residential development over 1,000m^2 will be expected as a minimum to meet the following targets (*unless this can be shown not to be viable*):

Target	% Minimum Requirement
Target 1: Network Development Area	CHP/ District heating anchor or connection or, where not feasible, a 15% increase on Part L 2010
Target 2: Electricity Intense Buildings	+ 15% increase on Part L 2010
Target 3: Micro Generation Area	+ 15% increase on Part L 2010

Table 1: CO_2 Emission Reduction Targets, Manchester Core Strategy.

Policy JP-S2 of the Greater Manchester Joint Development Plan, Places for Everyone, states that all developments should be consistent with the Part L 2021 Building Regulations, unless superseded by changes to building regulations and/or national or local planning policies. A robust and future-proofed energy strategy for the building fabric and services should be adopted at the Proposed Development in accordance with the energy hierarchy advocated by Places for Everyone, as shown;



Figure 1: Energy Hierarchy.

1.6 Passive design approach.

The assessment has used the energy hierarchy as part of the design strategy that prioritises passive design in order to minimise energy demand.

Passive Design measures are those which reduce the demand for energy within buildings, without consuming energy in the process.

These are the most robust and effective measures for reducing CO_2 emissions as the performance of the solutions, such as façade insulation, is unlikely to deteriorate significantly with time, or be subject to change by future property owners. In this sense, it is possible to have confidence that the benefits these measures will continue at a similar level for the duration of their installation.

	Fabric performance A 'fabric first' approach has been taken in order to reduce the energy demand and CO_2 emissions from the Proposed Development. The overriding objective for the façade design of the building will be to achieve the optimum balance between providing natural daylighting benefits to reduce the use of artificial lighting, the provision of passive solar heating to limit the need for space heating in winter and limiting summertime solar gains to reduce space cooling demands.
	Space cooling Comfort cooling only has been included as part of the development to satisfy Part O requirements due to window opening restrictions.
	Ventilation Mechanical Ventilation with Heat Recovery (MVHR) will be used throughout. Recovering heat from the extract air will help reduce annual heating energy demands considerably without impacting the quality of the incoming fresh air.
	Domestic hot water (DHW) system The Proposed Development will feature water efficient fixtures and fittings including WCs with low flush volume and flow reducers in the taps of wash hand basins and on showers to limit overall water consumption.
	Natural daylight and lighting strategy Artificial lighting tends to provide a significant contribution to regulated CO_2 emissions. As such, the implementation of energy efficient lighting design is paramount to reducing overall emissions for these spaces. Therefore, it is anticipated that the proposed development will be supplied with high efficiency lighting installations representing best practise. As well as the reduced energy requirement that will be achieved by implementing these strategies, the contribution to internal heat gains will be reduced. This will further reduce the total energy requirements and CO_2 emissions of the building.

Table 2: Passive design strategy.

Part L Compliance Overview.
This report demonstrates block compliance with the Part L1 regulated emissions criteria for the Proposed Development.

Against the Part L (2021) notional building regulated energy metric, the Proposed Development is anticipated to achieve a **66.05%** betterment; against the Part L (2021) Primary Energy metric, the Proposed Development is anticipated to achieve a **32.48%** betterment; and against the Part L (2021) Dwelling Fabric Energy Efficiency metric, the Proposed Development is anticipated to achieve a betterment of **5.65%.**

Manchester Core Strategy Compliance Overview.
With Part L (2021) compliance, the Proposed Development is anticipated to satisfy Manchester Core Strategy (2012)) policy EN6, as discussed in Section 1.

The proposed energy strategy in this report reflects this philosophy and ties in closely with Manchester City Councils carbon zero 2028 / 2038 targets.

Greater Manchester Joint Development Plan Compliance Overview.
This report demonstrates compliance with the Part L 2021 of the building regulations using the appropriate Energy Hierarchy.

Part O Compliance Overview.
The Part O strategy indicates that each sample dwelling assessed in the Proposed Development is anticipated to satisfy the CIBSE TM59 thermal comfort criteria through a mechanical ventilation and boosted comfort cooling strategy using the DSY1 climate scenario. This suggest that all proposed dwellings are anticipated to experience a very low risk of overheating, in line with the CIBSE TM59 criteria, approved document Part O and policy guidance.

Introduction.

This strategy has been prepared on behalf of Logik Developments in support of the proposed residential elements of the Arundel Street development in Manchester.

The project consists of a mixture of residential and retail development. The proposed development includes 355 new apartments at a gross internal floor area of ~30,904m^2 and commercial space. Further, the existing DOT building will be refurbished to accommodate 11 further dwellings.

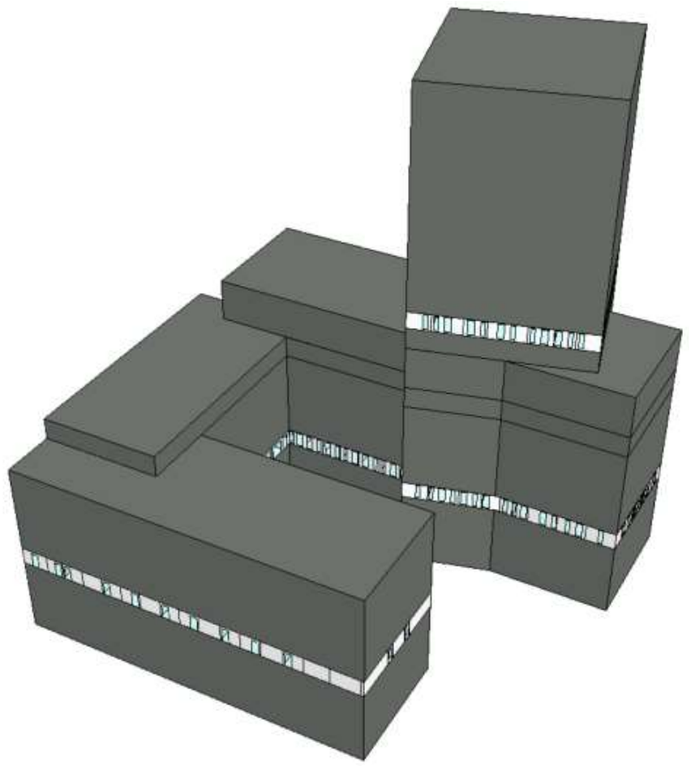


Figure 2: Dynamic Simulation Model of the Proposed Development – New Build only.

This strategy summarises the relevant regulatory and planning policies applicable to the proposed residential development and sets out how the development will address and achieve the relevant policy targets.

Manchester has recently set an ambitious target to be a 'zero carbon city' by 2038, with new development to be zero carbon by 2028. Whilst the shorter-term target is not included in current policy, the Proposed Development is expected to support these ambitions through incorporation of low carbon and renewable energy instead of fossil fuels.

Manchester Core Strategy (2012 – 2027) states within Policy EN6 that applications for commercial developments exceeding 1,000m^2 will be expected to achieve a minimum +10% increase on Part L 2010 and residential developments a minimum 15% increase on Part L 2010. Since the publication of the Core Strategy document, Approved Document Part L has since been updated in 2013, and again in 2021. Broadly speaking, compliance with Part L 2013 required a 9% reduction in carbon emissions compared to Part L 2010. A new domestic building will deliver a 31% reduction relative to ADL 2013, therefore compliance with ADL 2021 will automatically achieve the required improvement over ADL 2010.

1.7 Proposed Development – New Build.

The Proposed Development will provide 355 apartments with a mix of 1, 2 and 3 bed apartments over 22 storeys. The Proposed Development will also provide opportunities for ground floor commercial space, with building services located in the basement and on the roof-top as necessary.

The most efficient approach to demonstrating compliance during the early design stages is to model a sample set of SAP calculations and pro rata these results out across the building. In this case, a range of apartment types has been modelled in SAP to test compliance for a representative mix of units across the building using block compliance.

This energy strategy also considers the façade performance to find the balance between daylighting and useful solar gains. Details of the indicative areas that have been subject to analysis for the Energy Strategy and Part O study are outlined within the appendices.

2. Policy and Key Drivers.

The following section outlines the national and local policies and drivers.

