Cross Key Street Manchester

Energy & Environmental Standards Statement

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NOVO

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AMENDMENT HISTORY

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1 EXECUTIVE SUMMARY

The proposed development of 104nr Flats at Cross Keys Street, is located within Manchester City Centre and has incorporated building fabric enhancement (above current Building Regulation requirements) and renewable technology to increase the energy efficiency of the building.

This concludes that the development uses less energy, by adopting sustainable design and construction measures and by supplying energy efficiently.

Given the development site's location, policies detailed in the Manchester City Core Strategy must be adhered to. This report will directly address Policy EN4 and EN6 of the Manchester City Core strategy which requires all proposed developments to be designed and built to minimise greenhouse gas emissions across their lifetime and incorporate sustainable design and construction measures to comply with the current criteria set out within their adopted Core Strategy.

The methodology for this report is to take a 'fabric first' approach as set out in Manchester City Councils Core Strategy, making improvements to the envelope first, reviewing the results due to these fabric improvements and then reviewing suitable technologies to enhance this design philosophy where feasible. The calculations have been carried out using current Building Regulations Part L 2021.

The proposed fabric specification is described in Table 1 below. SAP 10.2 Appendix R reference values for thermal junction PSI-values have been used at this stage. Final junction PSI-Values will either be independently calculated where bespoke details are used OR confirmed using pre-existing PSI-Value calculations for common detail build ups listed in an approved database such as Recognised Construction Details. Final proposed PSI-Values are to be provided to the Energy Assessor to confirm compliance with the Part L Fabric Efficiency metric is maintained.

Table 1 Building Fabric Specification

Building Fabric			
Element	**Part L 2021 Limiting U-values (W/m².k)**	**Part L 2021 Notional U-values (W/m².k)**	**Proposed U-values (W/m².k)**
Floors	0.25	0.13	0.12
External Walls	0.30	0.18	0.14
Party walls between dwelling	0.20	0.00	0.00
Roof	0.20	0.13	0.11
Windows	2.00	1.40	1.3 (G-Value 0.63)
Air permeability (m²/h.m² @ 50 pa)			
All dwellings	10.0	5.0	3.0

External Junction Type	Linear Thermal Transmittance Used (Ψ)	Note
E1 Lintel	0.05	Independently calculated or chosen from a database
E3 Sill	0.05	Independently calculated or chosen from a database
E4 Jamb	0.05	Independently calculated or chosen from a database

E5 Ground Floor	0.16	Independently calculated or chosen from a database
E7 Part Floor Between Dwellings	0.07	Independently calculated or chosen from a database
E15 Flat Roof Parapet	0.56	Independently calculated or chosen from a database
E16 Corner (normal)	0.09	Independently calculated or chosen from a database
E17 Inverted Corner	0	Independently calculated or chosen from a database
E18 Party Wall Between Dwellings	0.06	Independently calculated or chosen from a database
Party Wall Junction Type	**Linear Thermal Transmittance Used (Ψ)**	**Note**
P1 Party Wall Ground Floor	0.08	Independently calculated or chosen from a database
P3 Party Wall – Intermediate Floor between dwellings	0	Independently calculated or chosen from a database
Thermal Mass Parameter (TMP)		
Calculated based on detail construction drawings, final thermal mass to achieve a light density of around 100 kJ/m^{2}K. Preliminary construction types entered as follows:		
Construction Type	**General Description**	
Party Walls (to dwellings and heated communal)	Steel Frame	
External Floors	Suspended concrete floor, carpeted	
External Wall	Steel Frame	
Roofs	Plasterboard, insulated at ceiling level	
Internal Partitions	Plasterboard on Timber Frame	

Regarding the systems used, the development will utilise an all-electric approach, heating will be provided by direct acting electric panel heaters and the hot water will be provided by duel electric immersion cylinders. Both systems are highly efficient with a delivery efficiency of 100%. For the ventilation needs, highly efficient Mechanical Ventilation Heat Recovery (MVHR) units will be implemented. Finally, to supplement these systems, a total of 81.6kWp of PV will be installed as the chosen renewable solution, supplying energy to each property. Final installed kWp may change as the design progresses. The main purpose of this installation is to improve the primary energy rating metric which must be passed overall to achieve Part L 2021 compliance.

In addition to efficient systems, consideration has been given to the reduction of mains potable water usage through efficient water fixtures. This is further detailed in section 4.5 however potable water demand is to be reduced to <16 litres/person/day as per the requirement within Building Regulations.

Utilising an all-electric strategy combined with the application of PV will allow the development to achieve the required CO_2 reduction dictated by the Manchester Core Strategy and also open up the opportunity to achieve zero carbon in the future. Currently the portion of renewable energy supplying the national grid is circa 48% therefore as the grid becomes greener so will developments that primarily use grid electricity.

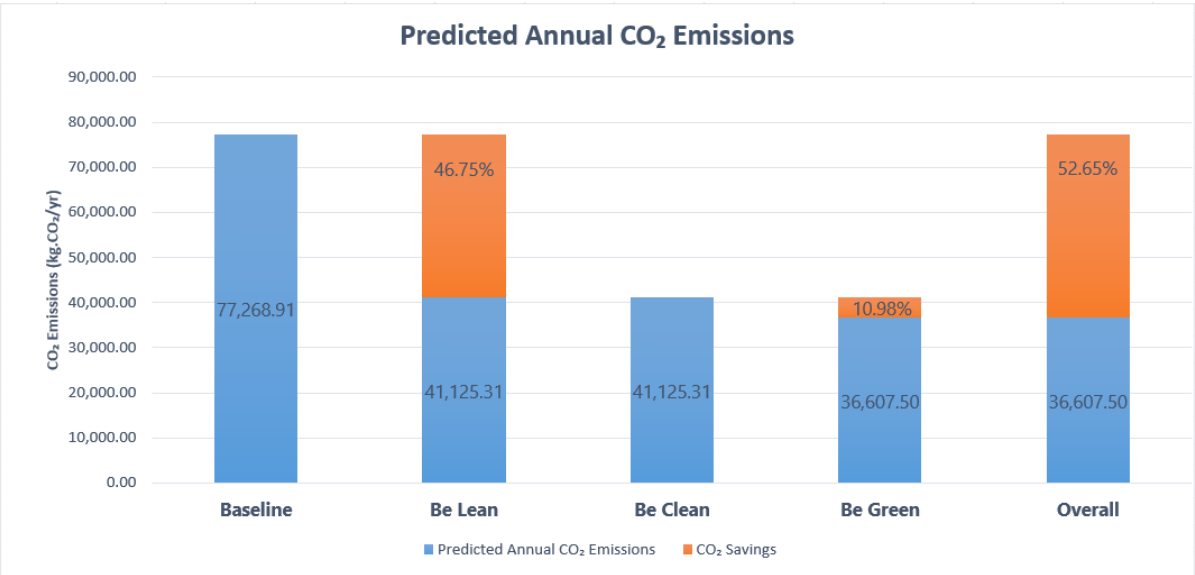
For this project the following results have been obtained, based on an area weighted average block compliance calculation method to adhere to the site wide requirements set out within the Local Authority Policies and the Manchester Core Strategy.

Table 2 As-Designed Building Regulations Part L Volume 1 2021 Results

Target Emission Rate vs Dwelling Emission Rate	
Combined Target Carbon Dioxide Emission Rate (TER)	11.63 $kgCO_2/m^2.yr$
Combined Dwelling Carbon Dioxide Emission Rate (DER)	5.51 $kgCO_2/m^2.yr$
% Reduction	**52.65%**
Target Fabric Energy Efficiency vs Dwelling Fabric Energy Efficiency	
Combined Target Fabric Energy Efficiency (TFEE)	21.12 $kgCO_2/m^2.yr$
Combined Dwelling Fabric Energy Efficiency (DFEE)	21.98 $kgCO_2/m^2.yr$
% Reduction	**3.95%**
Target Primary Energy Rate vs Dwelling Primary Energy Rate	
Combined Target Primary Energy Rate (TPER)	61.44 $kgCO_2/m^2.yr$
Combined Dwelling Primary Energy Rate (DPER)	62.92 $kgCO_2/m^2.yr$
% Reduction	**2.35%**

As all compliance metrics in Table 2 have been passed, it is deemed that the development complies with Part L Volume 1 2021. The Manchester Core Strategy states that a 15% reduction over 2010 Building regulations is required. Current 2021 Building regulations now exceed the previous 2010 Regulations by 37%. As shown in the above table the development achieves a 52.54% CO^2 reduction therefore complying and exceeding the requirements of the Manchester Core Strategy.

Figure 1 Energy Hierarchy overall results

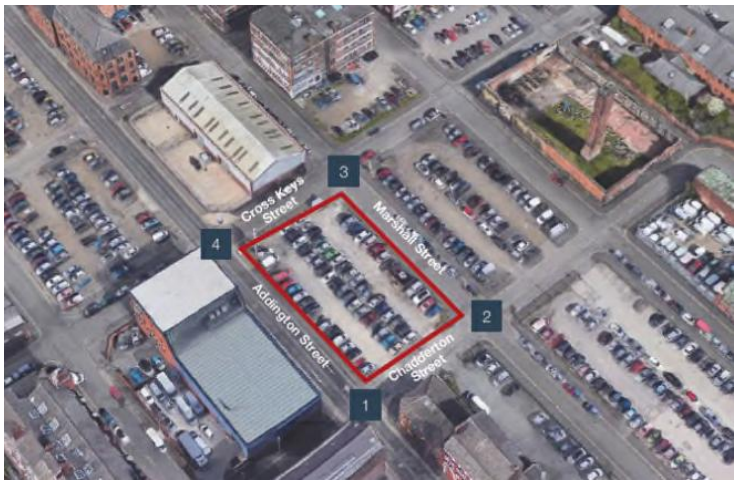


2 INTRODUCTION

2.1 PURPOSE

NOVO Integration Ltd has been appointed as Energy Consultants to produce an Energy strategy for the development at Cross Keys Street, Manchester. This is to support the scheme design process, demonstrate Building Regulations Part L Volume 1 compliance and to achieve the applicable planning polices set out in the Manchester Core Strategy.

Figure 2: Cross Keys Street, Manchester



This report will outline the following:

1. Assess the proposed development site's estimated CO_2 emissions, it will look into the feasibility of Low Zero Carbon technologies, examining the following aspects relative to LZC/renewable technologies:

    - Energy generated by Renewable/Low Zero Carbon Technologies (LZC)
    - Feasibility assessment for each Renewable/Low Zero Carbon Technologies (LZC)
    - Local Planning Requirements

2. The proposed building fabric and Low Zero Carbon (LZC) design strategy and analyse calculations, with respect to the Standard Assessment energy assessment Procedure (SAP). Demonstration of how the design is compliant against the current 2021 Part L Volume 1 Buildings Regulations.

3. The report will follow the steps related to the Energy Hierarchy and prioritise the 'Fabric First' approach defined therein.

2.2 BACKGROUND POLICY DOCUMENTS

The following statements and regulatory guidelines form the policy background to this Energy Strategy:

- The Kyoto Protocol at the United Nations.
- Framework Convention on Climate Change as negotiated in December 1997 has come into effect on 16 February 2005 following the ratification of the agreement by Russia on 18 November 2004. The Burden Sharing Agreement of the EU mandates a 12.5% reduction in greenhouse gas emissions for the UK by 2008 - 12.

- The Department of Transport and Industry White Paper, titled "Our Energy Future - Creating a Low Carbon Economy", spells out a target for 10% of electricity to be from renewable sources nationally by 2010 and twice this by 2020.
- National Policy Objectives in regard to renewable energy Planning Policy Statement 22: Renewable energy guidance for local governing bodies concerning implementation of renewable energy technologies through appropriate planning.
- The United Kingdom has made commitments that extend beyond this requirement. National Targets are for a reduction to 20% below 1990 CO_2 levels by 2010 and a 60% reduction by 2050.
- Integrating renewable energy into new developments: Toolkit for planners, developers and consultants, September 2004.
- National Planning Policy Framework (July 2021)
  The National Planning Policy Framework is a key part of our reforms to make the planning system less complex and more accessible, to protect the environment and to promote sustainable growth. In particular point A of paragraph 16 which states the following:

  Plans should:

  a) be prepared with the objective of contributing to the achievement of sustainable development.

  b) be prepared positively, in a way that is aspirational but deliverable

  c) be shaped by early, proportionate, and effective engagement between plan makers and communities, local organisations, businesses, infrastructure providers and operators and statutory consultees

  d) contain policies that are clearly written and unambiguous, so it is evident how a decision maker should react to development proposals

  e) be accessible through the use of digital tools to assist public involvement and policy presentation; and

  f) serve a clear purpose, avoiding unnecessary duplication of policies that apply to a particular area (including policies in this Framework, where relevant).

Another key point of the NPPF is paragraph 8, point C which states the following:

Achieving sustainable development means that the planning system has three overarching objectives, which are interdependent and need to be pursued in mutually supportive ways (so that opportunities can be taken to secure net gains across each of the different objectives):

a) 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;
b) 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 a well-designed and safe built environment, with accessible services and open spaces that reflect current and future needs and support communities' health, social and cultural well-being; and

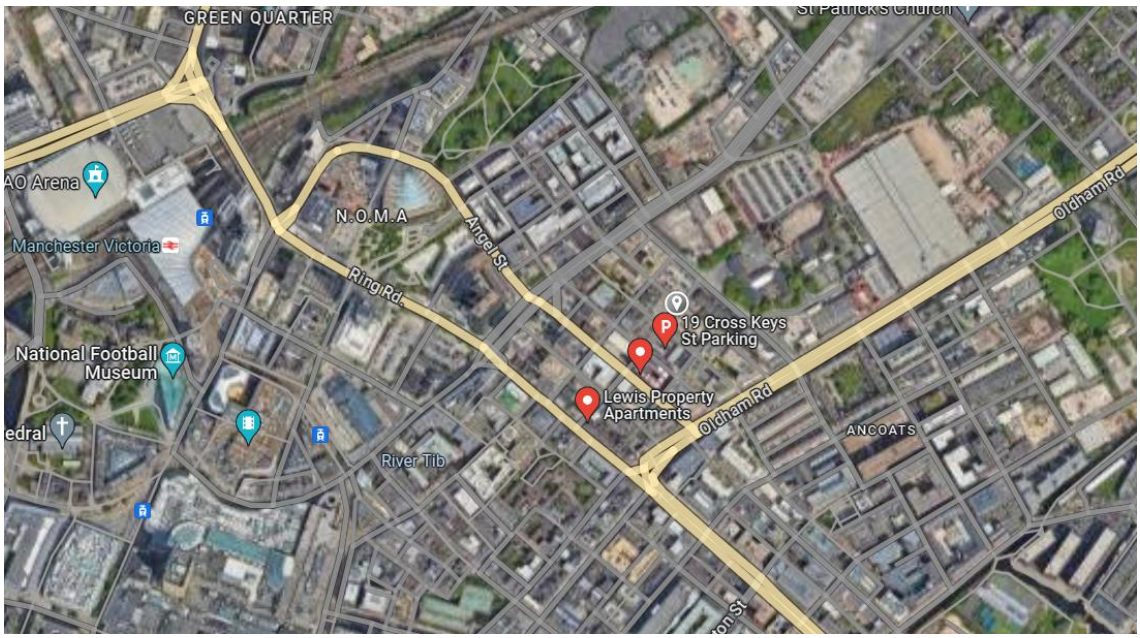
c) *an environmental objective – to contribute to protecting and enhancing our natural, built and historic environment; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy.*

- Manchester Core Strategy 2012-2027
- Manchester City Council Climate Change Framework (2020-2025)
- Approved Document Part L Volume 1: Dwellings 2021

2.3 SITE DESCRIPTION

The Site is located on Cross Keys Street located in close proximity to Manchester Victoria Station. The surrounding area is predominantly domestic in nature with various new builds neighbouring the development. Local amenity's nearby include supermarkets, retail opportunities, good transport links and various museums.

Figure 3: Ariel View



2.4 PLANNING POLICY

2.4.1 Local Policy

The locality of the development site means it falls under the jurisdiction of Manchester City Council. As such the policies adopted by Manchester City Council must be adhered to.

The document that details Manchester's strategy for development is 'Manchester's Local Development Framework – Core Strategy Development Plan Document', throughout the remainder of this report it shall be referred to as Manchester Core Strategy. The Core Strategy was adopted 11th July 2012.

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:

- *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*
- *Wherever possible new development and retrofit projects, including energy generation plant, must be located and designed in a manner that allows advantage to be taken of opportunities for low and zero carbon energy supplies*
- *Where possible new development and retrofit projects will be used as a mechanism to help improve energy efficiency and provide low and zero carbon energy supplies to existing buildings*
- *Where appropriate new development and retrofit projects will be required to connect to and/or make contributions to low or zero carbon energy schemes and/or to incorporate provision to enable future connection to any existing / potential decentralised energy schemes*

Policy EN6
Target Framework for CO_2 reductions from low or zero carbon energy supplies

Applications for residential development of 10 or more units and all other development over 1,000 sq m will be expected as a minimum to meet the target shown in Tables 12.1 or 12.2, unless this can be shown not to be viable. This should be demonstrated through an energy statement, submitted as part of the Design and Access Statement. Such a statement will be expected to set out the projected regulated energy demand and associated CO_2 emissions for all phases of the development.

