

BARCLAY HOUSE MANCHESTER

Energy, Environmental Standards
Statement and Ventilation Statement
Ref: P1421-ES-001 Rev B

NOVO

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AMENDMENT HISTORY



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1	EXECUTIVE SUMMARY	4
2	INTRODUCTION.....	6
2.1	PURPOSE.....	6
2.2	BACKGROUND POLICY DOCUMENTS	7
2.3	SITE DESCRIPTION	8
2.4	PLANNING POLICY	9
2.5	BUILDING REGULATIONS.....	11
2.6	THE ENERGY HIERARCHY.....	12
3	DESIGN PARAMETERS	14
3.1	METHODOLOGY	14
3.2	ARCHITECTURAL DRAWINGS BY HOWARD & SEDDON ARCHITECTS.....	15
3.3	FUEL	15
3.4	BASELINE CO ₂ EMISSIONS.....	15
4	ENERGY STRATEGY	17
4.1	ENERGY EFFICIENT DESIGN.....	17
4.2	REDUCTIONS AFTER FABRIC FIRST APPROACH	19
4.3	CLEANER ENERGY - CHP & DECENTRALISED ENERGY NETWORKS.....	20
4.4	LOW & ZERO CARBON TECHNOLOGIES	21
5	ENVIRONMENTAL STANDARDS	25
5.1	ENERGY EFFICIENCY.....	25
5.2	RENEWABLE ENERGY.....	25
5.3	ENERGY EFFICIENT DESIGN.....	26
5.4	ENERGY EFFICIENT DESIGN WITH GREEN TECHNOLOGY	26
5.5	WATER MANAGEMENT AND WEATHER RESILIENCE	27
5.6	WASTE MANAGEMENT	27
5.7	CONSTRUCTION MANAGEMENT	28
5.8	BIODIVERSITY.....	28
5.9	WATERWAYS.....	28
6	CONCLUSION	29
7	APPENDICES	31

Appendix A – SAP Calculations

1 EXECUTIVE SUMMARY

The design of the proposed development known as Barclay House, Manchester, located in an urban area of the city, has incorporated building fabric enhancement to increase the energy efficiency of the building.

The development is a refurbished development of apartments with a proposed 2 storey extension and conversion of ground floor carparking to 4 refurbished apartments, falling specifically under Part L1B. The total number of units is 13, with 9 new builds.

This report will deal solely with the two storey new build extension which falls under Part L1A.

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

Given the complexity of calculating and assessing CO₂ emissions, the Manchester City Council 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 Policy EN6 of 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 calculated using current Building Regulations Part L1a 2013.

The proposed fabric specification is described in the table below:

Table 1 Building Fabric Specification

Proposed Building Fabric			
Element	L1A: 2013 Limiting U-values (W/m ² .k)	L1A: 2013 Notional U-values (W/m ² .k)	Proposed U-values (W/m ² .k)
Floors	0.25	0.13	0.15 (0.075 semi exposed)
External Walls	0.30	0.18	0.16
Party walls between dwelling	0.20	0.00	0.00
Roof	0.20	0.13	0.11
Windows	2.00	1.40	1.2
Doors	2.00	1.0	NA
Y – value (W/m ² .k)	0.15	~0.05	0.08-0.12 ACD's
Air permeability (m ² /h.m ² @ 50 pa)			
All dwellings	10.0	5.0	3.0

For each of the 9 No new build dwellings within the development, 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:

- Target Carbon Dioxide Emission Rate (TER) **21.00 kg/m²**
- Dwelling Carbon Dioxide Emission Rate (DER) **19.10 kg/m²**

- a) The fabric improvements alone would provide a 9.05% CO₂ reduction (DER/TER) against current Building Regulations for the entire residential aspect of the development. This equates to 15.05% reduction in CO₂ over Building Regulations 2010.

Following the Fabric First approach of the EN6 Policy of Manchester City Council the following has been calculated.

- b) The Fabric Energy Efficiency of the entire development has been noticeably reduced by 15.22%

- | | |
|--|-------------------------------------|
| • Target Fabric Energy Efficiency (TFEE) | 41.93 kWh/m²/year |
| • Dwelling Fabric Energy Efficiency (DFEE) | 35.55 kWh/m²/year |

The report demonstrates that the development adheres fully with the requirements of Policy EN6 and associated paragraphs within the Manchester Core Strategy.