2.1 National Drivers.

2.1.1 Building Regulations Part L (2021).

Approved Document Part L (2021, England edition) is the Building Regulations relating to the conservation of fuel and power in buildings. The Approved Document is separated into two sections: Volume 1 and Volume 2:

- Part L Vol.1 relates to dwellings specifically, with an individual criterion for this building-use type

Schedule 1: Conservation of Fuel and Power.

Schedule 1 of the Building Regulations Part L states that reasonable provisions shall be made for:



- Limiting Heat Gains and Losses through;
  - Thermal elements and other parts of the building fabric; and;
  - From pipes, ducts and vessels used for space heating, space cooling and hot water services.
- Providing fixed building services which are:
  - Energy Efficient;
  - Have effective controls; and;
  - Are commissioned by testing and adjusting as necessary to ensure they use no more fuel and power than is reasonable in the circumstances

Developments should aim to at least meet the limiting values for system and fabric requirements in order to better the Building Emission Rate set by a notional building which uses standardised inputs based on the system and fabric design of each building.

Part L (2021) Conservation of Fuel and Power

With the release of the update to the Part L of Building Regulations in December 2021, the newest iteration is applicable to all developments commencing work after June 2022 which did not submit an initial notice.

2.1.2 National Planning Policy Framework.



The updated National Planning Policy Framework (NPPF) was published updated in December 2023 and has superseded all Planning Policy Statements (PPS) and Planning Policy Guidance (PPG) documents, with the exception of PPS10 (Waste). The NPPF sets out the Government's strategy on the delivery of sustainable development.
The NPPF places responsibility for policy making with the Local Planning Authority, who shall communicate their policies through Local Plans and facilitate the creation of Neighbourhood Plans. The NPPF states that there is a presumption in favour of sustainable development.
The following is extracted from paragraph 11 of the NPPF:

"Plans and decisions should apply a presumption in favour of sustainable development.
For plan-making this means that:

a) plans should positively seek opportunities to meet the development needs of their area, and be sufficiently flexible to adapt to rapid change;
b) strategic policies should, as a minimum, provide for objectively assessed needs for housing and other uses, as well as any needs that cannot be met within neighbouring areas, unless:
  i. the application of policies in this Framework that protect areas or assets of particular importance provides a strong reason for restricting the overall scale, type or distribution of development in the plan area ; or
  ii. any adverse impacts of doing so would significantly and demonstrably outweigh the benefits, when assessed against the policies in this Framework taken as a whole.

For decision-taking this means:

a) approving development proposals that accord with an up-to-date development plan without delay; or
b) where there are no relevant development plan policies, or the policies which are most important for determining the application are out-of-date7, granting permission unless:
  i. the application of policies in this Framework that protect areas or assets of particular importance provides a clear reason for refusing the development proposed 6; or
  ii. any adverse impacts of doing so would significantly and demonstrably outweigh the benefits, when assessed against the policies in this Framework taken as a whole."

In respect of energy policy contained within the NPPF, paragraph 155 sets out that:

"To help increase the use and supply of renewable and low carbon energy and heat, plans should:

a) provide a positive strategy for energy from these sources, that maximises the potential for suitable development, while ensuring that adverse impacts are addressed satisfactorily (including cumulative landscape and visual impacts);
b) consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development; and
c) identify opportunities for development to draw its energy supply from decentralised, renewable or low carbon energy supply systems and for co-locating potential heat customers and suppliers."

2.2 Local Drivers.

2.2.1 Places for Everyone.



The Places for Everyone (PfE) Plan took effect and became part of the statutory development plan for nine of the ten Greater Manchester planning authorities (Bolton, Bury, Manchester, Oldham, Rochdale, Salford, Tameside, Trafford and Wigan) on March 21, 2024.

It sets out a framework for sustainable, inclusive growth across the nine districts and sets out ten strategic objectives, including each Council playing their part in ensuring that Greater Manchester is a more resilient and carbon neutral city-region.

Policy JP-S2: Carbon and Energy partially replaces Policy EN 4: Reducing CO_2 Emissions by Enabling Low and Zero Carbon Development and Policy EN 6: Target Framework for CO_2 reductions from low or zero carbon energy supplies of the Manchester Core Strategy 2012 to 2027. This policy sets a range of measures that will support the aim of delivering a carbon neutral Greater Manchester by 2038, including:

An expectation that new development will, unless it can be demonstrated that it is not practicable or financially viable:

b) Be net zero carbon, which applies:
  1. from adoption– to regulated operational carbon emissions;
  2. from 2028 - to all emissions 'in construction'.

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:

i. Minimise energy demand;
ii. Maximise energy efficiency;
iii. Use renewable energy;
iv. Use low carbon energy; and

v. Utilise other energy sources.

As an interim measure, development should be consistent with Part L 2021 of the Building Regulations unless superseded by changes to building regulations and/or national or local planning policies.

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.

2.2.2 Local Planning Policy.

Manchester City Council (MCC) documentation:





- Core Strategy (CS) (July 2012)
- Supplementary Planning Documentation and Planning Guidance (SPDPG) (April 2007)

This strategy summarises the response of the Proposed Development's design to the policy framework of the MCC Adopted Core Strategy, and SPDPG documentation that together form the city's policy landscape. The CS documentation supersedes the SPDPG and therefore the CS documentation will take precedence.

Manchester City Council Core Strategy Development Plan Document (2012) Policy EN4 Reducing CO2 Emissions by Enabling Low and Zero Carbon Development states:

"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:

- *All developments must follow the principle of the Energy Hierarchy, being designed:*
    - *To reduce the need for energy through design features that provide passive heating, natural lighting and cooling*
    - *To reduce the need for energy through energy efficient features such as improved insulation and glazing*
    - *To meet residual energy requirements through the use of low or zero carbon energy generating technologies"*

2.2.3 Manchester Climate Change Framework (2020-2025).



The aim is that ""Manchester will play its full part in limiting the impacts of climate change and create a healthy, green, socially just city where everyone can thrive.""

It identifies four objectives we need to meet by 2025.

Objective 1 – Staying within our carbon budgets

Objective 2 – Climate adaptation and resilience

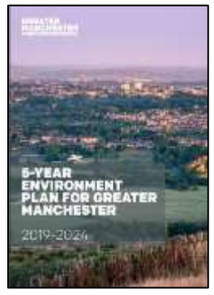
Objective 3 – Health and wellbeing

Objective 4 – Inclusive, zero carbon and climate resilient economy

Six priority areas for action have been identified as follows:

1. Buildings (existing and new)
2. Renewable energy
3. Transport and flying
4. Food
5. The things we buy and throw away
6. Green infrastructure and nature-based solutions

2.2.4 5-Year Environment Plan for Greater Manchester.



Greater Manchester Combined Authority (GMCA) sets an ambitious target to be a zero-carbon city by 2038. As part of this plan, the Greater Manchester Spatial Framework sets out plans for all new development to be zero carbon by 2028.

The five-year plan sets out a number of key items, including, but not limited to; increasing local renewable electricity generation, increasing the diversity and flexibility of energy supply and decarbonising how buildings are heated (serviced). These items encourage passive design and a shift away from fossil fuels to service buildings. The five-year plan also notes that new developments should seek to generate 20% onsite / renewable energy generation.

Additionally, the strategy includes a clean air plan to help tackle poor air quality – safeguarding Manchester residents from high levels of Nitrogen Dioxide (NO_2).

3. National Grid Decarbonisation.

With decarbonisation of the grid on-going, resultant from the connection of low-carbon and renewable technologies to the national grid (as well as the wind-down and decommissioning of coal fired power generation), the carbon factor of electricity generated has significantly decreased since the previous 2013 Part L methodology was released.

Grid decarbonisation has resulted in the emission rates demonstrated now being far more representative of the UK National Grid carbon factors.

At the end of 2020, the Department for Business, Energy, and Industrial Strategy (BEIS) reported the carbon factor of electricity as having fallen to 0.159 $kgCO_2/kWh$; a 70% reduction compared to that in Part L, 2021.