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

The target framework relates to three broad development locations and their potential for low and zero carbon, decentralised energy. The areas are defined as follows:

- *Target 1 Network development areas: Locations where the proximity of new and existing buildings, the mix of uses and density of development provide the right conditions to support district heating (and cooling)*
- *Target 2 Electricity intense areas: Locations where the predominant building type has an all-electric fit-out such as retail units and leisure complexes*
- *Target 3 MICRO-GENERATION AREAS: Locations where lower densities and a fragmented mix of uses tend to mean that only building scale solutions are practical*

Policy EN8:
Adaptation to Climate Change

The council outlines an indicative list of remedial actions for new developments in order to be adaptable to climate change in terms of design, layout, siting and function:

- *Minimisation of flood risk by appropriate siting, drainage, and treatment of surface areas to ensure rainwater permeability*
- *Reduction in urban heat island effect through the use of Green Infrastructure such as green roofs, green walls, increased tree cover and waterways*
- *The need to control overheating of buildings through passive design*
- *The opportunity to provide linked and diverse green space to enhance natural habitats which will assist species adaptation*

Domestic CO_2 emission targets
Table 12.1

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*

Non-domestic CO_2 emissions reduction targets
Table 12.2

Target	***% Minimum requirement***
Target 1: Network development area	*CHP/district heating anchor or connection or where not feasible a 15% increase on Part L 2010*
Target 2: Electricity intense buildings *(applies to commercial uses with a high proportion of emissions from electricity use (>45kgCO2/m2)*	*+15% increase on Part L 2010*
Target 3: Micro generation area	*+15% increase on Part L 2010*

Where the CO_2 emissions reduction required under any future revision to Part L of the building regulations become greater than the '% minimum requirement', the reduction required under building regulations would apply.

Where the Council identifies an 'allowable solution', for example within an energy proposals plan, that would produce higher carbon reductions at no extra cost than that of achieving the '% Minimum requirement' (or required under building regulations if greater) the higher percentage reduction will be required. The cost comparison is based on the cost of incorporating the 'allowable solution' at design stage.

The energy statement will be required to be submitted at the outset of any proposed development (outline application or before). Developers will be permitted to use green infrastructure elements such as green roofs, green walls, street trees and waterways to contribute to compliance with CO_2 mitigation, subject to the energy statement incorporating evidence such as modelling to demonstrate compliance.

Guidance on what the energy statement should contain and how to decide which target applies to a development proposal is given in appendix A.

The above policy states that this specific development requires a 15% betterment with CO_2 emission reduction over 2010 Building Regulations. However, the development will be constructed to adhere to 2021 Building Regulations.

2021 Part L Volume 1 Building Regulations is widely recognised within the industry as being 37% better than 2010. Meaning that it is already more onerous to achieve just a Building Regulations pass.

This is the target that shall be utilised throughout the remainder of this report.

Furthermore Section 4 Environmental Standards of the Manchester Supplementary Planning Document details the requirement for and Environmental Standards Statement highlighting a number of Environmental issues be addressed. These issues are addressed in Section 5 of this report.

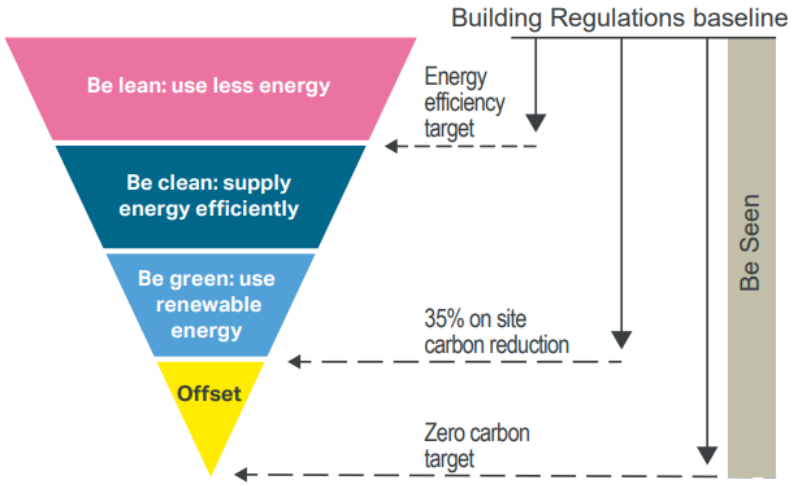
2.4.2 Energy Hierarchy

As part of the Sustainability and Energy analysis of the development Energy Hierarchy has been used as a means of structuring the sustainable design process.

We have taken this approach in order to properly address the Manchester Core Strategy Policies which promote low carbon design, assessment of connection to CHP and consideration of other low – zero carbon technologies.

An overview of the Energy Hierarchy is provided below:

Figure 4: Energy Hierarchy Diagram



- Using less energy, in particular by adopting sustainable design and construction measures.
- Supplying energy efficiency, in particular by prioritising decentralised energy generation; and
- Using renewable energy.

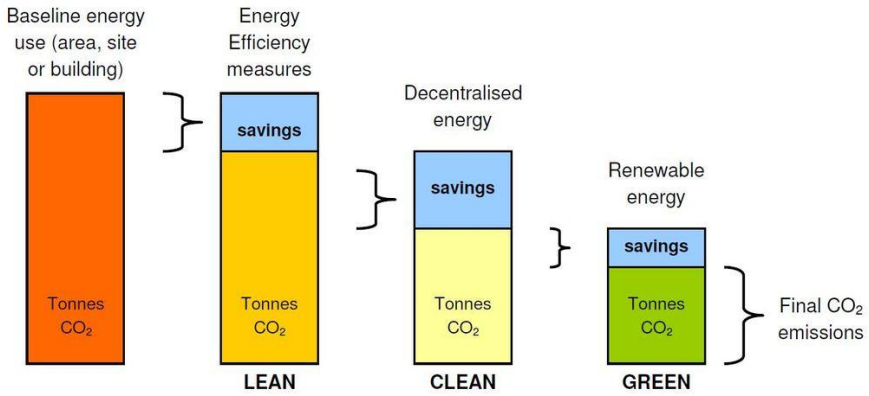
The development Energy strategy has adopted the following design ethos:

- **BE LEAN** – By using less energy and taking into account the further energy efficiency measure in comparison to the baseline building.

- **BE CLEAN** – By supplying energy efficiently. The clean building looks at further carbon dioxide emission savings over the lean building by taking into consideration the use of decentralise energy via CHP.

- **BE GREEN** – By integrating renewable energy into the scheme which can further reduce the carbon dioxide emission rate.

Figure 5: Energy Hierarchy Example Graph



2.5 BUILDING REGULATIONS

Compliance with the Approved Document Part L Volume 1 2021 should be demonstrated at detailed design stage, prior to construction in the detail design phase of the project.

The requirements for Part L 2021 Building Regulations are summarised below however, In this case a Part L 2021 calculation has been used to demonstrate compliance with the Manchester Core Strategy requirements.

1) The Dwelling Emission Rate must be lower than the Target Emission Rate
2) The Dwelling Fabric Energy Efficiency must be lower than the Target Fabric Energy Efficiency
3) The Dwelling Primary Energy Rate must be lower than the Target Primary Energy Rate

The following are some key extracts from ADL1 detailing the requirements of the regulations, for full details please refer to Part L Volume 1 2021.

Regulations

Methodology of calculation of the energy performance

24. (1) The Secretary of State shall approve—

(a) a methodology of calculation of the energy performance of buildings, including methods for calculating asset ratings and operational ratings of buildings; and

(b) ways in which the energy performance of buildings, as calculated in accordance with the methodology, shall be expressed.

(2) In this regulation—

"asset rating" means an energy performance indicator determined from the amount of energy estimated to meet the different needs associated with a standardised use of the building; and

"operational rating" means an energy performance indicator determined from the amount of energy consumed during the occupation of a building over a period of time and the energy demand associated with a typical use of the building over that period.

Minimum energy performance requirements for new buildings

25. Minimum energy performance requirements shall be approved by the Secretary of State, calculated and expressed in accordance with the methodology approved pursuant to regulation 24, for—

(a) new buildings (which shall include new dwellings), in the form of target CO_2 emission rates;

(b) new dwellings, in the form of target fabric efficiency rates; and

(c) new buildings in the form of target primary energy rates.

Nearly zero-energy requirements for new buildings

25B. Where a building is erected, it must be a nearly zero-energy building.

CO_2 emission rates for new buildings

26. Where a building is erected, it shall not exceed the target CO_2 emission rate for the building that has been approved pursuant to regulation 25, applying the methodology of calculation and expression of the energy performance of buildings approved pursuant to regulation 24.

Fabric energy efficiency rates for new dwellings

26A. Where a dwelling is erected, it shall not exceed the target fabric energy efficiency rate for the dwelling that has been approved pursuant to regulation 25, applying the methodology of calculation and expression of the energy performance of buildings approved pursuant to regulation 24.

Target primary energy rates for new buildings

26C. Where a building is erected it must not exceed the target primary energy rate for the building which has been approved pursuant to regulation 25(c), applying the methodology of calculation and expression of the energy performance of buildings approved pursuant to regulation 24.

Regulation *continued*

CO_2 emission rate calculations

27. (1) This regulation applies where a building is erected and regulation 26 applies.

(2) Not later than the day before the work starts, the person carrying out the work shall give the local authority a notice which specifies—

(a) the target CO_2 emission rate for the building, calculated and expressed in accordance with the methodology approved pursuant to regulation 24,

(b) the CO_2 emission rate for the building as designed, calculated and expressed in accordance with the methodology approved pursuant to regulation 24, and

(c) a list of specifications to which the building is to be constructed.

(3) Not later than five days after the work has been completed, the person carrying out the work shall give the local authority—

(a) a notice which specifies—

(i) the target CO_2 emission rate for the building, calculated and expressed in accordance with the methodology approved pursuant to regulation 24,

(ii) the CO_2 emission rate for the building as constructed, calculated and expressed in accordance with the methodology approved pursuant to regulation 24, and

(iii) whether the building has been constructed in accordance with the list of specifications referred to in paragraph (2)(c), and if not a list of any changes to those specifications; or

(b) a certificate of the sort referred to in paragraph (4) accompanied by the information referred to in sub-paragraph (a).

(4) A local authority are authorised to accept, as evidence that the requirements of regulation 26 have been satisfied, a certificate to that effect by an energy assessor who is accredited to produce energy performance certificates for that category of building.

(5) In this regulation, "specifications" means specifications used for the calculation of the CO_2 emission rate.

Fabric energy efficiency rate calculations

27A. (1) This regulation applies where a dwelling is erected and regulation 26A applies.

(2) Not later than the day before the work starts, the person carrying out the work shall give the local authority a notice which specifies—

(a) the target fabric energy efficiency rate for the dwelling, calculated and expressed in accordance with the methodology approved pursuant to regulation 24;

(b) the fabric energy efficiency rate for the dwelling as designed, calculated and expressed in accordance with the methodology approved pursuant to regulation 24; and

(c) a list of specifications to which the dwelling is to be constructed.

(3) Not later than five days after the work has been completed, the person carrying out the work shall give the local authority—

(a) a notice which specifies—

(i) the target fabric energy efficiency rate for the dwelling, calculated and expressed in accordance with the methodology approved pursuant to regulation 24;

(ii) the fabric energy efficiency rate for the dwelling as constructed, calculated and expressed in accordance with the methodology approved pursuant to regulation 24; and

(iii) whether the dwelling has been constructed in accordance with the list of specifications referred to in paragraph (2)(c), and if not a list of any changes to those specifications; or

(b) a certificate of the sort referred to in paragraph (4) accompanied by the information referred to in sub-paragraph (a).

(4) A local authority is authorised to accept, as evidence that the requirements of regulation 26A have been satisfied, a certificate to that effect by an energy assessor who is accredited to produce energy performance certificates for that category of building.

(5) In this regulation, "specifications" means specifications used for the calculation of the fabric energy efficiency rate.

Regulation *continued*

Target primary energy rate calculations for new buildings

27C. (1) This regulation applies where a building is erected.

(2) Not later than the day before the work starts, the person carrying out the work must give the local authority a notice which specifies—

(a) the target primary energy rate for the building calculated and expressed in accordance with the methodology approved pursuant to regulation 24;

(b) the calculated target primary energy rate for the building as designed, calculated and expressed in accordance with the methodology approved pursuant to regulation 24; and

(c) the list of specifications to which the building is to be constructed.

(3) Not later than five days after the work has been completed, the person carrying out the work must give the local authority—

(a) a notice which specifies—

(i) the target primary energy rate for the building calculated and expressed in accordance with the methodology approved pursuant to regulation 24;

(ii) the calculated target primary energy rate for the building as constructed, calculated and expressed in accordance with the methodology approved pursuant to regulation 24; and

(iii) whether the building has been constructed in accordance with the list of specifications referred to in paragraph (2)(c), and if not a list of any changes to those specifications; or

(b) a certificate of the sort referred to in paragraph (4) accompanied by the information referred to in sub-paragraph (a).

(4) A local authority is authorised to accept, as evidence that the requirements of regulation 26C have been satisfied, a certificate to that effect by an energy assessor who is accredited to produce energy performance certificates for that category of building.

(5) In this regulation, "specifications" means specifications used for the calculation of the target primary energy rate.

In addition to the upcoming fuel carbon factors this Energy Strategy has also given consideration to the RIBA 2030 Climate Challenge.

The RIBA 2030 Climate Challenge sets out a number of Sustainable Outcome targets including:

- Operational Energy
- Embodied Carbon
- Potable Water Use

It also sets out a number of best practice Health Targets including:

- Overheating
- Daylighting
- CO_2 Levels
- Total VOC's (Volatile Organic Compounds)
- Formaldehyde

The RIBA 2030 Climate Challenge was created following the RIBA Council vote on 29th June 2019 to join the global declaration of an environmental and climate emergency. These targets are none binding and still under development as RIBA discusses these metrics further with industry bodies before the targets are finalised. They do however make a useful resource for best practice given that these targets were developed to address the current climate emergency, therefore, although the targets are non-binding they have been considered where appropriate.

Figure 6: RIBA 2030 Climate Challenge Target Metrics

RIBA 2030 Climate Challenge target metrics for domestic buildings

RIBA Sustainable Outcome Metrics	Current Benchmarks	2020 Targets	2025 Targets	2030 Targets	Notes
Operational Energy kWh/m²/y	146 kWh/m² /y (Ofgem benchmark)	< 105 kWh/m²/y	< 70 kWh/m²/y	< 0 to 35 kWh/m²/y	UKGBC Net Zero Framework 1. Fabric First 2. Efficient services, and low-carbon heat 3. Maximise onsite renewables 4. Minimum offsetting using UK schemes (CCC)
Embodied Carbon $kgCO_2e/m^2$	1000 $kgCO_2e/m^2$ (M4i benchmark)	< 600 $kgCO_2e/m^2$	< 450 $kgCO_2e/m^2$	< 300 $kgCO_2e/m^2$	RICS Whole Life Carbon (A-C) 1. Whole Life Carbon Analysis 2. Using circular economy Strategies 3. Minimum offsetting using UK schemes (CCC)
Potable Water Use Litres/person/day	125 l/p/day (Building Regulations England and Wales)	< 110 l/p/day	< 95 l/p/day	< 75 l/p/day	CIBSE Guide G

RIBA 2030 Climate Challenge target metrics for non-domestic buildings

RIBA Sustainable Outcome Metrics	Current Benchmarks	2020 Targets	2025 Targets	2030 Targets	Notes
Operational Energy kWh/m²/y	225 kWh/m²/y DEC D rated (CIBSE TM46 benchmark)	< 170 kWh/m²/y DEC C rating	< 110 kWh/m²/y DEC B rating	< 0 to 55 kWh/m²/y DEC A rating	UKGBC Net Zero Framework 1. Fabric First 2. Efficient services, and low-carbon heat 3. Maximise onsite renewables 4. Minimum offsetting using UK schemes (CCC)
Embodied Carbon $kgCO_2e/m^2$	1100 $kgCO_2e/m^2$ (M4i benchmark)	< 800 $kgCO_2e/m^2$	< 650 $kgCO_2e/m^2$	< 500 $kgCO_2e/m^2$	RICS Whole Life Carbon (A-C) 1. Whole Life Carbon Analysis 2. Using circular economy Strategies 3. Minimum offsetting using UK schemes (CCC)
Potable Water Use Litres/person/day	>16 l/p/day (CIRA W11 benchmark)	< 16 l/p/day	< 13 l/p/day	< 10 l/p/day	CIBSE Guide G

RIBA 2030 Climate Challenge target metrics for all buildings

Best Practice Health Metrics		References
Overheating	25-28 °C maximum for 1% of occupied hours	CIBSE TM52, CIBSE TM59
Daylighting	> 2% av. daylight factor, 0.4 uniformity	CIBSE LG10
CO_2 levels	< 900 ppm	CIBSE TM40
Total VOCs	< 0.3 mg/m³)	Approved Document F
Formaldehyde	< 0.1 mg/m³)	BREEAM

Above is an extract showing the target metrics for domestic and non-domestic buildings. Particularly relevant to this report are the "Operational Energy" and "Potable Water Use" targets as through a fabric first approach, low/zero carbon technology and use of renewables these issues have been considered.

The Embodied Carbon target is addressed as far as our capacity as the Sustainability Consultant is concerned however in order to fully tackle the Whole Life Carbon of the building using Circular Economy Strategies; consideration of Embodied Carbon will be required by all parties involved with the design, construction and operation of each block, particularly parties with ISO14001 accreditation.

We have endeavoured to achieve the targets outlined through the fabric first approach combined with Low Carbon technology and efficient fittings all of which are detailed further in this report.

3 DESIGN PARAMETERS

3.1 METHODOLGY

The Standard Assessment Procedure (SAP) is the Government's approved methodology for assessing the predicted energy consumption and carbon dioxide emissions for new dwellings. Results are derived in respect of floor area and consider energy use (kWh/m^2/yr.) and associated CO_2 emissions (kg.CO_2/m^2/yr.) from the following:

- Space heating
- Domestic hot water
- Ventilation
- Lighting
- Ancillary pumps and fans
- Energy generation technology

SAP is compliant with the EU Energy Performance of Buildings Directive and is carried out using approved software. For the purpose of this report, data has been produced by an accredited domestic energy assessor using Design SAP 10.

To enable a review of each level of the Energy Hierarchy, firstly the Baseline CO_2 emission figures must be established. These figures are based on Part L Volume 1 2021 'Notional Dwelling', a specific set of specification criteria referenced in section 3.4 of this report.

All additional measures included to reduce the overall CO_2 emissions to the appropriate target of net zero, such as improved building fabric and renewable technology will be compared against the Baseline figures. These figures are the Target Emission Rate derived from SAP 10.2 for each of the specific dwellings within the development.

A 'fabric first' approach will be undertaken throughout this report, looking at improvements to the thermal envelope initially to understand the improvements that can be gained prior to the feasibility any renewable / low carbon technologies.