It has also been demonstrated that the ventilation strategy for the dwellings will aid with the achievement of the CO₂ target and comply with Part F of Building Regulations.

The report also demonstrates that the Environmental Standards that Manchester employ for developers will be taken account of under the full construction package and significant mindfulness of these issued is carried throughout the full design process.

An all-electric heating and water heating system would provide, quiet, and non-direct polluting system which is considered to be the most complimentary to the site.

An improvement fabric first approach which has a 15.22% improvement over the Fabric Energy Efficiency target which demonstrates focus and consideration on low heat loss and improved energy demand.

All Environmental Standards have been addressed accordingly, and a mindfulness to a sustainable and environmentally friendly design has been carried through to all aspects of the proposed development.

In addition the 4 converted ground floor units that fall under Part L1B will not contribute to the overall CO₂ reduction requirements as they have existing structure that would not meet new build minimums. The Building Regulations recognise this fact. However, these units will adhere to all minimum fabric and fixed services standards contained within Part L1B to achieve compliance.

2 INTRODUCTION

2.1 PURPOSE

NOVO Integration Ltd has been appointed as energy consultants to produce an energy, environmental and ventilation statement for the development known as Barclay House, Manchester, located on Whitworth Street, adjacent to the Rochdale Canal and in very close proximity to Manchester Oxford Road train station.

The development comprises of a 5 storey existing building that has already been refurbished into apartments. 9 new build apartments are proposed to be a 2 storey extension to the existing building. 4 No additional apartments are being formed within the ground floor carpark area, as such these 4 new apartments will be classed as L1B dwellings. As the extension comprises of brand new build apartments, this means that part L1A applies, as such this report will only be concerned with the new build apartments only.

The 4 change of use dwellings are to meet all appropriate fabric and fixed services criteria, but cannot form part of the calculations that contribute to the required CO₂ reductions required by the Manchester Core Strategy.

This report is to support the scheme design process, demonstrate Building Regulations Part L compliance, included details with regards the ventilation strategy for the entirety of the development and to achieve the applicable planning policies set out in the Local Authority of Manchester City Council Adopted Core Strategy Development Plan Document.

This report will outline the following:

1. Assess the proposed development site's estimated CO₂ 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 analysis calculations, with respect to the Standard Assessment energy assessment Procedure (SAP). Demonstration of how the design is compliant against the current 2013 Part L1A buildings regulations.
3. Assess the viability of compliance against Manchester's Core Strategy Environmental Standards as far as remit allows.
4. To provide relevant detail with regards the ventilation strategy for the development in order to confirm compliance viability with Part F of Building Regulations.
5. To provide a summary to the Environmental Standards and how the development will address these issues.

This report will deal specifically with the residential aspect of the development more the most part and will demonstrate what is required for compliance with regards Energy and CO₂ emissions through the residential aspect and excluding the non-domestic elements.

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 CO₂ levels by 2010 and a 60% reduction by 2050
- Integrating renewable energy into new developments: Toolkit for planners, developers and consultants, September 2004
- The Building Regulations 2013 - Approved Document L - Conservation of Fuel and Power in new buildings other than dwellings
- The Building Regulations 2013 – Approved Document F – Ventilation Means
- National Planning Policy Framework (July 2018)

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. Particularly section 2 which states:

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 climate change, including moving to a low carbon economy.

- Adopted Core Strategy Manchester Local Development Framework July 2012
- Guide to Development in Manchester Supplementary Planning Document and Planning Guidance Adopted April 2007.

2.3 SITE DESCRIPTION

The development site is located on Whitworth Street, adjacent to the Rochdale Canal and in very close proximity to Manchester Oxford Road train station.

The area surrounding the site is predominately urban commercial in its use, made up of mainly office buildings, shops, educational buildings and bars. There is also a significant amount of residential buildings, mainly apartments that surround the site in all aspects.

The new residential development being proposed is in keeping of the with the surrounding uses.

Please see the aerial view in figure (1).

Figure 1 Proposed Development (indicative only)



The proposed development consists of 9 No residential duplex units located over the 2 storey building extension.

The lower stories consist of refurbished apartments and associated communal areas.

Figure 2 Site Location Plan



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*

The policy relating to energy and sustainability that must be addressed for this particular development is Policy EN6: Target Framework for CO₂ reductions from low or zero carbon energy supplies.