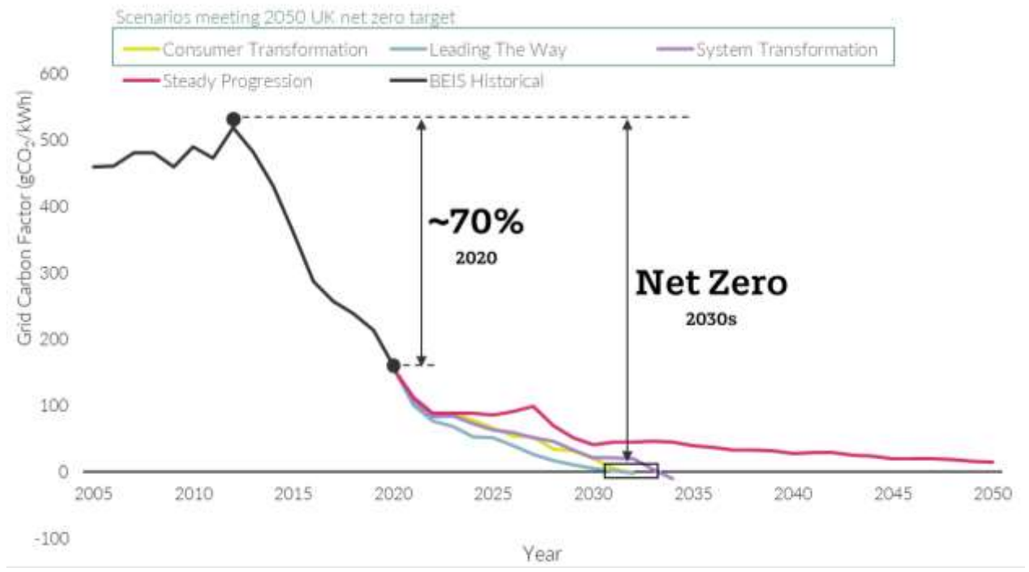


Figure 3: The carbon factor of grid electricity and the projected future energy scenarios published by the national grid

3.1.1 Carbon factors.

The updated Part L 2021 document uses the SAP 10.2 carbon factors. This assesses the emission rate using a different fuel factor for each month of the year depending on the average fuel mix seen to be accessible within that month.

Colder months are seen to have a higher carbon factor due to numerous factors, most notably the reduction in available Photovoltaic power, and the introduction of more fossil fuel sources to help manage the increased energy demand from heating.

Table 3: Carbon factors comparison.

Month	Carbon Factor $kgCO_2/kWh$	Month	Carbon Factor $kgCO_2/kWh$
January	0.163	July	0.111
February	0.160	August	0.112
March	0.153	September	0.122
April	0.143	October	0.136
May	0.132	November	0.151
June	0.120	December	0.163

4. Assessment Methodology.

The following is a summary of the data used and inputs / assumption made for simulation geometry modelling for the new building residential elements of the scheme.

4.1 Site Context.

The site is located near the Castlefield area in Manchester.

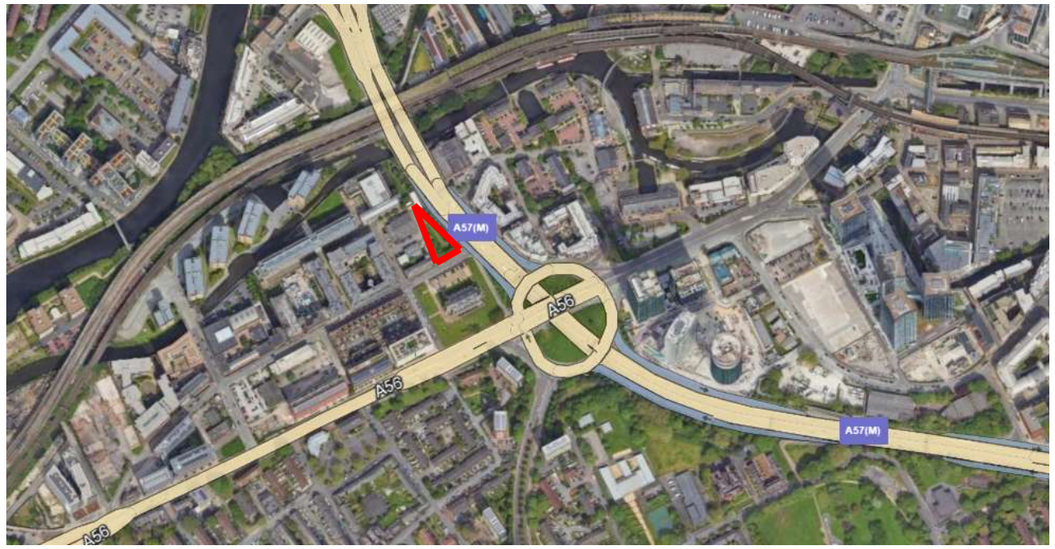


Figure 4: Location of the proposed Arundel Street development with respect to the surrounding area.

4.2 Standard Assessment Procedure (SAP).

SAP calculations were undertaken for a sample number of units using Elmhurst Design SAP 10. This is a software package that has the capabilities of enabling the user to assess performance against building regulations Part L 2021 and to, ultimately, create an Energy Performance Certificate (EPC) for a dwelling. The software calculates the annual operational regulated CO_2 emissions generated by the project.

The SAP geometry for the Proposed Development was modelled to geometry received from the Architect (Table 6).

The most efficient approach to demonstrating compliance during the early design stages is to model a sample set of SAPs and pro rata these results out across the building. In this case, a range of apartment types has been modelled in SAP to test compliance for a representative mix of units across the building using block compliance. The apartments modelled in SAP represent different dwelling sizes (number of bedrooms and resulting floor area), and account for different orientations and exposed heat loss elements i.e. external wall, floor and roof area. Further assessments will be undertaken during the next stage to account for any design changes and refined specification details.

4.3 Building Fabric Specification.

Optimising the development's fabric is seen to be the most robust and effective way to improve energy efficiency and in turn reduce carbon emissions whilst also impacting thermal comfort.

The performance of the envelope is unlikely to deteriorate significantly with time and therefore the benefits of these measures will continue at a similar performance for the duration of their installation. The current values used are as indicated by the architect and the fabric performance parameters are detailed below. Table 2 highlights where the fabric performance betters that of the notional building to which the proposed design is compared.

Table 4: Fabric Performance.

Parameter	Notional Values	Proposed New Development (residential)
Fabric air permeability ($m^3/m^2.h$ @ 50Pa)	5.00	3.00
External wall U-value ($W/m^2.K$) Building 1 / Building 2	0.18	0.14 / 0.11 #
Party Wall to heated corridor U-value ($W/m^2.K$)**	0.00	0.00
Party Wall to dwelling ($W/m^2.K$)	0.00	0.00
Exposed floor U-value ($W/m^2.K$)	0.13	0.15
Exposed roof U-value ($W/m^2.K$)	0.11	0.15
Glazing U-value ($W/m^2.K$) Building 1 / Building 2	1.20	0.88 / 0.91 #
Glazing g-value	0.63	0.40
Glazing Frame Factor	0.7	Window with Juliette: 0.67 Building 1 window: 0.71 Building 2 window: 0.78 Building 2 shaded window: 0.50
Thermal bridges (W/mK) Building 1 / Building 2	SAP10 Appendix R2	E2 Lintel : 0.06 / 0.08 E3: 0.03 / 0.07 E4: 0.07 / 0.10 E7: 0.20 / 0.04 E18: 0.10 / 0.10 All others: SAP10 Appendix R2*

*Thermal bridges must be calculated individually and should match or better the notional values set out in SAP10 Appendix R2.
**Note that the assessment is based on incorporating heated corridors and staircores.
Note that slightly updated figures have been provided by the façade consultant for the proposed wall and glazing u-values, however, tested parameters are deemed sufficient at this stage to confirm proposal compliance.

4.4 Mechanical and Electrical Information.

Mechanical engineers from Hoare Lea provided outline information on the systems modelled in the residential and commercial energy assessments. Further details can be found in the appendices.

Table 5: Mechanical Strategy.