An overall area weighted average figure will then be assessed to comply with the policies set out by the Manchester Core Strategy.

NOVO Integration Ltd have used the following information to formulate the Energy Strategy.

3.2 ARCHITECTURAL DRAWINGS BY TIM GROOM ARCHITECTS

Table 3 Architects Drawing Schedule

Drawing Number	Drawing Contents
1111-TGA-XX-00-DR-A-95300-P01 General Arrangement - Level 00	Proposed Level 00
1111-TGA-XX-UG-DR-A-95310-P01 General Arrangement - Upper GF	Proposed Level UGF
1111-TGA-XX-01-DR-A-95301-P01 General Arrangement - Level 01	Proposed Level 01
1111-TGA-XX-02-DR-A-95302-P01 General Arrangement - Level 02-05	Proposed Level 02-05
1111-TGA-XX-06-DR-A-95306-P01 General Arrangement - Level 06	Proposed Level 06
1111-TGA-XX-06-DR-A-95307-P01 General Arrangement - Level 07	Proposed Level 07
1111-TGA-XX-08-DR-A-95308-P01 General Arrangement - Level 08	Proposed Level 08

Drawing Number	Drawing Contents
1111-TGA-XX-RF-DR-A-95309-P01 General Arrangement - Roof Plan	Proposed Roof Plan
1111-TGA-XX-ZZ-DR-A-95400-P01 General Arrangement - Section AA	Proposed Section AA
1111-TGA-XX-ZZ-DR-A-95401-P01 General Arrangement - Section BB	Proposed Section BB
1111-TGA-XX-ZZ-DR-A-95402-P01 General Arrangement - Section CC	Proposed Section CC
1111-TGA-XX-ZZ-DR-A-95500-P02 General Arrangement - Goulden Street	Proposed Elevation
1111-TGA-XX-ZZ-DR-A-95501-P02 General Arrangement - Cross Keys	Proposed Elevation
1111-TGA-XX-ZZ-DR-A-95502-P02 General Arrangement - Marshall Street	Proposed Elevation
1111-TGA-XX-ZZ-DR-A-95503-P02 General Arrangement - Chadderton Street	Proposed Elevation

3.3 FUEL

Figure 7: Fuel Factors Applied Within Part L Calculation

$kgCO_2/kWh$	SAP 2012	SAP 10.1
Gas:		
mains gas	0.216	0.210
bulk LPG	0.241	0.241
bottled LPG	0.241	0.241
bottled LPG (no contract)	0.241	0.241
LPG subject to Special Condition 18	0.241	0.241
biogas (including anaerobic digestion)	0.098	0.024
Liquid fuel:		
heating oil	0.298	0.298
biodiesel from any biomass source	0.123	0.038
biodiesel from vegetable oil only	0.083	0.018
appliances able to use mineral oil or biodiesel	0.298	0.298
B30K	0.245	0.220
bioethanol from any biomass source	0.140	0.105
Solid fuel:		
house coal	0.394	0.395
anthracite	0.394	0.395
manufactured smokeless fuel	0.433	0.366
wood logs	0.019	0.028
wood pellets (in bags for secondary heating)	0.039	0.053
wood pellets (bulk supply for main heating)	0.039	0.053
wood chips	0.016	0.023
dual fuel appliance (mineral and wood)	0.226	0.087
Electricity:		
standard tariff	0.519	0.136
7-hour tariff (high rate)	0.519	0.136
7-hour tariff (low rate)	0.519	0.136
10-hour (high rate)	0.519	0.136
10-hour (low rate)	0.519	0.136
18-hour (high rate)	0.519	0.136
18-hour (low rate)	0.519	0.136
24-hour heating tariff	0.519	0.136
electricity exported to grid	0.519	0.136
electricity, any tariff	0.519	0.136
Community heating schemes:		
heat from boilers - mains gas	0.216	0.210
heat from boilers - LPG	0.241	0.241
heat from boilers - oil	0.331	0.335
heat from boilers that can use mineral oil or biodiesel	0.331	0.335
heat from boilers using biodiesel from any biomass source	0.123	0.038
heat from boilers using biodiesel from vegetable oil only	0.083	0.018
heat from boilers - B30D	0.269	0.269
heat from boilers - coal	0.380	0.375
heat from electric heat pump	0.519	0.136
heat from boilers - waste combustion	0.047	0.074
heat from boilers - biomass	0.031	0.029
heat from boilers - biogas (landfill or sewage gas)	0.098	0.024
waste heat from power station	0.058	0.015
geothermal heat source	0.041	0.011
heat from CHP	as above	0.011
electricity generated by CHP	0.519	0.136
electricity for pumping in distribution network	0.519	0.136

3.4 BASELINE CO_2 EMISSIONS

For the purpose of this report the baseline energy use and CO2 emissions are calculated based on the 'Notional Dwelling' requirements specified in the Building Regulations Part L Volume 1 2021 (Table 1.1).

Table 4 Residential Baseline Building Fabric

Building Fabric			
Element	**L1A: 2021 Limiting U-values (W/m².k)**	**L1A: 2021 Notional U-values (W/m².k)**	**Proposed U-values (W/m².k)**
Floors	0.18	0.13	-
External Walls	0.26	0.18	-
Party walls between dwelling	0.20	0.00	-
Roof	0.16	0.11	-
Windows	1.60	1.20	-
Doors	1.6	1.0	-
Air permeability (m²/h.m² @ 50 pa)			
All dwellings	8.0	5.0	-

The following table details the notional baseline area weighted CO_2 regulated emissions for the development. The target emission rates (TER's) in the above figures combined with the total floor area was used to produce the baseline CO_2 emissions below.

In order to satisfy the Manchester Core Strategy, this development must achieve a 15% reduction over 2010 Building Regulations the base line figure presented. A full copy of the SAP calculations has also been included within the Appendix of this report.

Table 5 Estimated Baseline Carbon Emissions SAP 10 Building Regulations

Building Services	**Baseline CO2 Emissions (kg CO_2/m2)**
Total regulated emissions (heating, hot water, lighting, fans & pumps)	77,268.91

The following table details the notional baseline area weighted CO_2 regulated emissions for the development. The target emission rates (TER's) in the above figures combined with the total floor area was used to produce the baseline CO_2 emissions below.

By using low u-values and high-performance materials to reduce greenhouse emissions and improve energy efficiency; the Be Lean stage of this report addresses policies EN4 and EN6 of the Manchester Core Strategy and is in accordance with Paragraph 8 of the National Planning Policy Framework (NPPF) by reducing CO_2 emissions and supporting a low carbon economy.

4 ENERGY STRATEGY

4.1 ENERGY EFFICIENT DESIGN

This section outlines the design energy efficient measures taken in order to minimise the building's energy demand and therefore reduce energy use and CO_2 emissions further than the Baseline (Building Regulations 2021 Part L Volume 1 compliance). Often referred to as the 'Fabric First' approach.

The energy efficient measures include:

a) Inclusion of better U-values than the minimum U-values set in the AD Volume 1
b) Designing for a buildings air permeability exceeding AD Volume 1 target values
c) Utilising Mechanical Ventilation Heat Recovery Systems to all dwellings
d) Utilising low energy efficient lighting such as LED lighting

The table below outlines the improvements made to the building fabric elements compared against both the Building Regulations limiting U-values and the 'Notional Dwelling' U-values which the baseline is derived from.

Table 2 Proposed Building Fabric Specification

Building Fabric			
Element	**L1A: 2021 Limiting U-values (W/m².k)**	**L1A: 2021 Notional U-values (W/m².k)**	**Proposed U-values (W/m².k)**
Floors	0.18	0.13	0.12
External Walls	0.26	0.18	0.14
Party walls between dwelling	0.20	0.00	0.00
Roof	0.16	0.11	0.11
Windows	1.60	1.20	1.3 (G-Value 0.63)
Air permeability (m²/h.m² @ 50 pa)			
All dwellings	8.0	5.0	3.0

As can be seen in the table above all elements of the building fabric have been improved significantly over the standard notional values, this results in a strong CO_2 reduction at the Be Lean Stage as detailed in section 4.2. The proposed U-Values detailed above are highly efficient primarily to ensure compliance with the fabric efficiency target as displayed in Figure 5 above.

4.1.1 Heating Demand

The heating energy demand will be reduced by providing high performance insulation of the building envelope as well as a low Air Permeability Target in order to minimise heat losses.

At the Be Lean stage, 100% efficient Electric Panel Heaters have also been observed for heating demand. DHW will be electric immersion cylinders which also have a 100% delivery efficiency. As this strategy effectively reduces the reliance on fossil fuels and contributes to the overall CO_2 reduction of the development, it therefore addresses Policy EN6 of the Manchester Core Strategy whilst also adhering to paragraph 150 of the National Planning Policy Framework (NPPF).

4.1.2 Ventilation

The entire site will utilise a Heat Recovery Mechanical Ventilation system (MVHR). This is to ensure acceptable indoor air quality levels can be maintained and satisfy conditions relating to pollutants. Occupants will also have a natural ventilation option via the openable doors and windows. Extract fans will be included to all wet areas and in the kitchens.

4.1.3 Lighting

The proposed light fittings will be low energy efficient fittings, in this instance LED fittings only throughout. For Part L compliance the lighting efficacy for each fitting type will stand at 90lm/w or higher.

4.2 CO_2 REDUCTIONS AFTER FABRIC FIRST APPROACH 'BE LEAN'

The following table demonstrates the reduction in CO2 emissions based on an area weighted average calculation utilising a fabric first approach with no reduction incorporated from the inclusion of any renewable/Low carbon technology.

Table 7: 2021 Building Regulations Fabric First Results

Regulated Emissions	Baseline CO_2 Emissions	Fabric First Building CO_2 Emissions	CO_2 Emission Savings	% reduction in CO_2 Emissions
kg of $CO_2/m^2/yr$	11.63	6.19	5.44	46.75%
kg of CO_2/yr	77,268.91	41,125.31	36,144	

From the table above it can be seen that the overall CO_2 reduction due to the fabric first 'Be Lean' approach is 40.75% for the development's total emissions.

Table 8: Be Lean Stage Fabric Energy Efficiency Results

Baseline Fabric Energy Efficiency vs Fabric First Stage Fabric Energy Efficiency	
Combined Target Fabric Energy Efficiency (TFEE)	21.98 kg CO_2/m^2
Combined Dwelling Fabric Energy Efficiency (DFEE)	21.12 kg CO_2/m^2
% Reduction	3.95%

A 3.95% reduction can be observed between the baseline and the fabric first Be Lean stage calculation therefore demonstrating compliance with Part L 2021 Building Regulations.

Table 9: Be Lean Stage Primary Energy Rate Results

Baseline Fabric Energy Efficiency vs Fabric First Stage Fabric Energy Efficiency	
Combined Target Primary Energy Rate (TPER)	62.92 kg CO_2/m^2
Combined Dwelling Primary Energy Rate (DPER)	66.01 kg CO_2/m^2
% Reduction	-4.92%

At the Be Lean stage, prior to the installation of renewable technology, the development does not achieve a reduction in primary energy.

Figure 8: Be Lean Carbon Emissions Current 2021 Building Regulations

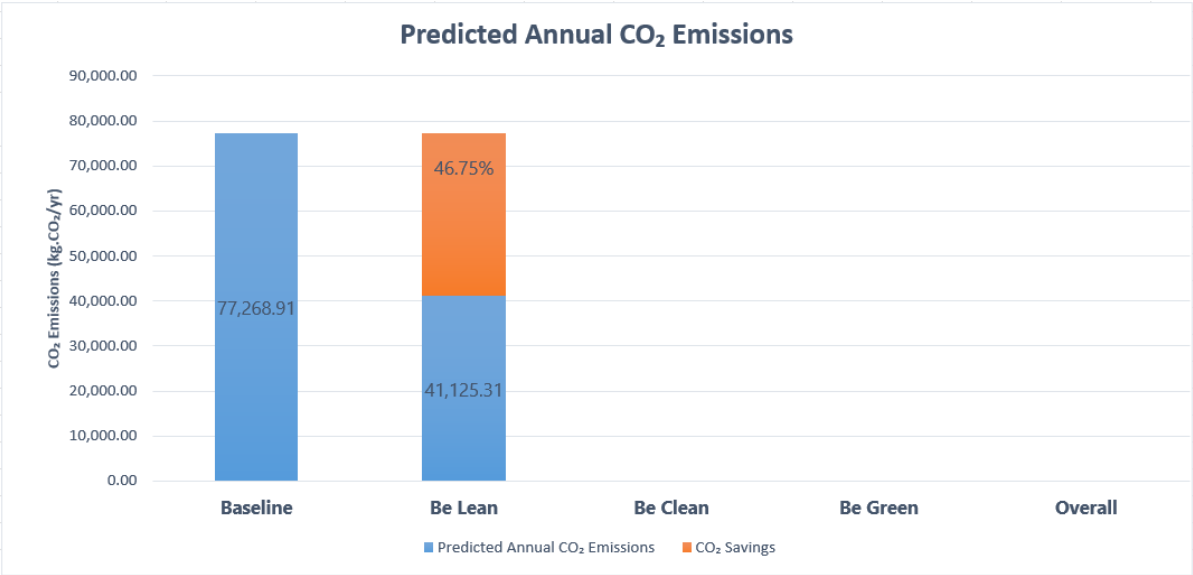


Figure 8 above shows the Be Lean CO_2 reduction under SAP 10.2 2021 Building Regulations, as can be seen a 46.75% reduction CO_2 is achieved through fabric performance and an all-electric system strategy. The improvement displayed here does not include any renewable technology and is purely the result of the Fabric First approach in accordance with the Energy Hierarchy and Manchester Core Strategy.

4.3 CLEANER ENERGY - CHP & DECENTRALISED ENERGY NETWORKS

The Energy Hierarchy encourages the use of a CHP system and/or the connection to District Heating system to reduce CO^2 emissions further.

4.3.1 CHP

The Energy Hierarchy identifies combined heat and power (CHP) as a method of producing heat and electricity with much lower emissions than separate heat and power. Also, it encourages the creation of district heating systems supplied by CHP.

The implementation of a CHP strategy should be decided according to good practice design. Key factors for the efficient implementation of the CHP system are:

- Development with high heating load for the majority of the year.
- CHP operation based on maximum heat load for minimum 10 hours per day.
- CHP operation at maximum capacity of 90% of its operating period.

A CHP system will not be considered for this development due to the following reasons:

- The heating load of the building is not enough for the CHP system to run efficiently.
- Economic viability is heavily dependent on the demand for heat and power, as well as the price of electricity and gas. The heat and power demand of the proposed development is not sufficient for a CHP system to run efficiently.

Hence, the implementation of a CHP strategy is not recommended for this development.

4.3.2 Micro - CHP

Micro CHP has not been considered further for this project for the following reasons:

Micro-CHP is a relatively new concept (Baxi Ecogen was made available in 2009) and issues are raised in relation to unproven technology, inefficiency for shorter run cycles and lack of technical knowledge that can limit the practical application of micro-CHP at present.

In addition, other issues surrounding the fact that around 50% of electricity generated in domestic properties is surplus, high installation costs and estimated low life expectancy has also been taken into consideration. Micro-CHP also has lower FIT tariff rate and period duration and is only applicable for systems under 2kW.

4.3.3 Communal Heating

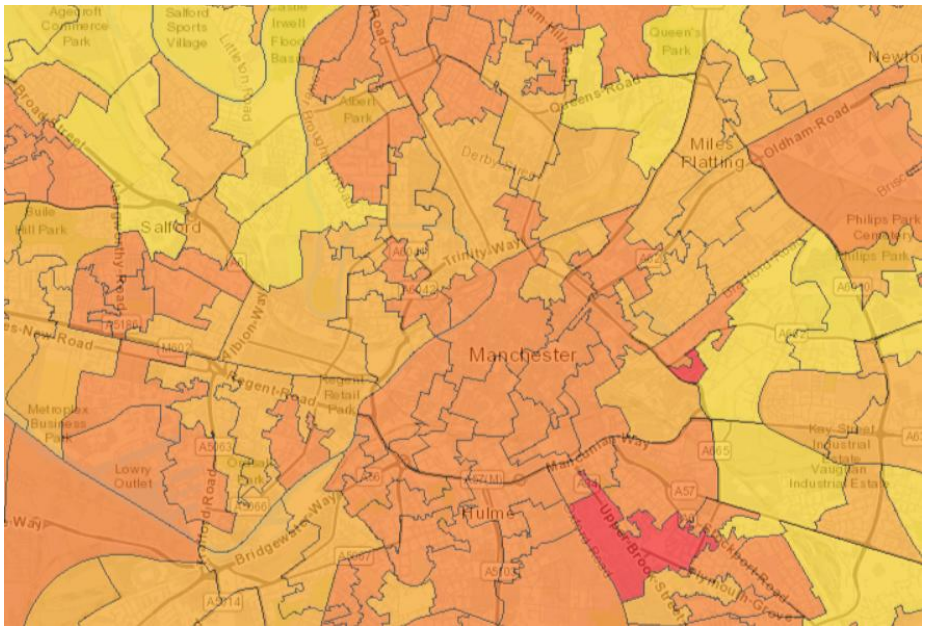
A communal heating scheme could consist of for example CHP unit, or a centralised gas boiler system supply heat and / or hot water to all individual units, alone with other varying systems.

The current design however is the preferred option as this system is purely electric, the fuel carbon factor for grid electricity is brought in line with natural gas under the SAP 10 changes and will eventually become zero carbon as the portion of renewable energy supplied to the grid increases. This therefore provides the development with some future proofing and better addresses the current climate emergency by removing another potential source of emissions.

4.3.4 Decentralised Energy Network

The feasibility of connecting into an existing heating network or providing the building with its own combined heat and power plant has been assessed through the use of UK CHP Development Map, for Manchester as for a District Heating network. The development is located within the Civic Quarter District Heating Network.