Policy EN6

Target Framework for CO₂ 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 CO₂ 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 EN 8:

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 CO₂ 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 CO₂ 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 (>45kgCO ₂ /m ²))	+15% increase on Part L 2010
Target 3: Micro generation area	+15% increase on Part L 2010

Where the CO₂ 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 CO₂ 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 CO₂ emission reduction over 2010 Building Regulations. However, the development will be constructed to adhere to 2013 Building Regulations.

2013 Part L1A Building Regulations is widely recognised within the industry as being 6% better than 2010. Meaning that it is already more onerous to achieve just a Building Regulations pass.

As such, the logic should apply to the Manchester Core Strategy policy. As 2013 Building Regulations has a 6% betterment, then the target should be 9% over 2013 Building Regulations for CO₂ emissions.

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

2.5 BUILDING REGULATIONS

2.5.1 Part L1A

Approved document L1A – Conservation of fuel and Power sets the standard for carbon emissions for new dwellings and was revised last April 2014 (Part L: 2013). Dwellings will need to comply with the criteria set out in the document, as follows:

- 1) The predicted Dwelling CO₂ Emission Rate (DER) should not be greater than the Target CO₂ Emission Rate (TER).
- 2) The performance of the building fabric and fixed building services should be no more than the design limits set out in Table 2 of the approved Document.
- 3) The dwelling will have appropriate passive control measures to limit the effect of solar gains on indoor temperatures in summer.
- 4) That the performance of dwellings as-built comply with DER values achieved, including site testing or a representative sample of dwellings, demonstrating that the 'air permeability' rate achieved is as per that specified, or better.
- 5) The necessary provisions for energy efficient operation of dwellings are put in place, including operation and maintenance instructions

Compliance with the Approved Document Part L1A should be demonstrated at detailed design stage, prior to construction in the detail design phase of the project.

2.5.2 Part F Ventilation

Building Regulations Part F 2013 states that all newly constructed dwellings are required to comply with the following criteria:-

- Criterion 1 – Extract ventilation to outside is required in each kitchen, utility room and bathroom. The extract can be either intermittent or continuously operating. The rate required are as shown in extracted (table 5.1a) below.
- Criterion 2 – The whole dwelling ventilation rate for the supply of air to the habitable room shall be no less than specified in the extracted (table 5.1a).
- Criterion 3 – Purge ventilation is required in each habitable room and should be capable of extracting a minimum of four air changes per hour (ach) per room directly to outside.

Figure 3: Ventilation Rates

Table 5.1a Extract ventilation rates			
Room	Intermittent extract	Continuous extract	
	Minimum rate	Minimum high rate	Minimum low rate
Kitchen	30 l/s adjacent to hob; or 60 l/s elsewhere	13 l/s	Total extract rate should be at least the whole dwelling ventilation rate given in Table 5.1b
Utility room	30 l/s	8 l/s	
Bathroom	15 l/s	8 l/s	
Sanitary accommodation	6 l/s	6 l/s	

Table 5.1b Whole dwelling ventilation rates					
	Number of bedrooms in dwelling				
	1	2	3	4	5
Whole dwelling ventilation rate ^{a, b} (l/s)	13	17	21	25	29

Notes:

a. In addition, the minimum ventilation rate should be not less than 0.3 l/s per m² of internal floor area. (This includes all floors, e.g. for a two-storey building add the ground and first floor areas.)

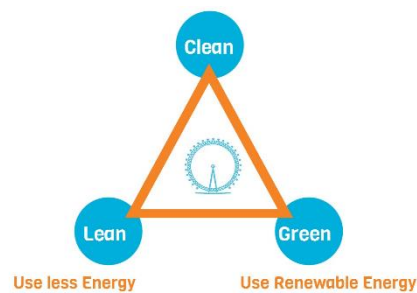
b. This is based on two occupants in the main bedroom and a single occupant in all other bedrooms. This should be used as the default value. If a greater level of occupancy is expected add 4 l/s per occupant.

It is proposed that the ventilation strategy for each apartment will satisfy these requirements. The exact specification will be determined at detailed design stage. The whole house ventilation strategy will be adopted to ensure that the air quality and the noise levels at all times of the day are acceptable.

2.6 THE ENERGY HIERARCHY

The Carbon Strategy adopts a set of principles to guide design development and decisions regarding energy, balanced with the need to optimise environmental and economic benefits. The following hierarchy should be used to assess applications:

- 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 Carbon 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

It is stated within the Manchester Core Strategies policies that the Energy Hierarchy is to be utilised with the energy strategy to form the basis of the methodology. In essence ensuring a 'Fabric First' approach is adopted.