Parameter	Strategy	Model
Heating	Electric Panel Heaters	SAP Input [691]
Hot water	Heat pump	SAP Input [941]
Ventilation	MVHR	Vent Axia Sentinel Kinetic Advance

4.5 Architectural drawings.

The geometry used to assess the Proposed Development was determined by the following drawings received from Simpson Haugh Architects. While minor updates may have been made to these drawings since their issue, the majority of the modelling information was based on the below information.

Table 6: Architectural Information.

Drawing Type	Document Package	Data Type	Date Received
Revit Models	10090-SHP-BZ-A-F200-M3-XX-0001 Apartment Model 10090-SHP-BZ-A-G200-M3-XX-0001 Building Model 10090-SHP-BZ-A-G200-M3-XX-0001 Building Model_combined 10090-SHP-BZ-A-G251-M3-XX-0001 Facade Model 10090-SHP-BZ-A-G000-M3-XX-0001 Site Model	Revit	21/06/2024

For clarity, the refurbished DOT building has not been modelled as it is not required to meet Part L1A new build standards or Part O,

4.6 Site location and weather data.

A building's thermal performance is its response to external environmental conditions. The more dependant a building is on passive features to achieve acceptable internal comfort, the more important the use of external weather information becomes.

Climate data is assigned to the virtual environment of the dynamic model to simulate external weather conditions that are likely to occur. Thermal comfort calculations require the simulation to be tested against Chartered Institute of Building Services Engineers (CIBSE) Design Summer Year (DSY) climate data to best assess how spaces will perform during a year with hot summer conditions. The UK Meteorological Office (MO) collects weather data at stations across the UK. Climate variables measured at hourly intervals include air temperatures, wind speed and direction and air pressure amongst various other characteristics.

CIBSE licenses the historic weather data from the MO for 14 locations in the United Kingdom: Belfast, Birmingham, Cardiff, Edinburgh, Glasgow, Leeds, London (3 sites), Manchester, Newcastle, Norwich, Nottingham, Plymouth, Southampton and Swindon. The weather variables are synthesised into 2 types of CIBSE weather file:

- Test Reference Year (TRY): 2006 and 2016
  The TRY is composed of 12 separate months of data each chosen to be the most average month from the collected data.
  The TRY is used for operational energy analysis and for compliance with the UK Building Regulations (Part L).
- Design Summer Year (DSY): 2006 and 2016
  The DSY is a single continuous year rather than a composite one made up from average months.
  The DSY is used for overheating analysis.

As per the standardised methodology for Part O, the Manchester_DSY1_2020High50 weather file was used.

4.7 Dynamic Simulation Model.

Based on the information above, a series of Dynamic Simulation Models were created to undertake appropriate assessments on the proposed design.

Integrated Environmental Solutions Virtual Environment (IESve) is an approved Dynamic Simulation Model (DSM) software package that has the capabilities of enabling the user to create a virtual representation of a building.

Models built in the IESve have been used to demonstrate compliance with Approved Document Part O (2021) using the National Calculation Methodology.

The DSM model, with simplified versions of the surrounding buildings (as appropriate) is displayed below.

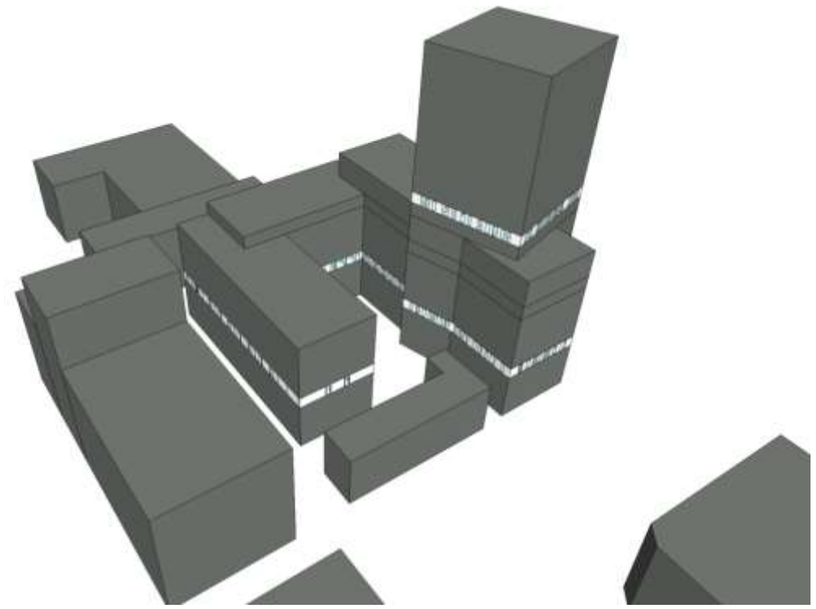


Figure 5: DSM Model Image – New Building Elements Assessed (DOT building indicative).

5. Cooling and overheating.

5.1 Cooling hierarchy.

Developments should reduce potential overheating risk and reliance on air conditioning systems. Following the 'cooling hierarchy' is the best way to design out risk, and the Proposed Development has sought to follow this hierarchy.

The following cooling hierarchy has been followed to limit the effects of heat gains in summer:

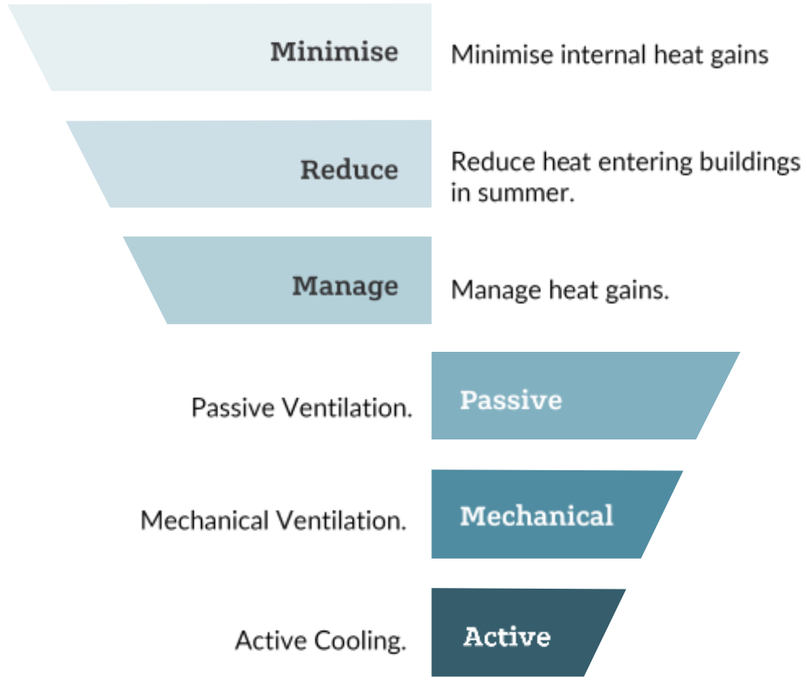


Figure 6: Cooling hierarchy.

5.2 Mitigation strategy.

The following mitigation methods will be implemented within the Proposed Residential Development:

Minimising internal heat generation through energy efficient design
The following mitigation methods will be implemented to minimise the internal heat generation through energy efficient design at the Proposed development:

- Energy efficient lighting (i.e. LED) with low heat output;
- Insulation to heating and hot water pipework and minimisation of dead legs to avoid standing heat loss;
- Energy efficient equipment with low heat output to reduce unnecessary heat gain.

Reducing the amount of heat entering the building in summer
The following mitigation methods will be considered to reduce the amount of heat entering the building in summer within the proposed development:

- A low fabric u-value allows for the slower heat transmission through the material, minimising the amount of heat penetrating the façade.
- A low glazing g-value results in a lower fraction of heat from the sun entering through the window;
- Solar shading via overhangs, window reveals, grills, balcony railings, columns and structures to further reduce solar gains entering the building.

Mechanical ventilation
Due to environmental factors, windows cannot be relied upon for natural ventilation. As such, a mechanical ventilation strategy is proposed for this scheme, with all dwellings achieving the thermal comfort criteria of TM59. Mechanical ventilation is an important element of building services, to maintain good indoor air quality throughout the day by providing fresh air and extracting ventilated air. Providing fresh air minimises the build-up of stale and stagnant air and limits the risk of condensation and mould growth as well as benefitting occupant physical and mental wellbeing.