Figure 9: Manchester Heat Map



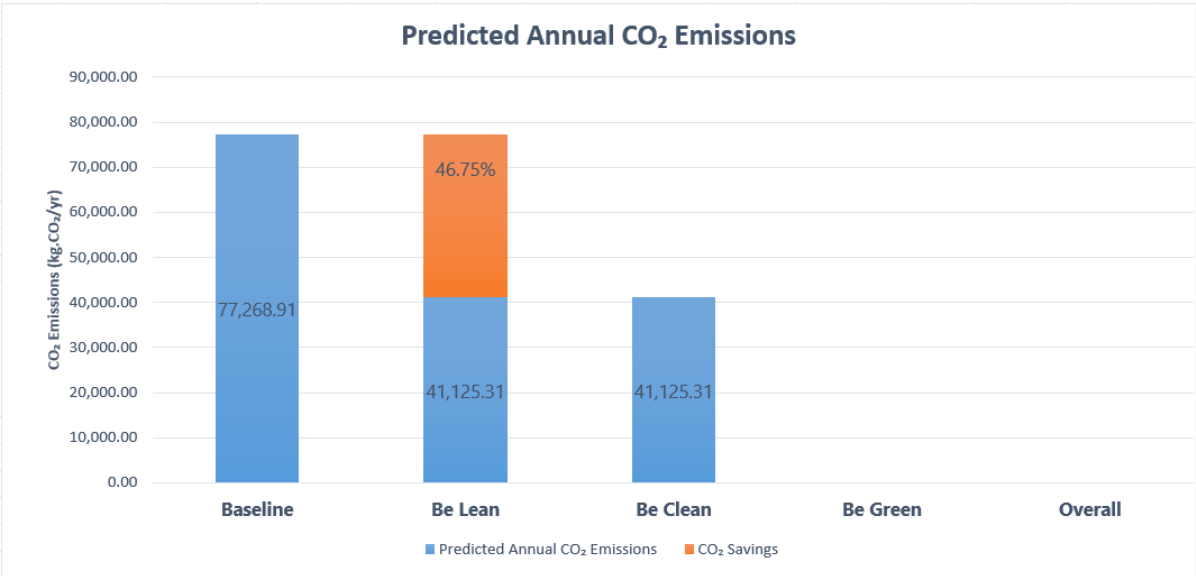
Presently there is the potential to connect to a heat network and should the District Heating Network evolve into an all-electric system and the infrastructure for such be provided then connection could be considered in the future.

Heat networks require developments to have appropriate space to accommodate plant space for buffer vessel, plate heat exchangers and manifold positions, meters. This development is on the larger scale and in the future could connect to a heat network if desired, provided there is enough available space within the development.

An all-electric strategy is the preferred option as the fuel carbon factor for grid electricity is to be brought in line with natural gas and will eventually become zero carbon as the portion of renewable energy supplied to the grid increases. This therefore provides the development with some future proofing, better addresses the current climate emergency by removing another potential source of emissions and supports the RIBA 2030 Climate Challenge through a low carbon heating and hot water solution.

As such no additional CO^2 reduction can be observed at the Be Clean stage, this is described in the graph below:

Figure 10 : Be Clean Carbon Emissions Current 2021 Building Regulations



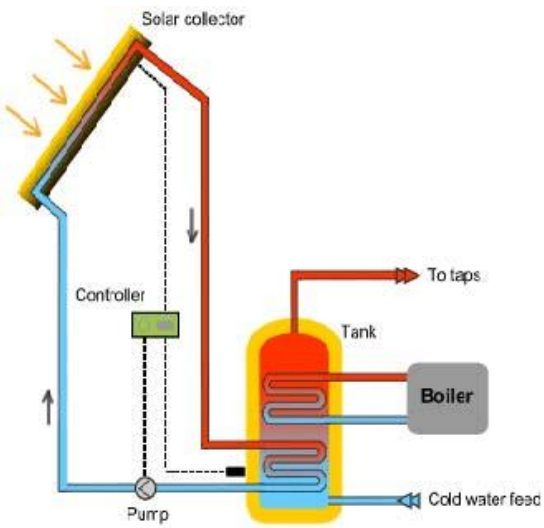
4.4 LOW & ZERO CARBON TECHNOLOGIES

4.4.1 General

Low and zero carbon (LZC) technologies are systems that generate energy with either zero or reduced CO2 emissions when compared against traditional energy generation methods.

The alternative LZC technologies have been assessed in relation to the development and their viability assessed. Some of the LZCs are intrinsically unsuitable due to the development type and location whereas others are potentially viable.

Figure 11: Solar Thermal Diagram



4.4.2 Solar Water Heating

Solar thermal panels utilise the suns energy to generate hot water for use within the building. The panels are commonly provided in either flat plate or evacuated tube arrangements. The panels are ideally located facing south at an approximate 30° inclination angle in areas where they are not subjected to shade.

Solar thermal water heating will introduce further piping into the dwellings which will emit heat and increase the mechanical ventilation and cooling load therefore increasing the energy demand. Roof space priority has also been given to Photovoltaics which will be providing the development with renewable energy and directly address the requirements of Policy EN6. As such roof space for Solar water heating is limited.

This system alone would not generate a large enough CO_2 reduction in proportion to other comparable technologies. This technology has also been discounted due to the inflated cost of installation with regards to additional pipe runs, maintenance requirements and the significant roof area that would be required. For these reasons, this technology has been discounted.

4.4.3 Wind Turbines

Wind turbines generate electrical energy derived from kinetic energy provided by the local wind resource. The performance of wind turbines depends greatly on the wind speed and turbulence that in turn is influenced by the terrain and installation height.

Figure 12: Wind Turbine

The use of wind turbines on the development will also have a significant visual impact on the location. Low frequency noise source and potential impact on the local aesthetic is likely to meet opposition within the local area.

For the reasons detailed above wind turbines are not considered viable for the development.

4.4.4 Photovoltaic Cells (PV)

Photovoltaic (PV) panels utilise the sun's energy to generate electricity. The optimum location for PV panels is south facing at an approximate 30° inclination angle in areas where they are not subjected to shade.

Figure 13: PV Examples

Photovoltaic panels have been included in the design in order to comply with policy EN6 of the Manchester Core Strategy which requires a minimum 15% reduction over Part L 2010.

To achieve this target and address the primary energy result at the Be Lean stage, the development has 81.6kWp (approximately 325m^2) of PV allocated along with export capable metering. This is assuming the use of 600W panels at 2.41m2 each, the final panel specification may change as the design develops.

4.4.5 Source Heating and Cooling

The Air Source Heat Pumps can be linked with indoor units to heat and cool the space. These could be either ceiling mounted cassette units, wall mounted units or floor mounted units. This option therefore has good flexibility in terms of installation.

The outdoor units can be located anywhere and are not dependant on orientation. They need to be externally mounted and in a local compound to be safe. Compared to a wet system this technology is more simplified in terms of installation and maintenance.

However due to site limitations with regards to plant space, this technology has been discounted.

4.4.6 Biomass Boiler

Biomass is considered to be a renewable fuel source as the CO_2 absorbed during the growth period is assessed as being approximately equal to the CO_2 emitted during combustion and hence deemed "carbon neutral". Biomass for boilers is typically wood either in chip or pellet form. Biomass boilers require fuel storage together with associated transportation and delivery to the store location.

Figure 14: Biomass Example

With the minimal plant areas, logistics of deliveries etc and the domestic nature of the development it is not considered viable to transport wood pellets or similar to the building. For the above reasons, the use of a biomass boiler plant is not considered viable for the development.

4.4.7 Fuel Cell

The fuel cell technology essentially converts chemical energy into both electrical and heat energy. The cell needs to be continually supplied with hydrogen (derived from either a piped or storage source) and oxygen (derived from air) that are combined and the chemical reaction produce electrical energy, heat energy and water vapour.

The fuel cell requires a hydrogen fuel source that can either be from a piped source (not currently available) or from stored gas. However, the more usual approach currently in the UK is to use natural gas in order to generate the hydrogen required to operate the fuel cell.

Fuel cells have various commercial and technical limitations. There is a high initial capital cost together with there being few established suppliers and a very limited specialist design, installation and maintenance capabilities. Certain fuel cell elements require regular replacement imposing a significant on-going cost implication. The fuel cells themselves are generally large, heavy and require fresh air ventilation.

Due to the initial capital cost, space requirements and on-going maintenance costs fuel cells are not considered viable for this development.

4.5 WATER

The dwellings will be designed to reduce mains/potable water and include water efficient devices and equipment. This will comprise of efficient water fixtures (low flow taps and showers, dual flush WCs and low volume baths) to reduce potable water demand to <105litres/person/day as per the requirement within Building Regulations.

This will be done through the use of low flow rate sanitaryware, low-capacity baths and the use of flow restrictors throughout the dwelling.

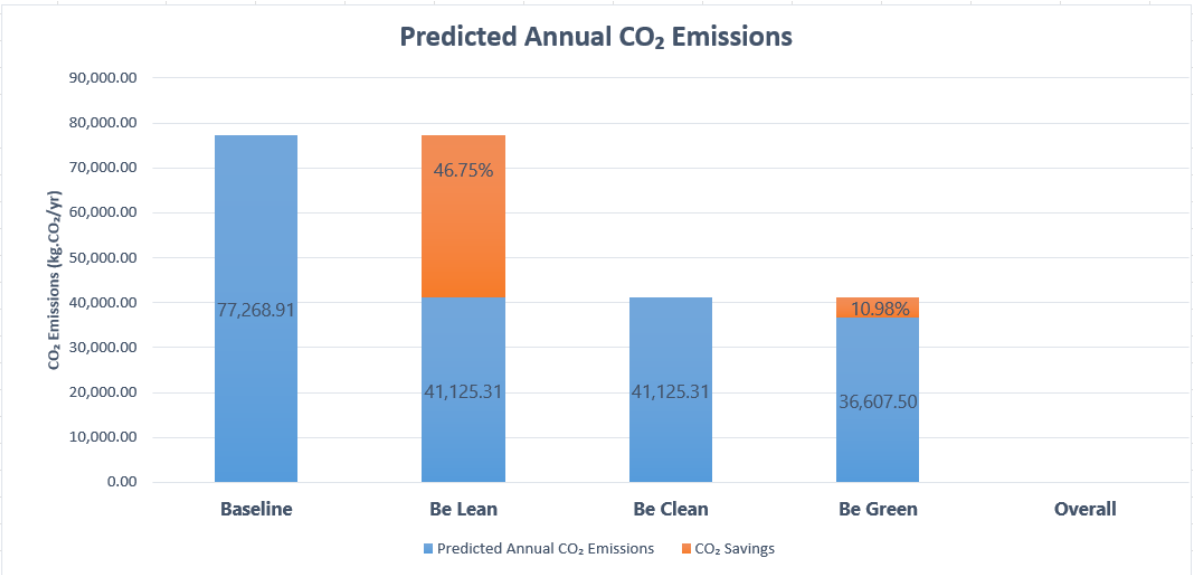
An example of the flow rates and capacities that could potentially be used are as follows. Please note these are a guide at this stage and actual figures may differ at the time of construction. However, they will fall within the required level:

- WC – Dual Flush – 6/3 Litre Flush capacity
- Bath – 130 Litre capacity
- Wash hand basin taps – 5 L/min
- Kitchen sink taps – 7L/min
- Shower – 7L/min

4.6 CHOSEN RENEWABLE SOLUTION

Following the above review of various LZC technology the chosen solution for this strategy is to supplement the current mechanical and electrical design with photovoltaic (PV) technology. This will supply renewable energy to each dwelling based on area weighted average, ensure compliance with Part L 2021 and support policy EN6 of the Manchester Core Strategy.

Figure 15: Be Green Carbon Emissions 2021 Building Regulations



The following tables demonstrates the reduction in CO2 emissions calculated on an area weighted average, via the "BE GREEN" energy efficiency measures mentioned above for the building:

Table 10: 2021 Building Regulations Be Green Emissions

Regulated Emissions	Baseline CO_2 Emissions	BE LEAN Building CO_2 Emissions	BE CLEAN Building CO_2 Emissions	BE GREEN Building CO_2 Emissions	Total Cumulative CO_2 Emission Savings	% Reduction in CO_2 Emissions
Kg of CO_2/m2/yr.	11.63	6.19	6.19	5.51	6.12	**52.65%**
Kg of CO_2/yr.	77,268.91	41,125.31	41,125.31	36,607.50	40,661.4	**52.65%**

Through the provision of low carbon technology, regulated on-site annual CO2 emissions have been significantly reduced beyond the Part L defined baseline target emission rates. The strategy also supports the low carbon/renewable technology objectives of the Manchester Core Strategy. As per Table 10 above the kgCO_2 /m2/yr reduction difference between the Be Lean/Clean stage and the Be Green stage is 11.63% therefore complying with policy EN6.

4.7 PRIMARY ENERGY DEMAND & RIBA 2030 CLIMATE CHALLENGE

In order to calculate the energy demand for the entire development in kWh/yr the follow is required.

The energy demand is made up of the following factors:

- Energy for space heating
- Energy for space cooling
- Energy for water heating
- Energy for ventilation
- Energy for lighting

- Energy generated by renewables
- This is more specifically the Primary, Regulated Energy Demand given the fabric, considering the above factors. The primary energy demand results are displayed in the below table.

Table 8 Primary Energy Demand Typical Units

Whole Block	**Energy Demand** kWh_{PE}/m^2
Block Average	61.95

This is a good improvement on the current benchmark target of 145 $kWh/m^2/yr$. It is worthy of note however that RIBA intend to work with professional bodies to finalise their target metrics which may change as those discussions progress.

Figure 16: RIBA 2030 Climate Challenge Domestic Target Metrics

RIBA 2030 Climate Challenge target metrics for domestic buildings

RIBA Sustainable Outcome Metrics	Current Benchmarks	2020 Targets	2025 Targets	2030 Targets	Notes
Operational Energy $kWh/m^2/y$	146 kWh/m^2 /y (Ofgem benchmark)	< 105 $kWh/m^2/y$	< 70 $kWh/m^2/y$	< 0 to 35 $kWh/m^2/y$	UKGBC Net Zero Framework 1. Fabric First 2. Efficient services, and low-carbon heat 3. Maximise onsite renewables 4. Minimum offsetting using UK schemes (CCC)
Embodied Carbon $kgCO_2e/m^2$	1000 $kgCO_2e/m^2$ (M4i benchmark)	< 600 $kgCO_2e/m^2$	< 450 $kgCO_2e/m^2$	< 300 $kgCO_2e/m^2$	RICS Whole Life Carbon (A-C) 1. Whole Life Carbon Analysis 2. Using circular economy Strategies 3. Minimum offsetting using UK schemes (CCC)
Potable Water Use Litres/person/day	125 l/p/day (Building Regulations England and Wales)	< 110 l/p/day	< 95 l/p/day	< 75 l/p/day	CIBSE Guide G

As stated in section 2.5.2 The Embodied Carbon target is addressed only as far as our capacity as the Sustainability Consultant is concerned. In order to fully tackle the Whole Life Carbon of the building using Circular Economy Strategies; consideration of Embodied Carbon will be required by all parties involved with the design, construction and operation of the development, particularly parties with ISO14001 accreditation.

The RIBA 2030 Climate Challenge targets are ultimately non-binding however indicate good practice; we have therefore endeavoured to achieve the targets outlined.

5 ENVIRONMENTAL STANDARDS STATEMENT

It is best practice to incorporate Environmental Standards within the design of such a development. Being mindful of the design standard issues often compliment the Energy Strategy and the Sustainability aspects of the design and this planning report.

Some elements described within the environmental standards section fall outside the remit of NOVO Integration Ltd and as such will be incorporated within other parties' appointments. This report will however summarise and reference other third-party reports where applicable to aid with addressing all applicable elements of the Environmental Standards.

The various topics covered within the environmental standards sections are as follows:

- Energy Efficiency
- Renewable Energy
- Environmental Design
- Water Management and Weather Resilience
- Waste Management
- Construction Management
- Waterways

Each element will be summarised how the development will achieve this, and any relevant third-party reports referenced accordingly.

Please note that where assumptions have been made of specific reports being carried out, confirmation of these reports from the developer will be required. Reference only is made within this report.

Any reports referenced within this section does not confirm that these reports are either required or have been or will be carried out and are assumptions of such only.

5.1 ENERGY EFFICIENCY

The Manchester Core Strategy states that in summary, all new developments should endeavour to reduce their CO_2 emission by particular targets as discussed previously in this report.

However, the principals highlighted within the section are carried through into the design.

Section 4 Energy Strategy of this report details specifically how the proposed design of the development including the fabric, mechanical and electrical services will use passive, energy efficient and low carbon technologies throughout with emphasis on a fabric first approach to minimise the CO_2 emissions and meet the targets set in the Manchester Core Strategy.

The Energy Strategy describes how the development follows the Energy Hierarchy approach which many local authorities advocate the use of.

5.2 RENEWABLE ENERGY

The Manchester Core Strategy encourages the use of Low Zero Carbon technologies, this again follows the Hierarchical approach.

This is to encourage opportunities to reduce the energy demand via the use of onsite renewable technologies to improve energy security for occupants of the site and export of surplus energy back to the grid.

Various opportunities and different technologies should be investigated to determine the most viable and appropriate technology for the site in question.

Again section 4 of this report deals with the Energy Hierarchical approach to Energy and the use of renewable technology. Many different technology opportunities have been investigated and discounted where applicable and included where appropriate.

Following these in-depth reviews of varying renewable technologies, Photovoltaic Panels have been deemed viable and appropriate for the development and have been included within the design.

5.3 ENVIRONMENTAL DESIGN

This element encourages developers to use the Building Research Establishment Assessment Method (BREEAM) to assess environmental performance or Code for Sustainable homes depending on whether the development is residential or non-residential in nature. Code for Sustainable Homes is no longer applicable following the Housing Standards Review. Were this standard still in operation however, the CO_2 reduction results identified in this report would equate to Code Level 4.

5.4 WATER MANAGEMENT AND WEATHER RESILIENCE

Thoughtful design to reduce the levels of pollution within the city's watercourses, as well as mitigating the effects of flooding should significant storms present themselves in the future should be considered.

As such a Flood Risk Assessment and Drainage Strategy Report will be produced to demonstrate the methodology as to how the development will manage excessive water in times of storms etc to minimise the risk of flooding to the development and surrounding areas.

As the development is within Flood Risk Zone 1 there is a low risk of flooding. Is it anticipated that any excessive rainwater will be dealt with through the use of attenuation other methodologies falling line with SUDs techniques to improve flows and quality of the surface water run-off.

Water Usage has been covered earlier within this report under section 4.6 and describes how the development will utilise low flow / volume sanitaryware to reduce the amount of water consumed and comply with the Building Regulations Part G but also aspires to achieve the target metrics described in the RIBA 2030 Climate Challenge.

5.5 WASTE MANAGEMENT

It is understood that the Construction Waste Management Plan will be prepared to ensure that all aspects of waste production, deliveries, noise, dust pollution etc are all accounted for and reasonably mitigated.

There is potential for the Waste Management Strategy to be reviewed by Building Management during the lifetime of the building for opportunities to improve the procedures and will also review areas where reductions in waste, or an increase in recycling waste can be made. This will form part of a Construction Management Plan which will likely be required by a condition attached to any planning permission.

The design of designated areas for waste and recyclable waste once construction has been completed for the use of the occupants has and will be carefully considered, not only in terms of capacity but allowances made for access for collections.

These areas will have designated areas for recyclable waste which will encourage further responsibility to be taken by the occupiers to separate their own waste accordingly.

5.6 CONSTRUCTION MANAGEMENT

Best practices encourage environmentally friendly construction methods and materials which in effect reduces energy consumption.

This standard also encourages best practices during construction to prevent or limit damage to the environment and to make sure these measures are not being abused during the full construction phase.

It is assumed that the contractor will be responsible for providing a comprehensive construction management plan containing all procedures on site and methodologies for a safe, environmentally conscious, and efficient construction period.

6 CONCLUSIONS

The Energy Strategy for the proposed development at Cross Keys Street, Manchester has adopted a hierarchical approach of using passive and low energy design technologies to reduce the baseline energy demand and hence CO_2 emissions followed by the feasibility of the application of low and zero carbon technologies as appropriate.

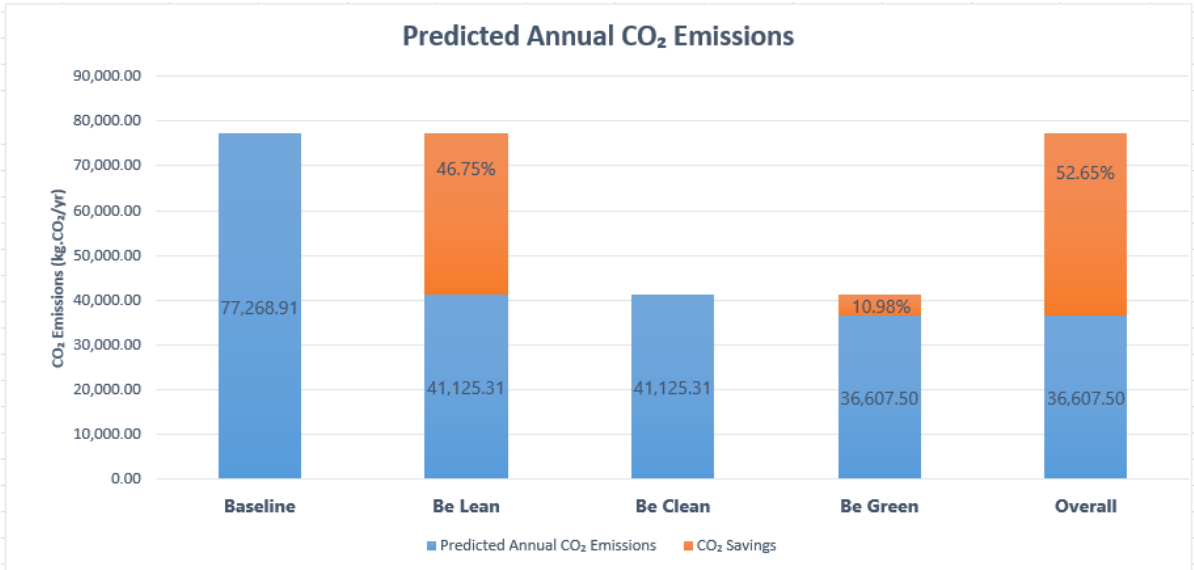
This is supported by the SAP Calculations to provide compliance in England with the Building Regulations Part L 2021, issued within this report. The analysis has shown that by incorporating passive and low energy design measures, there is a reduction of 52.65% over the developments annual CO_2 baseline emissions, therefore complying and exceeding the requirements of the Manchester Core Strategy and Part L 2021 Building Regulations.

This is achieved by incorporation of the following elements:

- High performance glazing to reduce solar and transmission gains
- Improved thermal transmittance U-valued as depicted
- Mechanical Ventilation Heat Recovery systems with 96% heat recovery efficiency
- Electric panel heaters and electric immersion water heating with 100% delivery efficiency
- Low building air leakage rate (3.0 m^3/h/m2 at a pressure differential of 50 Pa)
- Low energy lighting to achieve efficacies of 90+lm/w for each fitting type
- Low flow aerated showerheads and basin tap inserts to reduce water consumption
- Reducing mains/potable water via water efficient devices and equipment
- Total 81.6kWp of PV to supply renewable energy and export capable metering

A 'Fabric First' approach has been used in this strategy then, following the stages of the Energy Hierarchy, CHP and district heating has been assessed followed by a study of various low and zero carbon technologies. The graph below demonstrates the results of the passive fabric improvements made along with the application of renewable technology.

Figure 17: Overall CO_2 Emissions Reduction Current 2021 Building Regulations



6 CONCLUSIONS

A 52.65% overall reduction in CO_2 emissions over Part L 2021 Building Regulations can be observed. As stated previously, the Manchester Core Strategy requires a 15% improvement over Part L 2010 Building Regulations. These regulations have been superseded by 2021 Building Regulations which already have a 37% betterment over 2010 Building Regulations. Therefore, by achieving a CO_2 reduction greater than the required 15% improvement over 2010 building Regulations, Policy EN4 and EN6 requirements of the Manchester Core Strategy have been met.

Furthermore, consideration has also been given to the RIBA 2030 Climate Challenge Targets with respect to domestic operational energy, embodied carbon and potable water use. Although RIBA plans on developing their targets further with UK professional bodies in order obtain concrete benchmarks; we have made every effort to reach the current baselines prescribed as we share RIBA's urgency and enthusiasm in addressing the current Environment and Climate Emergency.

To summarise, the present 52.65% reduction in CO_2 has been achieved through the use of high-performance materials to improve the building fabric u-values, by incorporating electric panel heaters and immersion hot water cylinders for heating and hot water, and the use of MVHR for ventilation. Photovoltaic Panels will supply renewable energy and efficient low energy lighting will be used throughout; low flow rate fixtures and fittings will be used to reduce water consumption. It is therefore the conclusion of this report that the requirements of Part L 2021 have been met and policies EN4 and EN6 of the Manchester Core Strategy have been complied with.

7 APPENDICES

Appendix A – SAP Reports/Predicted EPCs (Issued Separately)
Appendix B – Block Compliance Reports

Appendix A

SAP Reports/Predicted EPCs (Issued separately)

Appendix B

Block Compliance Reports

Block Compliance

Block Reference	REV D - BE GREEN	Issued on Date	07/03/2025
Block Name			
Calculation Type	New Build (As Designed)		
Assessor Details	Mr. Adam Smith	Assessor ID	AV84-0001
Client	Test, Test, Test, Test, Test		

Block Compliance Report - DER

Block Reference: REV D - BE GREEN	Block Name:			
Property-Assessment Reference	Floor area (m^2)	DER ($kgCO_2/m^2$)	TER ($kgCO_2/m^2$)	% DER/TER
Unit 104 L04 - Unit 104 L04_Copy	51.17	5.41	11.15	51.48 %
Unit 120 L06 - Unit 120 L06_Copy	77.81	4.18	9.20	54.57 %
Unit 121 L06 - Unit 121 L06_Copy	72.08	4.40	9.47	53.54 %
Unit 122 L06 - Unit 122 L06_Copy	66.50	5.06	10.77	53.02 %
Unit 123 L06 - Unit 123 L06_Copy	48.81	5.64	11.84	52.36 %
Unit 124 L06 - Unit 124 L06_Copy	51.48	5.39	11.19	51.83 %
Unit 125 L06 - Unit 125 L06_Copy	65.60	5.89	12.26	51.96 %
Unit 126 L06 - Unit 126 L06_Copy	70.98	4.62	10.28	55.06 %
Unit 127 L06 - Unit 127 L06_Copy	66.41	5.43	11.48	52.70 %
Unit 128 L06 - Unit 128 L06_Copy	72.67	4.36	9.40	53.62 %
Unit 156 L05 - Unit 156 L05_Copy	63.66	6.25	12.30	49.19 %
Unit 157 L05 - Unit 157 L05_Copy	71.68	4.68	10.45	55.22 %
Unit 159 L05 - Unit 159 L05_Copy	64.31	5.60	11.61	51.77 %
Unit 161 L05 - Unit 161 L05_Copy	70.98	4.43	9.51	53.42 %
Unit 162 L05 - Unit 162 L05_Copy	66.50	5.05	10.63	52.49 %
Unit 163 L05 - Unit 163 L05_Copy	48.81	5.62	11.77	52.25 %
Unit 164 L05 - Unit 164 L05_Copy	51.48	5.38	11.09	51.49 %
Unit 165 L05 - Unit 165 L05_Copy	65.60	5.90	12.09	51.20 %
Unit 166 L05 - Unit 166 L05_Copy	70.98	4.64	10.30	54.95 %
Unit 167 L05 - Unit 167 L05_Copy	66.41	5.32	11.14	52.24 %
Unit 182 MEZ - Unit 182 MEZ_Copy	35.93	11.71	24.56	52.32 %
Unit 183 MEZ - Unit 183 MEZ_Copy	35.93	10.19	21.86	53.39 %

Unit 214 L08 - Unit 214 L08	73.33	5.59	11.90	53.03 %
Unit 215 L08 - Unit 215 L08	63.74	7.21	14.52	50.34 %
Unit 216 L08 - Unit 216 L08	53.19	6.43	13.44	52.16 %
Unit 217 L08 - Unit 217 L08	65.61	7.35	14.98	50.93 %
Unit 218 L08 - Unit 218 L08	71.87	6.13	12.81	52.15 %
Unit 219 L08 - Unit 219 L08	67.53	7.40	14.58	49.25 %
Unit 220 L08 - Unit 220 L08	73.45	5.99	12.44	51.85 %
Unit 272 MEZ - Unit 272 MEZ_Copy	35.93	11.42	24.20	52.81 %
Unit 286 L01 - Unit 286 L01_Copy	51.48	5.76	13.31	56.72 %
Unit 287 L01 - Unit 287 L01_Copy	65.60	6.61	14.04	52.92 %
Unit 288 L01 - Unit 288 L01_Copy	70.98	5.92	12.76	53.61 %
Unit 289 L01 - Unit 289 L01_Copy	66.41	6.74	13.70	50.80 %
Unit 292 L01 - Unit 292 L01_Copy	71.68	4.68	10.45	55.22 %
Unit 293 L01 - Unit 293 L01_Copy	63.66	6.25	12.30	49.19 %
Unit 298 L01 - Unit 298 L01_Copy	48.81	5.60	11.48	51.22 %
Unit 350 L06 - Unit 350 L06_Copy	71.68	5.29	11.66	54.63 %
Unit 351 L06 - Unit 351 L06 _Copy	63.66	7.49	14.43	48.09 %
Unit 352 L06 - Unit 352 L06_Copy	68.31	6.11	12.67	51.78 %
Unit 362 L07 - Unit 362 L07	63.95	6.46	13.57	52.39 %
Unit 363 L07 - Unit 363 L07	62.53	6.83	14.10	51.56 %
Unit 364 L07 - Unit 364 L07	76.79	4.68	10.27	54.43 %
Unit 365 L07 - Unit 365 L07	73.49	4.36	9.26	52.92 %
Unit 366 L07 - Unit 366 L07	63.72	5.03	10.84	53.60 %
Unit 367 L07 - Unit 367 L07	50.38	5.75	12.20	52.87 %
Unit 368 L07 - Unit 368 L07	53.14	5.30	10.76	50.74 %
Unit 369 L07 - Unit 369 L07	65.50	5.50	11.82	53.47 %
Unit 370 L07 - Unit 370 L07	71.92	4.51	9.97	54.76 %
Unit 371 L07 - Unit 371 L07	67.07	5.14	11.03	53.40 %

Unit 372 L0 - Unit 372 L07_Copy	72.47	4.40	9.41	53.24 %
Unit 377 L05 - Unit 377 L05_Copy	51.17	5.40	11.04	51.09 %
Unit 378 L05 - Unit 378 L05_Copy	45.99	5.83	11.95	51.21 %
Unit 379 L05 - Unit 379 L05_Copy	51.17	5.41	11.15	51.48 %
Unit 380 TH GF - Unit 380 TH_Copy	116.94	4.78	10.73	55.45 %
Unit 382 TH GF - Unit 382 TH_Copy	81.16	4.69	10.51	55.38 %
Unit 383 TH GF - Unit 383 TH_Copy	91.63	4.30	9.89	56.52 %
Unit 385 TH GF - Unit 385 TH_Copy	91.63	4.30	9.89	56.52 %
Unit 386 TH GF - Unit 386 TH_Copy	91.63	4.30	9.89	56.52 %
Unit 387 TH GF - Unit 387 TH_Copy	66.98	5.07	11.10	54.32 %
Unit 388 TH GF - Unit 388 TH_Copy	84.78	5.58	11.93	53.23 %
Unit 393 L03 - Unit 393 L03_Copy	63.66	6.25	12.30	49.19 %
Unit 394 L03 - Unit 394 L03_Copy	71.68	4.68	10.45	55.22 %
Unit 395 L03 - Unit 395 L03_Copy	51.17	5.40	11.04	51.09 %
Unit 396 L03 - Unit 396 L03_Copy	64.31	5.60	11.61	51.77 %
Unit 397 L03 - Unit 397 L03_Copy	45.99	4.99	11.91	58.10 %
Unit 401 L03 - Unit 401 L03_Copy	70.98	4.43	9.51	53.42 %
Unit 402 L03 - Unit 402 L03_Copy	66.50	5.05	10.63	52.49 %
Unit 403 L03 - Unit 403 L03_Copy	48.81	5.62	11.77	52.25 %
Unit 404 L03 - Unit 404 L03_Copy	51.48	5.38	11.09	51.49 %
Unit 405 L03 - Unit 405 L03_Copy	65.60	5.90	12.09	51.20 %
Unit 406 L03 - Unit 406 L03_Copy	70.98	4.64	10.30	54.95 %
Unit 407 L03 - Unit 407 L03_Copy	66.41	5.32	11.14	52.24 %
Unit 408 L03 - Unit 408 L03_Copy	51.17	5.41	11.15	51.48 %
Unit 411 L02 - Unit 411 L02_Copy	63.66	6.25	12.30	49.19 %
Unit 412 L02 - Unit 412 L02_Copy	71.68	4.68	10.45	55.22 %
Unit 413 L02 - Unit 413 L02_Copy	51.17	5.40	11.04	51.09 %
Unit 414 L02 - Unit 414 L02_Copy	64.31	5.60	11.61	51.77 %

Unit 415 L02 - Unit 415 L02_Copy	45.99	5.84	12.06	51.58 %
Unit 416 L02 - Unit 416 L02_Copy	70.98	4.43	9.51	53.42 %
Unit 417 L02 - Unit 417 L02_Copy	66.50	5.05	10.63	52.49 %
Unit 422 L02 - Unit 422 L02_Copy	48.81	5.62	11.76	52.21 %
Unit 423 L02 - Unit 423 L02_Copy	51.48	5.38	11.09	51.49 %
Unit 424 L02 - Unit 424 L02_Copy	65.60	5.93	12.09	50.95 %
Unit 425 L02 - Unit 425 L02_Copy	70.98	4.64	10.30	54.95 %
Unit 426 L02 - Unit 426 L02_Copy	66.41	5.32	11.14	52.24 %
Unit 427 L02 - Unit 427 L02_Copy	51.17	5.41	11.15	51.48 %
Unit 67 L04 - Unit 67 L04_Copy	63.66	6.25	12.30	49.19 %
Unit 68 L04 - Unit 68 L04_Copy	71.68	4.68	10.45	55.22 %
Unit 69 L04 - Unit 69 L04_Copy	51.17	5.40	11.04	51.09 %
Unit 71 L04 - Unit 71 L04_Copy	64.31	5.60	11.61	51.77 %
Unit 72 L04 - Unit 72 L04_Copy	45.99	5.82	11.91	51.13 %
Unit 73 L04 - Unit 73 L04_Copy	70.98	4.43	9.51	53.42 %
Unit 74 L04 - Unit 74 L04_Copy	66.50	5.05	10.63	52.49 %
Unit 75 L04 - Unit 75 L04_Copy	48.81	5.62	11.77	52.25 %
Unit 76 L04 - Unit 76 L04_Copy	51.48	5.38	11.09	51.49 %
Unit 77 L04 - Unit 77 L04_Copy	65.60	5.90	12.09	51.20 %
Unit 78 L04 - Unit 78 L04_Copy	70.98	4.64	10.30	54.95 %
Unit 79 L04 - Unit 79 L04_Copy	66.41	5.32	11.14	52.24 %
Unit 221 L08 - Unit 221 L08	70.66	5.54	11.94	53.60 %
Unit 222 L08 - Unit 222 L08	64.60	7.68	15.17	49.37 %
Unit 223 L08 - Unit 222 L08	74.09	7.26	14.30	49.23 %
Unit 224 L08 - Unit 222 L08	50.42	6.29	14.13	55.48 %
Unit 361 L07 - Unit 362 L07	72.27	5.25	11.80	55.51 %
Totals:	6643.83	585.07	1232.63	

Block Compliance

Average DER = 5.51 $kgCO_2/m^2$	**% DER/TER**	PASS
Average TER = 11.63 $kgCO_2/m^2$	52.65 %	