Mechanical ventilation plant will be located away from pollution sources. It is anticipated that the design flow rates specified will aid the regulation of internal temperatures in summer months.

Active cooling
Where environmental constraints require a dedicated fixed cooling system to be installed within the apartments, modulating control will be integrated to mitigate against the higher instance of overheating typically found in cities due to the Urban Heat Island effect. Cooling will be limited to comfort cooling via peak lopping.

Full active cooling will not be specified.

5.3 Thermal comfort analysis.

The cooling hierarchy principles have been followed as a means of reducing the amount of solar and internal gains, reducing the risk of overheating, and subsequently reducing the demand placed upon active systems.

All dwellings will be provided with a minimum of mechanical ventilation. Additionally, window openings will not be able to be relied upon for natural ventilation to limit overheating due to enviornmental constaints in all apartments due to the city centre location of the development. As such, trim cooling of the MVHR fresh air supply will be incorpoated. Note, dwellings have been tested against the thermal comfort criteria of TM59 and approved document Part O and have been shown to demonstrate compliance with a mechanical ventilation and trim cooling strategy.

5.3.1 Compliance with Thermal Comfort Criteria – Mechanically Ventilated/Comfort Cooled Solution.
Due to environmental factors, windows are not able to be relied upon for natural ventilation. Subsequently, the following Thermal Comfort Criteria must be adhered to as part of the TM59 guidelines in order to achieve compliance with Approved Document Part O.

CIBSE Guide A Fixed Comfort Criteria (all applicable rooms): **Rooms should not exceed operative temperature of 26°C for more than 1% of total annual hours.**

Figure 7: CIBSE TM59 / Part O Thermal Comfort Criteria – Mechanically Ventilated / Cooled.

The following tests were undertaken:

Test	Strategy
1	MVHR only strategy with Part F flow rates, windows closed
2	MVHR strategy with Part F flow rates, and trim cooling with boosted flow rates, windows closed.

5.3.2 Inputs.
Due to the early stage of the design, reasonable assumptions were made. The MVHR flow rates were based on Part F values, and boosted flow rates provided by Hoare Lea MEP for each size of tested dwelling as follows:

Table 7: Bedroom Flow Rates.

Dwelling	Part F (l/s)	Boosted Flow Rate (l/s)
1 bedroom	19	80
2 bedroom	25	100
3 bedroom	31	120

Flow is split between bedrooms and living rooms on an area weighted basis. Window sizes were based on indicative elevations provided by the architect team.

Trim cooling is incorporated within the dwellings as advised by the manufacturer for the KERS unit specified.

The CIBSE TM59 guidance stipulates that modelling must be undertaken with the weather file most appropriate to the location of the site, for the 2020s, high emissions scenario 50th percentile. The most appropriate file for the location of the Arundel Street site is the Manchester weather file.

The weather files available for this assessment are the 2020 High Emissions scenarios 50th Percentile Design Summer Years (DSYs). The three DSYs represent summers with different weather profiles; DSY1 - Moderately warm summer, DSY2 - Short, intense warm spell, - DSY3: Long, less intense warm spell. The risk of overheating has currently been assessed against DSY1, with results being reported in the appendices.



Figure 8: Typical floor layouts used as representative sample of assessed dwellings.

5.3.3 Results.
The below table outlines the Part O overheating compliance results, using CIBSE TM59 criteria, for each scenario tested under both conditions.

Test 1 – MVHR only with Part F flow rates, windows closed

Most tested dwellings do not comply.

Cooling required to be implemented where windows cannot be relied on for natural ventilation.

Test 2 – MVHR with Part F flow rates, boosted comfort cooling, and windows closed

All tested dwellings comply.

Part O and initial planning requirements achieved.

Figure 9: Indicative Part O test results.

The results demonstrate that when the windows are closed and the habitable rooms rely on mechanical ventilation with Part F flow rates only as a means of removing excess heat, there is a significant overheating risk, and the assessed dwellings fail to comply with the TM59 criteria and therefore do not comply with Approved Document Part O.

When comfort cooling is added to the MVHR, the results show mass compliance with the TM59 criteria and therefore Approved Document Part O. Incorporated measures are summarised below:

- Glazing ratio set to balance limiting solar gain whilst maintaining required daylight levels.
- Balanced glazing g-value (of 0.40) to limit solar gain in summer whilst maintaining passive heating benefits in winter.
- Window reveal included to limit solar gains when the sun is high in the sky in summertime.
- Shading from window grilles and Juliet balconies accounted for in glazing Frame Factor.
- Mechanical ventilation with heat recovery (MVHR) with comfort or peak lop cooling incorporated to increase ventilation air flow, maintain comfortable temperatures in summer and recover heat in winter time.

5.4 Assessment of overheating risk in homes - Summary.

Each dwelling assessed within this study has been shown to satisfy the CIBSE TM59 thermal comfort criteria using mechanical ventilation and cooling under the DSY1 2020 climate scenario and therefore compliant with Approved Document Part O.

As window openings cannot be relied upon for natural ventilation, passive and active measures have been incorporated to limit overheating risk, however, comfort cooling will be required. The intention is to provide this via peak lop cooling within the MVHRs. Further analysis will be required as the design progresses.

6. Part L Assessment Results.

It is necessary to translate the energy consumed by the dwelling into a tangible carbon consumption figure to assess the impact on regulated carbon emissions. This is achieved by inputting the details of each apartment into the standardised Part L1 compliance tool which features selections such as: pre-set occupation, small power and set points. The assessed dwelling is then compared to the notional dwelling and assessed based on the betterment of thermal bridges, fabric values and HVAC efficiency.

The overall emissions must achieve compliance by meeting and bettering the target emissions. This following section outlines the anticipate results of the Proposed Development's new build residential elements.

6.1.1 Dwelling Emission Rate analysis.

Under the Part L 2021 assessment methodology, the following results are observed when comparing the Dwelling Emission (DER) Rate with the Part L Target Emission Rate (TER). The proposed development is assessed for block compliance in line with Building Regulation guidance.

	TER $kgCO_2/m^2/year$	DER $kgCO_2/m^2/year$	Betterment
Block Compliance	11.43	3.88	66..05%

Table 8: Dwelling Emission Rate.

6.2 Primary Energy Rate analysis.

Measuring the Dwelling Primary Energy Rate against the notional Target is a new criterion of the Part L 2021 methodology and to comply, energy use intensity must be minimised as much as reasonably possible.

As with the Building Emission Rate, Part L 2021 states that the Dwelling Primary Energy Rate (DPER) must not exceed the notional target primary energy rate (TPER) on a block compliance basis.

	TPER $kWh/m^2/year$	DPER $kWh/m^2/year$	Betterment
Block Compliance	61.95	41.83	32.48%

Table 9: Dwelling Primary Energy.

6.3 Building Fabric Energy Efficiency analysis.

Assessing the Dwelling Fabric Energy Efficiency (DFEE) refers to the energy performance of the fabric. Included within this assessment are:

- The u-values and g-values associated with the dwellings;
- The thermal bridge psi-values and;
- The targeted air permeability of the dwellings.

As before, Part L 2021 states that the DFEE must not exceed the notional Target Fabric Energy Efficiency (TFEE). The Thermal Bridges within a development are required to be independently assessed as part of the update to Part L to ensure that the results are as accurate as possible.

	TFEE $kWh/m^2/year$	DFEE $kWh/m^2/year$	Betterment
Block Compliance	23.95	22.88	4.5%

Table 10: Dwelling Fabric Energy Efficiency.

The tested fabric performance demonstrates a betterment over the TFEE value, with a 4.5% compliance margin shown. Any deviation to the current design may result in a worse Building Fabric Energy Efficiency result and lead to non-compliance with Building Regulations Part L (2021).

7. Conclusion.

This energy strategy has been prepared on behalf of Logik Developments in support of the proposed new build residential elements of the Arundel Street development in Manchester.