Block Compliance Report - DFEE

Block Reference: REV D - BE GREEN	**Block Name:**			
Property-Assessment Reference	**Floor area (m^2)**	**DFEE ($kWh/m^2/yr$)**	**TFEE ($kWh/m^2/yr$)**	**% DFEE/TFEE**
Unit 104 L04 - Unit 104 L04_Copy	51.17	11.85	12.80	7.47 %
Unit 120 L06 - Unit 120 L06_Copy	77.81	13.00	14.32	9.19 %
Unit 121 L06 - Unit 121 L06_Copy	72.08	12.75	13.92	8.37 %
Unit 122 L06 - Unit 122 L06_Copy	66.50	18.75	19.70	4.82 %
Unit 123 L06 - Unit 123 L06_Copy	48.81	14.03	14.73	4.71 %
Unit 124 L06 - Unit 124 L06_Copy	51.48	11.94	13.00	8.15 %
Unit 125 L06 - Unit 125 L06_Copy	65.60	25.97	26.21	0.92 %
Unit 126 L06 - Unit 126 L06_Copy	70.98	16.69	17.69	5.66 %
Unit 127 L06 - Unit 127 L06_Copy	66.41	22.16	22.99	3.60 %
Unit 128 L06 - Unit 128 L06_Copy	72.67	12.07	13.36	9.63 %
Unit 156 L05 - Unit 156 L05_Copy	63.66	28.70	25.80	-11.22 %
Unit 157 L05 - Unit 157 L05_Copy	71.68	17.78	18.90	5.90 %
Unit 159 L05 - Unit 159 L05_Copy	64.31	23.37	22.77	-2.62 %
Unit 161 L05 - Unit 161 L05_Copy	70.98	12.95	14.02	7.68 %
Unit 162 L05 - Unit 162 L05_Copy	66.50	18.93	19.00	0.33 %
Unit 163 L05 - Unit 163 L05_Copy	48.81	13.68	14.36	4.74 %
Unit 164 L05 - Unit 164 L05_Copy	51.48	11.77	12.71	7.41 %
Unit 165 L05 - Unit 165 L05_Copy	65.60	26.20	25.40	-3.16 %
Unit 166 L05 - Unit 166 L05_Copy	70.98	17.06	17.98	5.14 %
Unit 167 L05 - Unit 167 L05_Copy	66.41	21.59	21.38	-0.98 %
Unit 182 MEZ - Unit 182 MEZ_Copy	35.93	60.30	67.24	10.33 %
Unit 183 MEZ - Unit 183 MEZ_Copy	35.93	51.17	55.51	7.82 %

Unit 214 L08 - Unit 214 L08	73.33	23.81	25.38	6.21 %
Unit 215 L08 - Unit 215 L08	63.74	33.73	35.69	5.49 %
Unit 216 L08 - Unit 216 L08	53.19	22.89	24.41	6.22 %
Unit 217 L08 - Unit 217 L08	65.61	34.47	37.91	9.08 %
Unit 218 L08 - Unit 218 L08	71.87	28.02	29.25	4.21 %
Unit 219 L08 - Unit 219 L08	67.53	35.41	37.11	4.58 %
Unit 220 L08 - Unit 220 L08	73.45	25.98	27.67	6.10 %
Unit 272 MEZ - Unit 272 MEZ_Copy	35.93	59.13	65.63	9.90 %
Unit 286 L01 - Unit 286 L01_Copy	51.48	21.63	23.75	8.92 %
Unit 287 L01 - Unit 287 L01_Copy	65.60	31.18	34.28	9.03 %
Unit 288 L01 - Unit 288 L01_Copy	70.98	27.70	29.46	5.99 %
Unit 289 L01 - Unit 289 L01_Copy	66.41	32.05	33.19	3.45 %
Unit 292 L01 - Unit 292 L01_Copy	71.68	17.78	18.90	5.90 %
Unit 293 L01 - Unit 293 L01_Copy	63.66	28.70	25.80	-11.22 %
Unit 298 L01 - Unit 298 L01_Copy	48.81	11.14	12.05	7.57 %
Unit 350 L06 - Unit 350 L06_Copy	71.68	23.03	24.38	5.57 %
Unit 351 L06 - Unit 351 L06 _Copy	63.66	36.56	35.44	-3.17 %
Unit 352 L06 - Unit 352 L06_Copy	68.31	27.73	28.99	4.33 %
Unit 362 L07 - Unit 362 L07	63.95	31.83	31.58	-0.80 %
Unit 363 L07 - Unit 363 L07	62.53	31.97	33.47	4.48 %
Unit 364 L07 - Unit 364 L07	76.79	17.35	19.01	8.74 %
Unit 365 L07 - Unit 365 L07	73.49	12.56	13.55	7.31 %
Unit 366 L07 - Unit 366 L07	63.72	17.83	18.95	5.88 %
Unit 367 L07 - Unit 367 L07	50.38	16.80	17.55	4.24 %
Unit 368 L07 - Unit 368 L07	53.14	10.56	11.52	8.28 %
Unit 369 L07 - Unit 369 L07	65.50	22.56	23.88	5.50 %
Unit 370 L07 - Unit 370 L07	71.92	15.36	16.32	5.87 %
Unit 371 L07 - Unit 371 L07	67.07	19.74	21.03	6.11 %

Unit 372 L0 - Unit 372 L07_Copy	72.47	12.12	13.41	9.63 %
Unit 377 L05 - Unit 377 L05_Copy	51.17	10.56	11.66	9.46 %
Unit 378 L05 - Unit 378 L05_Copy	45.99	12.53	13.52	7.35 %
Unit 379 L05 - Unit 379 L05_Copy	51.17	11.85	12.80	7.47 %
Unit 380 TH GF - Unit 380 TH_Copy	116.94	29.13	31.77	8.29 %
Unit 382 TH GF - Unit 382 TH_Copy	81.16	20.36	22.09	7.84 %
Unit 383 TH GF - Unit 383 TH_Copy	91.63	20.09	21.76	7.69 %
Unit 385 TH GF - Unit 385 TH_Copy	91.63	20.09	21.76	7.69 %
Unit 386 TH GF - Unit 386 TH_Copy	91.63	20.09	21.76	7.69 %
Unit 387 TH GF - Unit 387 TH_Copy	66.98	18.22	19.71	7.57 %
Unit 388 TH GF - Unit 388 TH_Copy	84.78	29.03	30.52	4.89 %
Unit 393 L03 - Unit 393 L03_Copy	63.66	28.70	25.80	-11.22 %
Unit 394 L03 - Unit 394 L03_Copy	71.68	17.78	18.90	5.90 %
Unit 395 L03 - Unit 395 L03_Copy	51.17	10.56	11.66	9.46 %
Unit 396 L03 - Unit 396 L03_Copy	64.31	23.37	22.77	-2.62 %
Unit 397 L03 - Unit 397 L03_Copy	45.99	12.01	13.06	8.05 %
Unit 401 L03 - Unit 401 L03_Copy	70.98	12.95	14.02	7.68 %
Unit 402 L03 - Unit 402 L03_Copy	66.50	18.93	19.00	0.33 %
Unit 403 L03 - Unit 403 L03_Copy	48.81	13.68	14.36	4.74 %
Unit 404 L03 - Unit 404 L03_Copy	51.48	11.77	12.71	7.41 %
Unit 405 L03 - Unit 405 L03_Copy	65.60	26.20	25.40	-3.16 %
Unit 406 L03 - Unit 406 L03_Copy	70.98	17.06	17.98	5.14 %
Unit 407 L03 - Unit 407 L03_Copy	66.41	21.59	21.38	-0.98 %
Unit 408 L03 - Unit 408 L03_Copy	51.17	11.85	12.80	7.47 %
Unit 411 L02 - Unit 411 L02_Copy	63.66	28.70	25.80	-11.22 %
Unit 412 L02 - Unit 412 L02_Copy	71.68	17.78	18.90	5.90 %
Unit 413 L02 - Unit 413 L02_Copy	51.17	10.56	11.66	9.46 %

Unit 414 L02 - Unit 414 L02_Copy	64.31	23.37	22.77	-2.62 %
Unit 415 L02 - Unit 415 L02_Copy	45.99	12.73	13.86	8.13 %
Unit 416 L02 - Unit 416 L02_Copy	70.98	12.95	14.02	7.68 %
Unit 417 L02 - Unit 417 L02_Copy	66.50	18.93	19.00	0.33 %
Unit 422 L02 - Unit 422 L02_Copy	48.81	13.63	14.31	4.74 %
Unit 423 L02 - Unit 423 L02_Copy	51.48	11.77	12.71	7.41 %
Unit 424 L02 - Unit 424 L02_Copy	65.60	26.45	25.40	-4.14 %
Unit 425 L02 - Unit 425 L02_Copy	70.98	17.06	17.98	5.14 %
Unit 426 L02 - Unit 426 L02_Copy	66.41	21.59	21.38	-0.98 %
Unit 427 L02 - Unit 427 L02_Copy	51.17	11.85	12.80	7.47 %
Unit 67 L04 - Unit 67 L04_Copy	63.66	28.70	25.80	-11.22 %
Unit 68 L04 - Unit 68 L04_Copy	71.68	17.78	18.90	5.90 %
Unit 69 L04 - Unit 69 L04_Copy	51.17	10.56	11.66	9.46 %
Unit 71 L04 - Unit 71 L04_Copy	64.31	23.37	22.77	-2.62 %
Unit 72 L04 - Unit 72 L04_Copy	45.99	12.01	13.06	8.05 %
Unit 73 L04 - Unit 73 L04_Copy	70.98	12.95	14.02	7.68 %
Unit 74 L04 - Unit 74 L04_Copy	66.50	18.93	19.00	0.33 %
Unit 75 L04 - Unit 75 L04_Copy	48.81	13.68	14.36	4.74 %
Unit 76 L04 - Unit 76 L04_Copy	51.48	11.77	12.71	7.41 %
Unit 77 L04 - Unit 77 L04_Copy	65.60	26.20	25.40	-3.16 %
Unit 78 L04 - Unit 78 L04_Copy	70.98	17.06	17.98	5.14 %
Unit 79 L04 - Unit 79 L04_Copy	66.41	21.59	21.38	-0.98 %
Unit 221 L08 - Unit 221 L08	70.66	22.60	24.32	7.07 %
Unit 222 L08 - Unit 222 L08	64.60	36.48	38.38	4.95 %
Unit 223 L08 - Unit 222 L08	74.09	35.59	37.30	4.57 %
Unit 224 L08 - Unit 222 L08	50.42	25.02	26.16	4.33 %
Unit 361 L07 - Unit 362 L07	72.27	23.67	25.10	5.69 %

Block Compliance

Totals:	6643.83	2196.03	2289.42	
Average DFEE = 21.12 $kgCO_2/m^2$	% DFEE/TFEE	PASS		
Average TFEE = 21.98 $kgCO_2/m^2$	3.95 %			

Block Compliance Report - DPER

Block Reference: REV D - BE GREEN	Block Name:			
Property-Assessment Reference	**Floor area (m^2)**	**DPER ($kWh/m^2/yr$)**	**TPER ($kWh/m^2/yr$)**	**% DPER/TPER**
Unit 104 L04 - Unit 104 L04_Copy	51.17	60.93	60.59	-0.56 %
Unit 120 L06 - Unit 120 L06_Copy	77.81	47.84	49.68	3.70 %
Unit 121 L06 - Unit 121 L06_Copy	72.08	50.08	51.17	2.13 %
Unit 122 L06 - Unit 122 L06_Copy	66.50	56.83	58.19	2.34 %
Unit 123 L06 - Unit 123 L06_Copy	48.81	63.30	64.47	1.81 %
Unit 124 L06 - Unit 124 L06_Copy	51.48	60.74	60.85	0.18 %
Unit 125 L06 - Unit 125 L06_Copy	65.60	65.18	66.22	1.57 %
Unit 126 L06 - Unit 126 L06_Copy	70.98	52.32	55.55	5.81 %
Unit 127 L06 - Unit 127 L06_Copy	66.41	60.47	62.01	2.48 %
Unit 128 L06 - Unit 128 L06_Copy	72.67	49.68	50.86	2.32 %
Unit 156 L05 - Unit 156 L05_Copy	63.66	68.78	66.47	-3.48 %
Unit 157 L05 - Unit 157 L05_Copy	71.68	52.87	56.41	6.28 %
Unit 159 L05 - Unit 159 L05_Copy	64.31	62.24	62.72	0.77 %
Unit 161 L05 - Unit 161 L05_Copy	70.98	50.50	51.39	1.73 %
Unit 162 L05 - Unit 162 L05_Copy	66.50	56.68	57.39	1.24 %
Unit 163 L05 - Unit 163 L05_Copy	48.81	63.15	64.09	1.47 %
Unit 164 L05 - Unit 164 L05_Copy	51.48	60.59	60.30	-0.48 %
Unit 165 L05 - Unit 165 L05_Copy	65.60	65.22	65.26	0.06 %
Unit 166 L05 - Unit 166 L05_Copy	70.98	52.51	55.61	5.57 %
Unit 167 L05 - Unit 167 L05_Copy	66.41	59.44	60.16	1.20 %
Unit 182 MEZ - Unit 182 MEZ_Copy	35.93	125.37	133.31	5.96 %
Unit 183 MEZ - Unit 183 MEZ_Copy	35.93	109.97	118.81	7.44 %

Unit 214 L08 - Unit 214 L08	73.33	61.98	64.28	3.58 %
Unit 215 L08 - Unit 215 L08	63.74	78.64	78.39	-0.32 %
Unit 216 L08 - Unit 216 L08	53.19	70.95	72.99	2.79 %
Unit 217 L08 - Unit 217 L08	65.61	79.98	80.83	1.05 %
Unit 218 L08 - Unit 218 L08	71.87	67.49	69.21	2.49 %
Unit 219 L08 - Unit 219 L08	67.53	80.29	78.65	-2.09 %
Unit 220 L08 - Unit 220 L08	73.45	65.78	67.22	2.14 %
Unit 272 MEZ - Unit 272 MEZ_Copy	35.93	122.49	131.38	6.77 %
Unit 286 L01 - Unit 286 L01_Copy	51.48	65.31	72.23	9.58 %
Unit 287 L01 - Unit 287 L01_Copy	65.60	72.37	75.77	4.49 %
Unit 288 L01 - Unit 288 L01_Copy	70.98	65.30	68.89	5.21 %
Unit 289 L01 - Unit 289 L01_Copy	66.41	73.64	73.96	0.43 %
Unit 292 L01 - Unit 292 L01_Copy	71.68	52.87	56.41	6.28 %
Unit 293 L01 - Unit 293 L01_Copy	63.66	68.78	66.47	-3.48 %
Unit 298 L01 - Unit 298 L01_Copy	48.81	62.89	62.71	-0.29 %
Unit 350 L06 - Unit 350 L06_Copy	71.68	59.00	63.00	6.35 %
Unit 351 L06 - Unit 351 L06 _Copy	63.66	81.25	77.89	-4.31 %
Unit 352 L06 - Unit 352 L06_Copy	68.31	67.25	68.34	1.59 %
Unit 362 L07 - Unit 362 L07	63.95	71.60	73.26	2.27 %
Unit 363 L07 - Unit 363 L07	62.53	74.82	76.14	1.73 %
Unit 364 L07 - Unit 364 L07	76.79	52.45	55.51	5.51 %
Unit 365 L07 - Unit 365 L07	73.49	49.62	50.01	0.78 %
Unit 366 L07 - Unit 366 L07	63.72	56.69	58.57	3.21 %
Unit 367 L07 - Unit 367 L07	50.38	64.23	66.40	3.27 %
Unit 368 L07 - Unit 368 L07	53.14	59.65	58.57	-1.84 %
Unit 369 L07 - Unit 369 L07	65.50	61.26	63.83	4.03 %
Unit 370 L07 - Unit 370 L07	71.92	51.17	53.92	5.10 %
Unit 371 L07 - Unit 371 L07	67.07	57.54	59.55	3.38 %

Unit 372 L0 - Unit 372 L07_Copy	72.47	50.06	50.90	1.65 %
Unit 377 L05 - Unit 377 L05_Copy	51.17	60.84	60.15	-1.15 %
Unit 378 L05 - Unit 378 L05_Copy	45.99	65.31	65.03	-0.43 %
Unit 379 L05 - Unit 379 L05_Copy	51.17	60.93	60.59	-0.56 %
Unit 380 TH GF - Unit 380 TH_Copy	116.94	53.10	57.41	7.51 %
Unit 382 TH GF - Unit 382 TH_Copy	81.16	52.79	56.58	6.70 %
Unit 383 TH GF - Unit 383 TH_Copy	91.63	48.75	53.17	8.31 %
Unit 385 TH GF - Unit 385 TH_Copy	91.63	48.75	53.17	8.31 %
Unit 386 TH GF - Unit 386 TH_Copy	91.63	48.75	53.17	8.31 %
Unit 387 TH GF - Unit 387 TH_Copy	66.98	57.02	60.05	5.05 %
Unit 388 TH GF - Unit 388 TH_Copy	84.78	61.60	64.19	4.03 %
Unit 393 L03 - Unit 393 L03_Copy	63.66	68.78	66.47	-3.48 %
Unit 394 L03 - Unit 394 L03_Copy	71.68	52.87	56.41	6.28 %
Unit 395 L03 - Unit 395 L03_Copy	51.17	60.84	60.15	-1.15 %
Unit 396 L03 - Unit 396 L03_Copy	64.31	62.24	62.72	0.77 %
Unit 397 L03 - Unit 397 L03_Copy	45.99	58.98	64.84	9.04 %
Unit 401 L03 - Unit 401 L03_Copy	70.98	50.50	51.39	1.73 %
Unit 402 L03 - Unit 402 L03_Copy	66.50	56.68	57.39	1.24 %
Unit 403 L03 - Unit 403 L03_Copy	48.81	63.15	64.09	1.47 %
Unit 404 L03 - Unit 404 L03_Copy	51.48	60.59	60.30	-0.48 %
Unit 405 L03 - Unit 405 L03_Copy	65.60	65.22	65.26	0.06 %
Unit 406 L03 - Unit 406 L03_Copy	70.98	52.51	55.61	5.57 %
Unit 407 L03 - Unit 407 L03_Copy	66.41	59.44	60.16	1.20 %
Unit 408 L03 - Unit 408 L03_Copy	51.17	60.93	60.59	-0.56 %
Unit 411 L02 - Unit 411 L02_Copy	63.66	68.78	66.47	-3.48 %
Unit 412 L02 - Unit 412 L02_Copy	71.68	52.87	56.41	6.28 %
Unit 413 L02 - Unit 413 L02_Copy	51.17	60.84	60.15	-1.15 %
Unit 414 L02 - Unit 414 L02_Copy	64.31	62.24	62.72	0.77 %