This strategy summarises the relevant regulatory and planning policies and sets out how the development will address and achieve the relevant policy targets. The strategy responds to the UK planning and regulatory framework, and specifically to the Manchester Core Strategy policy documentation.

7.1 Planning Policy.

The Manchester Core Strategy Policy EN6 states that residential development of 10 or more units and all other non-residential development over 1,000m^2 is expected as a minimum to meet the following targets (*unless this can be shown not to be viable*):

Table 11 CO_2 Emission Reduction Targets, Manchester Core Strategy.

Target	% Minimum Requirement
Target 1: Network Development Area	CHP/ District heating anchor or connection or, where not feasible, a 15% increase on Part L 2010
Target 2: Electricity Intense Buildings	+ 15% increase on Part L 2010
Target 3: Micro Generation Area	+ 15% increase on Part L 2010

Each of the above targets require a 15% increase (increase is understood to be a reduction over the target) on Part L 2010 emission rates. Broadly speaking, compliance with Part L 2013 required a 9% reduction in carbon emissions compared to Part L 2010. A new domestic building built to ADL 2021 standards will deliver a 31% reduction in CO_2 emissions on average across the new domestic building mix relative to ADL 2013.

As such, compliance with Part L 2021 is expected to achieve compliance with the Planning Policy.

7.2 Passive Design Approach.

The assessment has used the energy hierarchy as part of the design strategy that prioritises passive design in order to minimise energy demand as per the first step of the energy hierarchy.

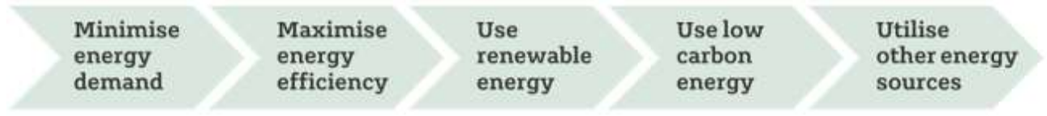


Figure 10: Energy hierarchy.

Passive Design measures are those which reduce the demand for energy within buildings, without consuming energy in the process.

These are the most robust and effective measures for reducing CO_2 emissions as the performance of the solutions, such as façade insulation, is unlikely to deteriorate significantly with time, or be subject to change by future property owners. In this sense, it is possible to have confidence that the benefits these measures will continue at a similar level for the duration of their installation.

7.3 Energy Strategy.

The energy strategy indicates that the residential units could achieve 66.05% reduction in regulated carbon emissions over the Part L 2021 baseline.

The decarbonisation of the grid being reflected in the latest Building Regulations has helped the electrically-driven strategy to achieve greater margins than it would have under previous versions.

This level of performance exceeds the Core Strategy Policy requirement for ≥15% improvement over Part L 2010.

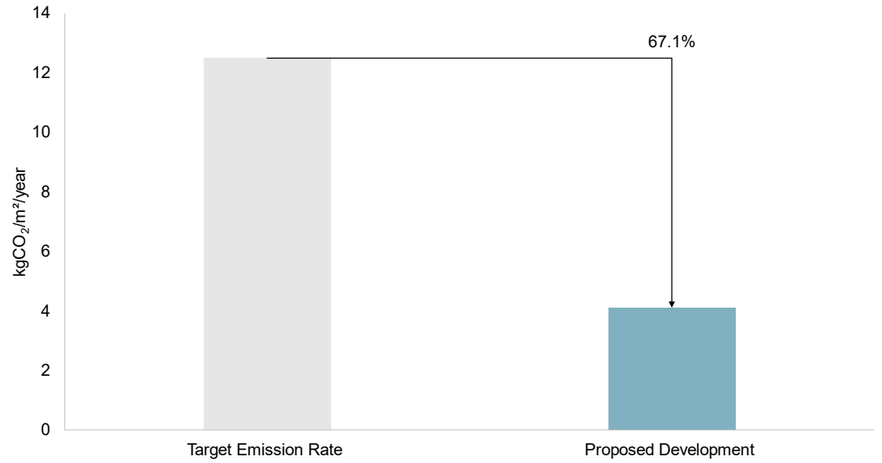


Figure 11: Energy Strategy summary for the Proposed Development.

7.4 Part O Strategy.

The below table outlines the Part O overheating compliance results, using CIBSE TM59 criteria, for each scenario tested under both conditions.

Test 1 – MVHR only with Part F flow rates, windows closed

Most tested dwellings do not comply.

Cooling required to be implemented where windows cannot be relied on for natural ventilation.

Test 2 – MVHR with Part F flow rates, boosted comfort cooling, and windows closed

All tested dwellings comply.

Part O and initial planning requirements achieved.

Figure 12: Indicative Part O test results.

The results demonstrate that when the windows are closed and the habitable rooms rely on mechanical ventilation with Part F flow rates only as a means of removing excess heat, there is a significant overheating risk, and the assessed dwellings fail to comply with the TM59 criteria and therefore do not comply with Approved Document Part O.

When boosted comfort cooling is added, the results show mass compliance with the TM59 criteria and therefore Approved Document Part O.

Appendix A: Software Details.

Compliance software and procedure.

The proposed Arundel Street development has been assessed using the National Calculation Methodology to demonstrate compliance with Approved Document Part L.

Part L1A Residential

The residential units were assessed using SAP approved software (Design SAP 10). The results have been used to inform the energy strategy.

The calculations have been carried out based on drawings provided by Simpson Haugh Architects, and the energy performance parameters identified within this energy strategy. A sample of different unit types were modelled to indicate preliminary results against the three primary metrics assessed under ADL 2021.

1. Carbon Emission Reductions (DER/TER).

   The aggregate dwelling emission rate (DER) for each building should be equal or less than the aggregate target emission rate (TER) for each building before low and zero carbon technologies are taken into account.

2. Fabric Energy Efficiency Standards (DFEE/TFEE).

   The aggregate dwelling fabric energy efficiency standard (DFEE) for each building should be equal or less than the aggregate target fabric energy efficiency standard (TFEE) for each building.

3. Primary Energy Rate (DPER/TPER)

   The aggregate dwelling primary energy rate (DPER) for each building should be equal or less than the aggregate target primary energy rate (TPER) for each building.

Design SAP modelling disclaimer

A new version of Design SAP was released in August 2022, with several further batch releases continuing to be issued since then. As such, the software used to run our analysis is subject to ongoing development and the results from this initial analysis may change slightly when tested in the final version during the next stage.

For this early-stage analysis, certain simplifications have been applied in the SAP calculation to enable results to be processed efficiently. More detailed modelling will be completed during stage 3 when data entry points can be refined. Furthermore, during the next stage, the thermal bridge psi values will need to be calculated in line with BR497 as the default value won't achieve the required dwelling fabric performance and the 'approved' figures can no longer be used.

Part O compliance

A simulation model were created to assess the design of the Arundel Street development. Integrated Environmental Solutions Virtual Environment (IESve) is an approved Dynamic Simulations Modelling (DSM) software package which has the capabilities of enabling the user to create a virtual representation of a building. The results presented in this report for the Non-residential aspects were calculated using the approved compliance software IESve 2023 (v23.1.0.0).

The IESve models were drawn using information provided by the relevant architects.

IESve modelling disclaimer

Full certainty can only be achieved by measuring the performance of the building and associated systems after a period of use.

The actual energy usage for the buildings once occupied may vary from the calculated values submitted to Building Control. These differences will occur due to several variable parameters between the modelled building and the actual building. Such differences will include the hours, levels of occupancy, how the plant is used and the design criteria with regards to how the rooms are environmentally controlled.

Whilst the simulations have been undertaken in good faith using reasonable skill and care, Hoare Lea can take no responsibility for differences between the computer simulations and the actual performance of the completed buildings due to the inherent complexity and variability of the physics in a building and its environment.
It should be noted that the data generated by this work is obtained using approved calculations and computer simulations. These simulations are the best means of predicting the performance of the buildings at this stage.

The calculations produced by Hoare Lea have been carried out with the information provided by the architects to determine whether the Proposed Development can achieve compliance with Approved Document Part O of the Building Regulations.

Appendix B: SAP / Part O input parameters.

Parameter	Notional Values	Proposed New Development
Fabric air permeability ($m^3/m^2.h$ @ 50Pa)	5.00	3.00
External wall U-value ($W/m^2.K$)	0.18	0.16
Party Wall to heated corridor U-value ($W/m^2.K$)**	0.00	0.00
Party Wall to dwelling ($W/m^2.K$)	0.00	0.00
Exposed floor U-value ($W/m^2.K$)	0.13	0.15
Exposed roof U-value ($W/m^2.K$)	0.11	0.15
Glazing U-value ($W/m^2.K$)	1.20	0.90
Glazing g-value	0.63	0.40
Glazing Frame Factor	0.7	Window with grille: 0.37#
		Window at recon-stone: 0.78
		Juliet Balcony window: 0.44#
		Brick façade single window: 0.71
Thermal bridges	SAP10 Appendix R2	SAP10 Appendix R2*

*Thermal bridges must be calculated individually and should match or better the notional values set out in SAP10 Appendix R2.
**Party walls must be calculated individually and should match or better the notional values set out in SAP10.
#Frame factor has been amended to account for shading elements in front of glazing.

Parameter	Proposed New Development
Space heating	Electric Panel, convector or radiant heater [691]
Heating controls	Programmer and room thermostat [2605]
Ventilation	Vent Axia Sentinel Kinetic Advance [500447]
Water heating	Electric heat pump for water heating only [941] Cold Water source: mains Shower type: Vented Flow rate: 7 l/min Hot water cylinder Measured Loss 1 Bed Volume: 145l 1 Bed Loss: 1.18kwh/day 2 Bed+ Volume: 210l 2 Bed+ Loss: 1.42kwh/day
Lighting	Power: 13 W Efficacy: 92 lm.W

Representative sample used for assessments:

	Space use	Proposed Apartments#	Part L: Representative Sample	Part O: Representative Sample
Residential	1 Bed Apartment*	121	1	13
	2 Bed Apartment*	212	6	21
	3 Bed Apartment*	22	-	2

* Areas taken from drawings provided by Simpson Haugh Architects, built according to SAP10 Methodology and National Calculation Methodology (NCM).

Numbers taken from Simpson Haugh Architect's Design Progress Updates Report (14 March 2024)

Appendix C: SAP Summary Input Data (example dwelling).

Summary for Input Data

elmhurst energy

Property Reference	01a FF 1Bed_Copy_Copy			Issued on Date	27/03/2024
Assessment Reference	22_Copy_Copy_Copy			Prop. Type Ref	
Property	D, 01f, Manchester				
SAP Rating	85 B	DER	3.63	TER	14.28
Environmental	97 A	% DER < TER			74.58
CO_2 Emissions (t/year)	0.24	DFEE	31.12	TFEE	32.18
Compliance Check	See BREL	% DFEE < TFEE			3.30
% DPER < TPER	50.24	DPER	39.10	TPER	78.57
Assessor Details	Mr. Callum MacGillivray			Assessor ID	UB82-0001
Client					

SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

Orientation	Southeast
Property Tenture	ND
Transaction Type	6
Terrain Type	Suburban
1.0 Property Type	Flat, Mid-Terrace
Position of Flat	Mid-floor flat
Which Floor	1
2.0 Number of Storeys	1
3.0 Date Built	2024
4.0 Sheltered Sides	3
5.0 Sunlight/Shade	Average or unknown
6.0 Thermal Mass Parameter	Precise calculation
7.0 Electricity Tariff	Standard
Smart electricity meter fitted	No
Smart gas meter fitted	No

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	17.20 m	64.90 m²	2.78 m

8.0 Living Area 25.60 m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
External	Solid Wall	Solid wall : dense plaster, 200 mm dense block, insulated externally	0.18	180.00	23.90	14.85	0.00	None	9.05	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Corridor	Filled Cavity with Edge Sealing	Dense plaster both sides, dense blocks, cavity or cavity fill	0.00	180.00	23.90		None
Party	Filled Cavity with Edge Sealing	Dense plaster both sides, dense blocks, cavity or cavity fill	0.00	180.00	42.30		None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall 1	Dense block, plasterboard on dabs	75.00	51.40

10.1 Party Ceilings

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Party Ceiling 1	Precast concrete planks floor, screed, carpeted	30.00	64.90

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Heatloss Floor 1	Exposed Floor - Solid	Lowest occupied	Other	0.15	None	0.00	0.00	64.90

12.0 Opening Types

Summary for Input Data

elmhurst energy

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Juliet	Manufacturer	Window	Double Low-E Hard 0.2			0.40		0.44	0.90
Half Juliet	Manufacturer	Window	Double Low-E Hard 0.2			0.40		0.71	0.90

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Half Juliet	Juliet	External	North West	4.28	
Juliet	Juliet	External	North West	4.77	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	
17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E1 Steel lintel with perforated steel base plate	Independently assessed	4.23	0.05	0.05	No
E4 Jamb	Independently assessed	12.84	0.05	0.05	No
E7 Party floor between dwellings (in blocks of flats)	Independently assessed	8.60	0.07	0.07	No
E18 Party wall between dwellings	Independently assessed	5.56	0.06	0.06	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	23.80	0.00	0.00	No
E20 Exposed floor (normal)	Table K1 - Default	8.60	0.32	0.32	No
P7 Party Wall - Exposed floor (normal)	Independently assessed	23.80	0.16	0.16	No

Y-value	0.09	W/m²K
18.0 Pressure Testing	Yes	
Designed AP_{50}	3.00	m³/(h.m²) @ 50 Pa
Test Method	Blower Door	

19.0 Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Balanced mechanical ventilation with heat recovery
MV Reference Number	500447
Configuration	1
Manufacturer SFP	0.39
Duct Type	Rigid
MVHR Efficiency	93.00
Wet Rooms	1
SFP from Installer Commissioning Certificate	No
MVHR System Location	Inside heated envelope (installed exclusively)
Duct Installation Specification	Level 1

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System	No
22.0 Lighting	
No Fixed Lighting	No

Name	Efficacy	Power	Capacity	Count
Low energy Lighting	92.00	13	1196	10

24.0 Main Heating 1	Manufacturer	
Percentage of Heat	100.00	%
Fuel Type	Electricity	
TestMethod	not specified	
SAP Code	691	
In Winter	0.00	
In Summer	0.00	

Summary for Input Data

elmhurst energy

Model Name	A
Manufacturer	A
Controls SAP Code	2606
PCDF Controls	0
25.0 Main Heating 2	None
26.0 Heat Networks	None

	Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1										
Heat source 2										
Heat source 3										
Heat source 4										
Heat source 5										

28.0 Water Heating		
Water Heating	Independent	
SAP Code	941	
Fuel Type	Electricity	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
Cold Water Source	From mains	
Bath Count	1	

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	145.00	L
Loss	1.18	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	
31.0 Thermal Store	None	
34.0 Small-scale Hydro	None	

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations
Lower cost measures
None
Further measures to achieve even higher standards

	Typical Cost	Typical savings per year	Ratings after improvement SAP rating	Environmental Impact
			0	0
			0	0
			0	0

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Appendix D: Part O Results Summary.

Mechanically ventilated rooms
CIBSE TM59 overheating methodology for predominantly mech. vent. rooms states the operative temperature of all rooms shall not exceed 26°C for more than 3% of annual occupied hours.