Unit 415 L02 - Unit 415 L02_Copy	45.99	65.47	65.63	0.24 %
Unit 416 L02 - Unit 416 L02_Copy	70.98	50.50	51.39	1.73 %
Unit 417 L02 - Unit 417 L02_Copy	66.50	56.68	57.39	1.24 %
Unit 422 L02 - Unit 422 L02_Copy	48.81	63.13	64.05	1.44 %
Unit 423 L02 - Unit 423 L02_Copy	51.48	60.59	60.30	-0.48 %
Unit 424 L02 - Unit 424 L02_Copy	65.60	65.50	65.27	-0.35 %
Unit 425 L02 - Unit 425 L02_Copy	70.98	52.51	55.61	5.57 %
Unit 426 L02 - Unit 426 L02_Copy	66.41	59.44	60.16	1.20 %
Unit 427 L02 - Unit 427 L02_Copy	51.17	60.93	60.59	-0.56 %
Unit 67 L04 - Unit 67 L04_Copy	63.66	68.78	66.47	-3.48 %
Unit 68 L04 - Unit 68 L04_Copy	71.68	52.87	56.41	6.28 %
Unit 69 L04 - Unit 69 L04_Copy	51.17	60.84	60.15	-1.15 %
Unit 71 L04 - Unit 71 L04_Copy	64.31	62.24	62.72	0.77 %
Unit 72 L04 - Unit 72 L04_Copy	45.99	65.21	64.84	-0.57 %
Unit 73 L04 - Unit 73 L04_Copy	70.98	50.50	51.39	1.73 %
Unit 74 L04 - Unit 74 L04_Copy	66.50	56.68	57.39	1.24 %
Unit 75 L04 - Unit 75 L04_Copy	48.81	63.15	64.09	1.47 %
Unit 76 L04 - Unit 76 L04_Copy	51.48	60.59	60.30	-0.48 %
Unit 77 L04 - Unit 77 L04_Copy	65.60	65.22	65.26	0.06 %
Unit 78 L04 - Unit 78 L04_Copy	70.98	52.51	55.61	5.57 %
Unit 79 L04 - Unit 79 L04_Copy	66.41	59.44	60.16	1.20 %
Unit 221 L08 - Unit 221 L08	70.66	61.50	64.58	4.77 %
Unit 222 L08 - Unit 222 L08	64.60	83.48	81.89	-1.94 %
Unit 223 L08 - Unit 222 L08	74.09	78.63	77.05	-2.05 %
Unit 224 L08 - Unit 222 L08	50.42	70.93	76.75	7.58 %
Unit 361 L07 - Unit 362 L07	72.27	58.85	63.78	7.73 %
Totals:	6643.83	6521.51	6670.66	

Block Compliance

Average DPER = 61.44 $kgCO_2/m^2$	**% DPER/TPER**	PASS
Average TPER = 62.92 $kgCO_2/m^2$	2.35 %	

Block Compliance

Block Reference	REV D - BE LEAN	Issued on Date	07/03/2025
Block Name			
Calculation Type	New Build (As Designed)		
Assessor Details	Mr. Adam Smith	Assessor ID	AV84-0001
Client	Test, Test, Test, Test, Test		

Block Compliance Report - DER

Block Reference: REV D - BE LEAN	Block Name:			
Property-Assessment Reference	Floor area (m^2)	DER ($kgCO_2/m^2$)	TER ($kgCO_2/m^2$)	% DER/TER
Unit 104 L04 - Unit 104 L04_Copy	51.17	5.96	11.15	46.55 %
Unit 120 L06 - Unit 120 L06_Copy	77.81	4.91	9.20	46.63 %
Unit 121 L06 - Unit 121 L06_Copy	72.08	5.08	9.47	46.36 %
Unit 122 L06 - Unit 122 L06_Copy	66.50	5.74	10.77	46.70 %
Unit 123 L06 - Unit 123 L06_Copy	48.81	6.17	11.84	47.89 %
Unit 124 L06 - Unit 124 L06_Copy	51.48	5.95	11.19	46.83 %
Unit 125 L06 - Unit 125 L06_Copy	65.60	6.61	12.26	46.08 %
Unit 126 L06 - Unit 126 L06_Copy	70.98	5.33	10.28	48.15 %
Unit 127 L06 - Unit 127 L06_Copy	66.41	6.12	11.48	46.69 %
Unit 128 L06 - Unit 128 L06_Copy	72.67	5.04	9.40	46.38 %
Unit 156 L05 - Unit 156 L05_Copy	63.66	6.95	12.30	43.50 %
Unit 157 L05 - Unit 157 L05_Copy	71.68	5.40	10.45	48.33 %
Unit 159 L05 - Unit 159 L05_Copy	64.31	6.28	11.61	45.91 %
Unit 161 L05 - Unit 161 L05_Copy	70.98	5.12	9.51	46.16 %
Unit 162 L05 - Unit 162 L05_Copy	66.50	5.72	10.63	46.19 %
Unit 163 L05 - Unit 163 L05_Copy	48.81	6.16	11.77	47.66 %
Unit 164 L05 - Unit 164 L05_Copy	51.48	5.94	11.09	46.44 %
Unit 165 L05 - Unit 165 L05_Copy	65.60	6.61	12.09	45.33 %
Unit 166 L05 - Unit 166 L05_Copy	70.98	5.35	10.30	48.06 %
Unit 167 L05 - Unit 167 L05_Copy	66.41	6.02	11.14	45.96 %
Unit 182 MEZ - Unit 182 MEZ_Copy	35.93	11.96	24.56	51.30 %
Unit 183 MEZ - Unit 183 MEZ_Copy	35.93	10.42	21.86	52.33 %

Unit 214 L08 - Unit 214 L08	73.33	6.30	11.90	47.06 %
Unit 215 L08 - Unit 215 L08	63.74	7.95	14.52	45.25 %
Unit 216 L08 - Unit 216 L08	53.19	7.01	13.44	47.84 %
Unit 217 L08 - Unit 217 L08	65.61	8.07	14.98	46.13 %
Unit 218 L08 - Unit 218 L08	71.87	6.86	12.81	46.45 %
Unit 219 L08 - Unit 219 L08	67.53	8.09	14.58	44.51 %
Unit 220 L08 - Unit 220 L08	73.45	6.62	12.44	46.78 %
Unit 221 L08 - Unit 221 L08	70.66	6.21	11.94	47.99 %
Unit 222 L08 - Unit 222 L08	64.60	8.46	15.17	44.23 %
Unit 223 L08 - Unit 222 L08	74.09	7.91	14.30	44.69 %
Unit 224 L08 - Unit 222 L08	50.42	7.38	14.13	47.77 %
Unit 272 MEZ - Unit 272 MEZ_Copy	35.93	11.67	24.20	51.78 %
Unit 286 L01 - Unit 286 L01_Copy	51.48	6.78	13.31	49.06 %
Unit 287 L01 - Unit 287 L01_Copy	65.60	7.34	14.04	47.72 %
Unit 288 L01 - Unit 288 L01_Copy	70.98	6.67	12.76	47.73 %
Unit 289 L01 - Unit 289 L01_Copy	66.41	7.46	13.70	45.55 %
Unit 292 L01 - Unit 292 L01_Copy	71.68	5.40	10.45	48.33 %
Unit 293 L01 - Unit 293 L01_Copy	63.66	6.95	12.30	43.50 %
Unit 298 L01 - Unit 298 L01_Copy	48.81	6.11	11.48	46.78 %
Unit 350 L06 - Unit 350 L06_Copy	71.68	6.04	11.66	48.20 %
Unit 351 L06 - Unit 351 L06 _Copy	63.66	8.20	14.43	43.17 %
Unit 352 L06 - Unit 352 L06_Copy	68.31	6.83	12.67	46.09 %
Unit 361 L07 - Unit 362 L07	72.27	6.10	11.80	48.31 %
Unit 362 L07 - Unit 362 L07	63.95	7.47	13.57	44.95 %
Unit 363 L07 - Unit 363 L07	62.53	7.60	14.10	46.10 %
Unit 364 L07 - Unit 364 L07	76.79	5.29	10.27	48.49 %
Unit 365 L07 - Unit 365 L07	73.49	5.01	9.26	45.90 %
Unit 366 L07 - Unit 366 L07	63.72	5.74	10.84	47.05 %

Unit 367 L07 - Unit 367 L07	50.38	6.28	12.20	48.52 %
Unit 368 L07 - Unit 368 L07	53.14	5.82	10.76	45.91 %
Unit 369 L07 - Unit 369 L07	65.50	6.21	11.82	47.46 %
Unit 370 L07 - Unit 370 L07	71.92	5.20	9.97	47.84 %
Unit 371 L07 - Unit 371 L07	67.07	5.82	11.03	47.23 %
Unit 372 L0 - Unit 372 L07_Copy	72.47	5.05	9.41	46.33 %
Unit 377 L05 - Unit 377 L05_Copy	51.17	5.94	11.04	46.20 %
Unit 378 L05 - Unit 378 L05_Copy	45.99	6.31	11.95	47.20 %
Unit 379 L05 - Unit 379 L05_Copy	51.17	5.96	11.15	46.55 %
Unit 380 TH GF - Unit 380 TH_Copy	116.94	5.70	10.73	46.88 %
Unit 382 TH GF - Unit 382 TH_Copy	81.16	5.45	10.51	48.14 %
Unit 383 TH GF - Unit 383 TH_Copy	91.63	5.12	9.89	48.23 %
Unit 385 TH GF - Unit 385 TH_Copy	91.63	5.12	9.89	48.23 %
Unit 386 TH GF - Unit 386 TH_Copy	91.63	5.12	9.89	48.23 %
Unit 387 TH GF - Unit 387 TH_Copy	66.98	5.76	11.10	48.11 %
Unit 388 TH GF - Unit 388 TH_Copy	84.78	6.36	11.93	46.69 %
Unit 393 L03 - Unit 393 L03_Copy	63.66	6.95	12.30	43.50 %
Unit 394 L03 - Unit 394 L03_Copy	71.68	5.40	10.45	48.33 %
Unit 395 L03 - Unit 395 L03_Copy	51.17	5.94	11.04	46.20 %
Unit 396 L03 - Unit 396 L03_Copy	64.31	6.28	11.61	45.91 %
Unit 397 L03 - Unit 397 L03_Copy	45.99	6.30	11.91	47.10 %
Unit 401 L03 - Unit 401 L03_Copy	70.98	5.12	9.51	46.16 %
Unit 402 L03 - Unit 402 L03_Copy	66.50	5.72	10.63	46.19 %
Unit 403 L03 - Unit 403 L03_Copy	48.81	6.16	11.77	47.66 %
Unit 404 L03 - Unit 404 L03_Copy	51.48	5.94	11.09	46.44 %
Unit 405 L03 - Unit 405 L03_Copy	65.60	6.61	12.09	45.33 %
Unit 406 L03 - Unit 406 L03_Copy	70.98	5.35	10.30	48.06 %
Unit 407 L03 - Unit 407 L03_Copy	66.41	6.02	11.14	45.96 %

Unit 408 L03 - Unit 408 L03_Copy	51.17	5.96	11.15	46.55 %
Unit 411 L02 - Unit 411 L02_Copy	63.66	6.95	12.30	43.50 %
Unit 412 L02 - Unit 412 L02_Copy	71.68	5.40	10.45	48.33 %
Unit 413 L02 - Unit 413 L02_Copy	51.17	5.94	11.04	46.20 %
Unit 414 L02 - Unit 414 L02_Copy	64.31	6.28	11.61	45.91 %
Unit 415 L02 - Unit 415 L02_Copy	45.99	6.33	12.06	47.51 %
Unit 416 L02 - Unit 416 L02_Copy	70.98	5.12	9.51	46.16 %
Unit 417 L02 - Unit 417 L02_Copy	66.50	5.72	10.63	46.19 %
Unit 422 L02 - Unit 422 L02_Copy	48.81	6.15	11.76	47.70 %
Unit 423 L02 - Unit 423 L02_Copy	51.48	5.94	11.09	46.44 %
Unit 424 L02 - Unit 424 L02_Copy	65.60	6.64	12.09	45.08 %
Unit 425 L02 - Unit 425 L02_Copy	70.98	5.35	10.30	48.06 %
Unit 426 L02 - Unit 426 L02_Copy	66.41	6.02	11.14	45.96 %
Unit 427 L02 - Unit 427 L02_Copy	51.17	5.96	11.15	46.55 %
Unit 67 L04 - Unit 67 L04_Copy	63.66	6.95	12.30	43.50 %
Unit 68 L04 - Unit 68 L04_Copy	71.68	5.40	10.45	48.33 %
Unit 69 L04 - Unit 69 L04_Copy	51.17	5.94	11.04	46.20 %
Unit 71 L04 - Unit 71 L04_Copy	64.31	6.28	11.61	45.91 %
Unit 72 L04 - Unit 72 L04_Copy	45.99	6.30	11.91	47.10 %
Unit 73 L04 - Unit 73 L04_Copy	70.98	5.12	9.51	46.16 %
Unit 74 L04 - Unit 74 L04_Copy	66.50	5.72	10.63	46.19 %
Unit 75 L04 - Unit 75 L04_Copy	48.81	6.16	11.77	47.66 %
Unit 76 L04 - Unit 76 L04_Copy	51.48	5.94	11.09	46.44 %
Unit 77 L04 - Unit 77 L04_Copy	65.60	6.61	12.09	45.33 %
Unit 78 L04 - Unit 78 L04_Copy	70.98	5.35	10.30	48.06 %
Unit 79 L04 - Unit 79 L04_Copy	66.41	6.02	11.14	45.96 %
Totals:	6643.83	654.92	1232.63	

Block Compliance

Average DER = 6.19 $kgCO_2/m^2$	**% DER/TER**	PASS
Average TER = 11.63 $kgCO_2/m^2$	46.75 %	

Block Compliance Report - DFEE

Block Reference: REV D - BE LEAN	**Block Name:**			
Property-Assessment Reference	**Floor area (m^2)**	**DFEE ($kWh/m^2/yr$)**	**TFEE ($kWh/m^2/yr$)**	**% DFEE/TFEE**
Unit 104 L04 - Unit 104 L04_Copy	51.17	11.85	12.80	7.47 %
Unit 120 L06 - Unit 120 L06_Copy	77.81	13.00	14.32	9.19 %
Unit 121 L06 - Unit 121 L06_Copy	72.08	12.75	13.92	8.37 %
Unit 122 L06 - Unit 122 L06_Copy	66.50	18.75	19.70	4.82 %
Unit 123 L06 - Unit 123 L06_Copy	48.81	14.03	14.73	4.71 %
Unit 124 L06 - Unit 124 L06_Copy	51.48	11.94	13.00	8.15 %
Unit 125 L06 - Unit 125 L06_Copy	65.60	25.97	26.21	0.92 %
Unit 126 L06 - Unit 126 L06_Copy	70.98	16.69	17.69	5.66 %
Unit 127 L06 - Unit 127 L06_Copy	66.41	22.16	22.99	3.60 %
Unit 128 L06 - Unit 128 L06_Copy	72.67	12.07	13.36	9.63 %
Unit 156 L05 - Unit 156 L05_Copy	63.66	28.70	25.80	-11.22 %
Unit 157 L05 - Unit 157 L05_Copy	71.68	17.78	18.90	5.90 %
Unit 159 L05 - Unit 159 L05_Copy	64.31	23.37	22.77	-2.62 %
Unit 161 L05 - Unit 161 L05_Copy	70.98	12.95	14.02	7.68 %
Unit 162 L05 - Unit 162 L05_Copy	66.50	18.93	19.00	0.33 %
Unit 163 L05 - Unit 163 L05_Copy	48.81	13.68	14.36	4.74 %
Unit 164 L05 - Unit 164 L05_Copy	51.48	11.77	12.71	7.41 %
Unit 165 L05 - Unit 165 L05_Copy	65.60	26.20	25.40	-3.16 %
Unit 166 L05 - Unit 166 L05_Copy	70.98	17.06	17.98	5.14 %
Unit 167 L05 - Unit 167 L05_Copy	66.41	21.59	21.38	-0.98 %
Unit 182 MEZ - Unit 182 MEZ_Copy	35.93	60.30	67.24	10.33 %
Unit 183 MEZ - Unit 183 MEZ_Copy	35.93	51.17	55.51	7.82 %

Unit 214 L08 - Unit 214 L08	73.33	23.81	25.38	6.21 %
Unit 215 L08 - Unit 215 L08	63.74	33.73	35.69	5.49 %
Unit 216 L08 - Unit 216 L08	53.19	22.89	24.41	6.22 %
Unit 217 L08 - Unit 217 L08	65.61	34.47	37.91	9.08 %
Unit 218 L08 - Unit 218 L08	71.87	28.02	29.25	4.21 %
Unit 219 L08 - Unit 219 L08	67.53	35.41	37.11	4.58 %
Unit 220 L08 - Unit 220 L08	73.45	25.98	27.67	6.10 %
Unit 221 L08 - Unit 221 L08	70.66	22.60	24.32	7.07 %
Unit 222 L08 - Unit 222 L08	64.60	36.48	38.38	4.95 %
Unit 223 L08 - Unit 222 L08	74.09	35.59	37.30	4.57 %
Unit 224 L08 - Unit 222 L08	50.42	25.02	26.16	4.33 %
Unit 272 MEZ - Unit 272 MEZ_Copy	35.93	59.13	65.63	9.90 %
Unit 286 L01 - Unit 286 L01_Copy	51.48	21.63	23.75	8.92 %
Unit 287 L01 - Unit 287 L01_Copy	65.60	31.18	34.28	9.03 %
Unit 288 L01 - Unit 288 L01_Copy	70.98	27.70	29.46	5.99 %
Unit 289 L01 - Unit 289 L01_Copy	66.41	32.05	33.19	3.45 %
Unit 292 L01 - Unit 292 L01_Copy	71.68	17.78	18.90	5.90 %
Unit 293 L01 - Unit 293 L01_Copy	63.66	28.70	25.80	-11.22 %
Unit 298 L01 - Unit 298 L01_Copy	48.81	11.14	12.05	7.57 %
Unit 350 L06 - Unit 350 L06_Copy	71.68	23.03	24.38	5.57 %
Unit 351 L06 - Unit 351 L06 _Copy	63.66	36.56	35.44	-3.17 %
Unit 352 L06 - Unit 352 L06_Copy	68.31	27.73	28.99	4.33 %
Unit 361 L07 - Unit 362 L07	72.27	23.67	25.10	5.69 %
Unit 362 L07 - Unit 362 L07	63.95	31.83	31.58	-0.80 %
Unit 363 L07 - Unit 363 L07	62.53	31.97	33.47	4.48 %
Unit 364 L07 - Unit 364 L07	76.79	17.35	19.01	8.74 %
Unit 365 L07 - Unit 365 L07	73.49	12.56	13.55	7.31 %
Unit 366 L07 - Unit 366 L07	63.72	17.83	18.95	5.88 %

Unit 367 L07 - Unit 367 L07	50.38	16.80	17.55	4.24 %
Unit 368 L07 - Unit 368 L07	53.14	10.56	11.52	8.28 %
Unit 369 L07 - Unit 369 L07	65.50	22.56	23.88	5.50 %
Unit 370 L07 - Unit 370 L07	71.92	15.36	16.32	5.87 %
Unit 371 L07 - Unit 371 L07	67.07	19.74	21.03	6.11 %
Unit 372 L0 - Unit 372 L07_Copy	72.47	12.12	13.41	9.63 %
Unit 377 L05 - Unit 377 L05_Copy	51.17	10.56	11.66	9.46 %
Unit 378 L05 - Unit 378 L05_Copy	45.99	12.53	13.52	7.35 %
Unit 379 L05 - Unit 379 L05_Copy	51.17	11.85	12.80	7.47 %
Unit 380 TH GF - Unit 380 TH_Copy	116.94	29.13	31.77	8.29 %
Unit 382 TH GF - Unit 382 TH_Copy	81.16	20.36	22.09	7.84 %
Unit 383 TH GF - Unit 383 TH_Copy	91.63	20.09	21.76	7.69 %
Unit 385 TH GF - Unit 385 TH_Copy	91.63	20.09	21.76	7.69 %
Unit 386 TH GF - Unit 386 TH_Copy	91.63	20.09	21.76	7.69 %
Unit 387 TH GF - Unit 387 TH_Copy	66.98	18.22	19.71	7.57 %
Unit 388 TH GF - Unit 388 TH_Copy	84.78	29.03	30.52	4.89 %
Unit 393 L03 - Unit 393 L03_Copy	63.66	28.70	25.80	-11.22 %
Unit 394 L03 - Unit 394 L03_Copy	71.68	17.78	18.90	5.90 %
Unit 395 L03 - Unit 395 L03_Copy	51.17	10.56	11.66	9.46 %
Unit 396 L03 - Unit 396 L03_Copy	64.31	23.37	22.77	-2.62 %
Unit 397 L03 - Unit 397 L03_Copy	45.99	12.01	13.06	8.05 %
Unit 401 L03 - Unit 401 L03_Copy	70.98	12.95	14.02	7.68 %
Unit 402 L03 - Unit 402 L03_Copy	66.50	18.93	19.00	0.33 %
Unit 403 L03 - Unit 403 L03_Copy	48.81	13.68	14.36	4.74 %
Unit 404 L03 - Unit 404 L03_Copy	51.48	11.77	12.71	7.41 %
Unit 405 L03 - Unit 405 L03_Copy	65.60	26.20	25.40	-3.16 %
Unit 406 L03 - Unit 406 L03_Copy	70.98	17.06	17.98	5.14 %

Unit 407 L03 - Unit 407 L03_Copy	66.41	21.59	21.38	-0.98 %
Unit 408 L03 - Unit 408 L03_Copy	51.17	11.85	12.80	7.47 %
Unit 411 L02 - Unit 411 L02_Copy	63.66	28.70	25.80	-11.22 %
Unit 412 L02 - Unit 412 L02_Copy	71.68	17.78	18.90	5.90 %
Unit 413 L02 - Unit 413 L02_Copy	51.17	10.56	11.66	9.46 %
Unit 414 L02 - Unit 414 L02_Copy	64.31	23.37	22.77	-2.62 %
Unit 415 L02 - Unit 415 L02_Copy	45.99	12.73	13.86	8.13 %
Unit 416 L02 - Unit 416 L02_Copy	70.98	12.95	14.02	7.68 %
Unit 417 L02 - Unit 417 L02_Copy	66.50	18.93	19.00	0.33 %
Unit 422 L02 - Unit 422 L02_Copy	48.81	13.63	14.31	4.74 %
Unit 423 L02 - Unit 423 L02_Copy	51.48	11.77	12.71	7.41 %
Unit 424 L02 - Unit 424 L02_Copy	65.60	26.45	25.40	-4.14 %
Unit 425 L02 - Unit 425 L02_Copy	70.98	17.06	17.98	5.14 %
Unit 426 L02 - Unit 426 L02_Copy	66.41	21.59	21.38	-0.98 %
Unit 427 L02 - Unit 427 L02_Copy	51.17	11.85	12.80	7.47 %
Unit 67 L04 - Unit 67 L04_Copy	63.66	28.70	25.80	-11.22 %
Unit 68 L04 - Unit 68 L04_Copy	71.68	17.78	18.90	5.90 %
Unit 69 L04 - Unit 69 L04_Copy	51.17	10.56	11.66	9.46 %
Unit 71 L04 - Unit 71 L04_Copy	64.31	23.37	22.77	-2.62 %
Unit 72 L04 - Unit 72 L04_Copy	45.99	12.01	13.06	8.05 %
Unit 73 L04 - Unit 73 L04_Copy	70.98	12.95	14.02	7.68 %
Unit 74 L04 - Unit 74 L04_Copy	66.50	18.93	19.00	0.33 %
Unit 75 L04 - Unit 75 L04_Copy	48.81	13.68	14.36	4.74 %
Unit 76 L04 - Unit 76 L04_Copy	51.48	11.77	12.71	7.41 %
Unit 77 L04 - Unit 77 L04_Copy	65.60	26.20	25.40	-3.16 %
Unit 78 L04 - Unit 78 L04_Copy	70.98	17.06	17.98	5.14 %

Block Compliance

Unit 79 L04 - Unit 79 L04_Copy	66.41	21.59	21.38	-0.98 %
Totals:	6643.83	2196.03	2289.42	
Average DFEE = 21.12 $kgCO_2/m^2$	% DFEE/TFEE	PASS		
Average TFEE = 21.98 $kgCO_2/m^2$	3.95 %			

Block Compliance Report - DPER

Block Reference: REV D - BE LEAN	Block Name:			
Property-Assessment Reference	Floor area (m^2)	DPER ($kWh/m^2/yr$)	TPER ($kWh/m^2/yr$)	% DPER/TPER
Unit 104 L04 - Unit 104 L04_Copy	51.17	64.12	60.59	-5.83 %
Unit 120 L06 - Unit 120 L06_Copy	77.81	52.75	49.68	-6.18 %
Unit 121 L06 - Unit 121 L06_Copy	72.08	54.63	51.17	-6.76 %
Unit 122 L06 - Unit 122 L06_Copy	66.50	61.34	58.19	-5.41 %
Unit 123 L06 - Unit 123 L06_Copy	48.81	66.42	64.47	-3.02 %
Unit 124 L06 - Unit 124 L06_Copy	51.48	64.07	60.85	-5.29 %
Unit 125 L06 - Unit 125 L06_Copy	65.60	70.10	66.22	-5.86 %
Unit 126 L06 - Unit 126 L06_Copy	70.98	57.12	55.55	-2.83 %
Unit 127 L06 - Unit 127 L06_Copy	66.41	65.19	62.01	-5.13 %
Unit 128 L06 - Unit 128 L06_Copy	72.67	54.26	50.86	-6.69 %
Unit 156 L05 - Unit 156 L05_Copy	63.66	73.55	66.47	-10.65 %
Unit 157 L05 - Unit 157 L05_Copy	71.68	57.78	56.41	-2.43 %
Unit 159 L05 - Unit 159 L05_Copy	64.31	66.83	62.72	-6.55 %
Unit 161 L05 - Unit 161 L05_Copy	70.98	55.03	51.39	-7.08 %
Unit 162 L05 - Unit 162 L05_Copy	66.50	61.17	57.39	-6.59 %
Unit 163 L05 - Unit 163 L05_Copy	48.81	66.24	64.09	-3.35 %
Unit 164 L05 - Unit 164 L05_Copy	51.48	63.90	60.30	-5.97 %
Unit 165 L05 - Unit 165 L05_Copy	65.60	70.13	65.26	-7.46 %
Unit 166 L05 - Unit 166 L05_Copy	70.98	57.31	55.61	-3.06 %
Unit 167 L05 - Unit 167 L05_Copy	66.41	64.10	60.16	-6.55 %
Unit 182 MEZ - Unit 182 MEZ_Copy	35.93	125.70	133.31	5.71 %

Unit 183 MEZ - Unit 183 MEZ_Copy	35.93	110.09	118.81	7.34 %
Unit 214 L08 - Unit 214 L08	73.33	66.87	64.28	-4.03 %
Unit 215 L08 - Unit 215 L08	63.74	83.80	78.39	-6.90 %
Unit 216 L08 - Unit 216 L08	53.19	74.60	72.99	-2.21 %
Unit 217 L08 - Unit 217 L08	65.61	85.01	80.83	-5.17 %
Unit 218 L08 - Unit 218 L08	71.87	72.61	69.21	-4.91 %
Unit 219 L08 - Unit 219 L08	67.53	85.12	78.65	-8.23 %
Unit 220 L08 - Unit 220 L08	73.45	70.17	67.22	-4.39 %
Unit 221 L08 - Unit 221 L08	70.66	66.04	64.58	-2.26 %
Unit 222 L08 - Unit 222 L08	64.60	89.01	81.89	-8.69 %
Unit 223 L08 - Unit 222 L08	74.09	83.19	77.05	-7.97 %
Unit 224 L08 - Unit 222 L08	50.42	78.47	76.75	-2.24 %
Unit 272 MEZ - Unit 272 MEZ_Copy	35.93	122.80	131.38	6.53 %
Unit 286 L01 - Unit 286 L01_Copy	51.48	72.34	72.23	-0.15 %
Unit 287 L01 - Unit 287 L01_Copy	65.60	77.42	75.77	-2.18 %
Unit 288 L01 - Unit 288 L01_Copy	70.98	70.63	68.89	-2.53 %
Unit 289 L01 - Unit 289 L01_Copy	66.41	78.61	73.96	-6.29 %
Unit 292 L01 - Unit 292 L01_Copy	71.68	57.78	56.41	-2.43 %
Unit 293 L01 - Unit 293 L01_Copy	63.66	73.55	66.47	-10.65 %
Unit 298 L01 - Unit 298 L01_Copy	48.81	65.85	62.71	-5.01 %
Unit 350 L06 - Unit 350 L06_Copy	71.68	64.21	63.00	-1.92 %
Unit 351 L06 - Unit 351 L06 _Copy	63.66	86.20	77.89	-10.67 %
Unit 352 L06 - Unit 352 L06_Copy	68.31	72.19	68.34	-5.63 %
Unit 361 L07 - Unit 362 L07	72.27	64.83	63.78	-1.65 %
Unit 362 L07 - Unit 362 L07	63.95	78.86	73.26	-7.64 %
Unit 363 L07 - Unit 363 L07	62.53	80.17	76.14	-5.29 %
Unit 364 L07 - Unit 364 L07	76.79	56.54	55.51	-1.86 %
Unit 365 L07 - Unit 365 L07	73.49	53.90	50.01	-7.78 %

Unit 366 L07 - Unit 366 L07	63.72	61.47	58.57	-4.95 %
Unit 367 L07 - Unit 367 L07	50.38	67.39	66.40	-1.49 %
Unit 368 L07 - Unit 368 L07	53.14	62.71	58.57	-7.07 %
Unit 369 L07 - Unit 369 L07	65.50	66.11	63.83	-3.57 %
Unit 370 L07 - Unit 370 L07	71.92	55.79	53.92	-3.47 %
Unit 371 L07 - Unit 371 L07	67.07	62.10	59.55	-4.28 %
Unit 372 L0 - Unit 372 L07_Copy	72.47	54.32	50.90	-6.72 %
Unit 377 L05 - Unit 377 L05_Copy	51.17	63.99	60.15	-6.38 %
Unit 378 L05 - Unit 378 L05_Copy	45.99	67.97	65.03	-4.52 %
Unit 379 L05 - Unit 379 L05_Copy	51.17	64.12	60.59	-5.83 %
Unit 380 TH GF - Unit 380 TH_Copy	116.94	59.92	57.41	-4.37 %
Unit 382 TH GF - Unit 382 TH_Copy	81.16	58.07	56.58	-2.63 %
Unit 383 TH GF - Unit 383 TH_Copy	91.63	54.51	53.17	-2.52 %
Unit 385 TH GF - Unit 385 TH_Copy	91.63	54.51	53.17	-2.52 %
Unit 386 TH GF - Unit 386 TH_Copy	91.63	54.51	53.17	-2.52 %
Unit 387 TH GF - Unit 387 TH_Copy	66.98	61.62	60.05	-2.61 %
Unit 388 TH GF - Unit 388 TH_Copy	84.78	67.17	64.19	-4.64 %
Unit 393 L03 - Unit 393 L03_Copy	63.66	73.55	66.47	-10.65 %
Unit 394 L03 - Unit 394 L03_Copy	71.68	57.78	56.41	-2.43 %
Unit 395 L03 - Unit 395 L03_Copy	51.17	63.99	60.15	-6.38 %
Unit 396 L03 - Unit 396 L03_Copy	64.31	66.83	62.72	-6.55 %
Unit 397 L03 - Unit 397 L03_Copy	45.99	67.87	64.84	-4.67 %
Unit 401 L03 - Unit 401 L03_Copy	70.98	55.03	51.39	-7.08 %
Unit 402 L03 - Unit 402 L03_Copy	66.50	61.17	57.39	-6.59 %
Unit 403 L03 - Unit 403 L03_Copy	48.81	66.24	64.09	-3.35 %
Unit 404 L03 - Unit 404 L03_Copy	51.48	63.90	60.30	-5.97 %
Unit 405 L03 - Unit 405 L03_Copy	65.60	70.13	65.26	-7.46 %
Unit 406 L03 - Unit 406 L03_Copy	70.98	57.31	55.61	-3.06 %

Unit 407 L03 - Unit 407 L03_Copy	66.41	64.10	60.16	-6.55 %
Unit 408 L03 - Unit 408 L03_Copy	51.17	64.12	60.59	-5.83 %
Unit 411 L02 - Unit 411 L02_Copy	63.66	73.55	66.47	-10.65 %
Unit 412 L02 - Unit 412 L02_Copy	71.68	57.78	56.41	-2.43 %
Unit 413 L02 - Unit 413 L02_Copy	51.17	63.99	60.15	-6.38 %
Unit 414 L02 - Unit 414 L02_Copy	64.31	66.83	62.72	-6.55 %
Unit 415 L02 - Unit 415 L02_Copy	45.99	68.16	65.63	-3.85 %
Unit 416 L02 - Unit 416 L02_Copy	70.98	55.03	51.39	-7.08 %
Unit 417 L02 - Unit 417 L02_Copy	66.50	61.17	57.39	-6.59 %
Unit 422 L02 - Unit 422 L02_Copy	48.81	66.22	64.05	-3.39 %
Unit 423 L02 - Unit 423 L02_Copy	51.48	63.90	60.30	-5.97 %
Unit 424 L02 - Unit 424 L02_Copy	65.60	70.41	65.27	-7.87 %
Unit 425 L02 - Unit 425 L02_Copy	70.98	57.31	55.61	-3.06 %
Unit 426 L02 - Unit 426 L02_Copy	66.41	64.10	60.16	-6.55 %
Unit 427 L02 - Unit 427 L02_Copy	51.17	64.12	60.59	-5.83 %
Unit 67 L04 - Unit 67 L04_Copy	63.66	73.55	66.47	-10.65 %
Unit 68 L04 - Unit 68 L04_Copy	71.68	57.78	56.41	-2.43 %
Unit 69 L04 - Unit 69 L04_Copy	51.17	63.99	60.15	-6.38 %
Unit 71 L04 - Unit 71 L04_Copy	64.31	66.83	62.72	-6.55 %
Unit 72 L04 - Unit 72 L04_Copy	45.99	67.87	64.84	-4.67 %
Unit 73 L04 - Unit 73 L04_Copy	70.98	55.03	51.39	-7.08 %
Unit 74 L04 - Unit 74 L04_Copy	66.50	61.17	57.39	-6.59 %
Unit 75 L04 - Unit 75 L04_Copy	48.81	66.24	64.09	-3.35 %
Unit 76 L04 - Unit 76 L04_Copy	51.48	63.90	60.30	-5.97 %
Unit 77 L04 - Unit 77 L04_Copy	65.60	70.13	65.26	-7.46 %
Unit 78 L04 - Unit 78 L04_Copy	70.98	57.31	55.61	-3.06 %
Unit 79 L04 - Unit 79 L04_Copy	66.41	64.10	60.16	-6.55 %
Totals:	6643.83	6981.37	6670.66	

Block Compliance

Average DPER = 66.01 $kgCO_2/m^2$	**% DPER/TPER**	FAIL
Average TPER = 62.92 $kgCO_2/m^2$	-4.92 %	