Room name	No. hours > 26°C	% Annual hours > 26°C	Mechanically ventilated check
L03-Unit 1-1B1P-Double Bedroom	0	0.0	Pass
L03-Unit 1-1B1P-Living/Kitchen	0	0.0	Pass
L03-Unit 2-1B2P-Double Bedroom	0	0.0	Pass
L03-Unit 2-1B2P-Living/Kitchen	0	0.0	Pass
L03-Unit 3-3B4P-Double Bedroom 1	0	0.0	Pass
L03-Unit 3-3B4P-Double Bedroom 2	1	0.0	Pass
L03-Unit 3-3B4P-Living/Kitchen	0	0.0	Pass
L03-Unit 4-3B6P-Double Bedroom 1	0	0.0	Pass
L03-Unit 4-3B6P-Double Bedroom 2	0	0.0	Pass
L03-Unit 4-3B6P-Double Bedroom 3	0	0.0	Pass
L03-Unit 4-3B6P-Living/Kitchen	0	0.0	Pass
L03-Unit 5-1B1P-Double Bedroom	0	0.0	Pass
L03-Unit 5-1B1P-Living/Kitchen	0	0.0	Pass
L03-Unit 6-2B2P-Double Bedroom	0	0.0	Pass
L03-Unit 6-2B2P-Living/Kitchen	0	0.0	Pass
L03-Unit 7-2B4P-Double Bedroom 1	0	0.0	Pass
L03-Unit 7-2B4P-Double Bedroom 2	0	0.0	Pass
L03-Unit 7-2B4P-Living/Kitchen	0	0.0	Pass
L03-Unit 8-2B3P-Double Bedroom	0	0.0	Pass
L03-Unit 8-2B3P-Living/Kitchen	0	0.0	Pass
L03-Unit 8-2B3P-Single Bedroom	22	0.3	Pass
L03-Unit 9-2B4P-Double Bedroom 1	0	0.0	Pass
L03-Unit 9-2B4P-Double Bedroom 2	0	0.0	Pass
L03-Unit 9-2B4P-Living/Kitchen	0	0.0	Pass
L03-Unit 10-1B1P-Double Bedroom	0	0.0	Pass
L03-Unit 10-1B1P-Living/Kitchen	0	0.0	Pass
L03-Unit 11-1B-Double Bedroom	0	0.0	Pass
L03-Unit 11-1B-Living/Kitchen	0	0.0	Pass
L03-Unit 12-2B-Double Bedroom 1	0	0.0	Pass
L03-Unit 12-2B-Double Bedroom 2	0	0.0	Pass
L03-Unit 12-2B-Living/Kitchen	0	0.0	Pass
L03-Unit 13-2B-Double Bedroom 1	0	0.0	Pass
L03-Unit 13-2B-Double Bedroom 2	0	0.0	Pass
L03-Unit 13-2B-Living/Kitchen	0	0.0	Pass
L03-Unit 14-2B-Double Bedroom 1	0	0.0	Pass
L03-Unit 14-2B-Double Bedroom 2	0	0.0	Pass
L03-Unit 14-2B-Living/Kitchen	0	0.0	Pass
L03-Unit 15-1B-Double Bedroom	0	0.0	Pass
L03-Unit 15-1B-Living/Kitchen	0	0.0	Pass
L03-Unit 16-2B-Double Bedroom	0	0.0	Pass
L03-Unit 16-2B-Living/Kitchen	0	0.0	Pass
L03-Unit 16-2B-Single Bedroom	0	0.0	Pass
L03-Unit 17-1B-Double Bedroom	0	0.0	Pass
L03-Unit 17-1B-Living/Kitchen	0	0.0	Pass
L03-Unit 18-2B-Double Bedroom	0	0.0	Pass
L03-Unit 18-2B-Living/Kitchen	0	0.0	Pass
L03-Unit 18-2B-Single Bedroom	0	0.0	Pass
L03-Unit 19-1B-Double Bedroom	0	0.0	Pass
L03-Unit 19-1B-Living/Kitchen	0	0.0	Pass
L03-Unit 20-2B-Double Bedroom	0	0.0	Pass
L03-Unit 20-2B-Living/Kitchen	0	0.0	Pass
L03-Unit 20-2B-Single Bedroom	0	0.0	Pass
L03-Unit 21-1B-Double Bedroom	0	0.0	Pass
L03-Unit 21-1B-Living/Kitchen	0	0.0	Pass
L03-Unit 22-2B-Double Bedroom	0	0.0	Pass
L03-Unit 22-2B-Living/Kitchen	0	0.0	Pass
L03-Unit 22-2B-Single Bedroom	0	0.0	Pass
L03-Unit 23-2B-Double Bedroom 1	0	0.0	Pass
L03-Unit 23-2B-Double Bedroom 2	2	0.0	Pass
L03-Unit 23-2B-Living/Kitchen	0	0.0	Pass
L03-Unit 24-1B-Double Bedroom	0	0.0	Pass
L03-Unit 24-1B-Living/Kitchen	0	0.0	Pass
L03-Unit 25-2B-Double Bedroom	0	0.0	Pass
L03-Unit 25-2B-Living/Kitchen	0	0.0	Pass
L03-Unit 25-2B-Single Bedroom	0	0.0	Pass
L03-Unit 26-2B-Double Bedroom	0	0.0	Pass
L03-Unit 26-2B-Living/Kitchen	0	0.0	Pass
L03-Unit 26-2B-Single Bedroom	0	0.0	Pass
L03-Unit 27-2B-Double Bedroom	0	0.0	Pass
L03-Unit 27-2B-Living/Kitchen	0	0.0	Pass
L03-Unit 27-2B-Single Bedroom	0	0.0	Pass
L03-Unit 28-2B-Double Bedroom	0	0.0	Pass
L03-Unit 28-2B-Living/Kitchen	0	0.0	Pass
L03-Unit 28-2B-Single Bedroom	0	0.0	Pass
L03-Unit 29-2B-Double Bedroom	0	0.0	Pass
L03-Unit 29-2B-Living/Kitchen	0	0.0	Pass
L03-Unit 29-2B-Single Bedroom	0	0.0	Pass
L03-Unit 30-2B-Double Bedroom	0	0.0	Pass
L03-Unit 30-2B-Living/Kitchen	0	0.0	Pass

Room name	No. hours > 26°C	% Annual hours > 26°C	Mechanically ventilated check
L03-Unit 31-2B-Double Bedroom	0	0.0	Pass
L03-Unit 31-2B-Living/Kitchen	0	0.0	Pass
L03-Unit 31-2B-Single Bedroom	0	0.0	Pass
L03-Unit 32-2B-Double Bedroom	0	0.0	Pass
L03-Unit 32-2B-Living/Kitchen	0	0.0	Pass
L03-Unit 32-2B-Single Bedroom	0	0.0	Pass
L12-Unit 6-1B2P-Double Bedroom	0	0.0	Pass
L12-Communal Corridor 2	0	0	Pass
L12-Communal Corridor 3	0	0	Pass
L12-Communal Corridor 1	0	0	Pass
L12-Communal Corridor 4	0	0	Pass
L12-Unit 7-2B4P-Living/Kitchen	0	0.0	Pass
L12-Unit 7-2B4P-Double Bedroom 2	1	0.0	Pass
L12-Unit 5-1B2P-Double Bedroom	4	0.0	Pass
L12-Unit 5-1B2P-Living/Kitchen	0	0.0	Pass
L12-Unit 4-2B4P-Double Bedroom 2	27	0.3	Pass
L12-Unit 4-2B5P-Living/Kitchen	0	0.0	Pass
L12-Unit 3-2B4P-Double Bedroom 1	17	0.2	Pass
L12-Unit 3-2B4P-Double Bedroom 2	89	1.0	Pass
L12-Unit 2-2B4P-Double Bedroom 1	51	0.6	Pass
L12-Unit 2-2B4P-Double Bedroom 2	21	0.2	Pass
L12-Unit 1-3B5P-Double Bedroom 1	36	0.4	Pass
L12-Unit 1-3B5P-Single Bedroom	92	1.1	Pass
L12-Unit 1-3B5P-Living/Kitchen	2	0.0	Pass
L12-Unit 1-3B5P-Double Bedroom 2	2	0.0	Pass
L12-Unit 6-1B2P-Living/Kitchen	0	0.0	Pass
L12-Unit 7-2B4P-Double Bedroom 1	0	0.0	Pass
L12-Unit 3-2B4P-Living/Kitchen	3	0.1	Pass
L12-Unit 2-2B4P-Living/Kitchen	0	0.0	Pass
L12-Unit 4-2B4P-Double Bedroom 2	0	0.0	Pass

HOARE LEA

ROWAN PALMER
ASSOCIATE

+44 141 471 0002
rowanpalmer@hoarelea.com

HOARELEA.COM

4th Floor
58 Waterloo Street
Glasgow
G2 7DA
Scotland