This approach reduces heat losses and energy demand initially by ensuring the dwellings in question are thermally efficient and reduce heat losses.

3 DESIGN PARAMETERS

3.1 METHODOLOGY

As this report deals with the residential aspect of this development only in terms of energy and CO₂ emissions due to this being the predominant use of the development, the following calculation methodology will be utilised for compliance.

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/m²/yr) and associated CO₂ emissions (kg.CO₂/m²/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 FSAP 2012 version 1.0.5.9 software.

To enable a review of how the proposed development will achieve an improvement, firstly the Baseline CO₂ emission figures must be established. These figures are based on Part L1a 2013's 'Notional Dwelling', a specific set of specification criteria referenced in section 3.4 of this report.

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 any renewable / low carbon technologies are included.

The 'fabric first' approach will follow the guidance highlighted within the afore mentioned Energy Hierarchy.

Renewable / low carbon technologies will then be considered with regards to special constraints and the amounts required, giving specific consideration to the surrounding areas.

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

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

3.2 ARCHITECTURAL DRAWINGS BY HOWARD & SEDDON ARCHITECTS

Table 2 Architects Drawing Schedule

Drawing Number	Drawing Contents
12,982 M05 F	Proposed 5 th & 6 th Floor Plan
12,982 M14A	Front Elevation
12,982 M15A	West Side Elevation
12,982 M16A	Rear Elevation
12,982 M17A	East Side Elevations
12,982 DAS	Design & Access Statement (location plan)

3.3 FUEL

The assessment has assumed the following fuel carbon emissions factors - The fuel carbon emissions factors used are in accordance with **SAP 2012 (for Building Regs Part L1A)**.

Table 3 Fuel Factors

Carbon Emissions Factor	SAP 2012 kgCO ₂ /kW
Grid Electricity	0.517
Grid displaced Electricity	0.529
Manufactured smokeless fuel	0.402
Coal (traditional British Coal)	0.301
Heating Oil	0.28
LPG	0.25
Natural Gas	0.198
Wood Pellets	0.028
Bio Diesel	0.098
Bio Gas	0.019

3.4 BASELINE CO₂ EMISSIONS

The baseline energy use and resulting CO₂ emissions rates of the development have been assessed using the SAP 2012 Government approved software. The SAP 2012 calculations have been produced according to the L1A 2013 building regulation requirements.

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 L1A 2013 (Table 4).

Table 4 Baseline Building Fabric

Proposed Building Fabric		
Element	L1A: 2013 Limiting U-values (W/m ² .k)	L1A: 2013 Notional U-values (W/m ² .k)
Floors	0.25	0.13
External Walls	0.30	0.18
Party Wall between dwelling	0.20	0.00
Roof	0.20	0.13
Windows	2.0	1.40
Doors	2.0	1.00
Y-value (W/m ² .k)	0.15	~0.05
Air permeability (m ² /h.m ² @ 50 pa)		
All dwellings	10.0	3.0

The individual CO₂ emissions and area weighted block compliance results for the development are presented in the table below. A full copy of the SAP calculations have also been included within the appendix of this report.

Please note that all units (9 No) have been modelled using the SAP 2012 software to give the most accurate results.

The following table details the notional baseline area weighted CO₂ regulated emissions for the development.

Table 5 Baseline Carbon Emissions

Building Services	Baseline CO ₂ Emissions (kg CO ₂ /m ² /yr)	Baseline CO ₂ Emissions for overall development (kg CO ₂ / yr)
Total regulated emissions (heating, hot water, lighting, fans & pumps)	21.00	21350.07

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 CO₂ emissions further than the Baseline (Building Regulations 2013 Part L1A compliance). Often referred to as the 'Fabric First' approach as per the Policy EN6 of the Manchester City Council Core Strategy.

The energy efficient measures include:

- Inclusion of better U-values than the minimum U-values set in the ADL1A
- Designing for a buildings air permeability exceeding ADL1A target values
- Utilising the highly efficient heating and hot water systems
- 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 6 Proposed Building Fabric Specification

Proposed Building Fabric			
Element	L1A: 2013 Limiting U-values (W/m ² .k)	L1A: 2013 Notional U-values (W/m ² .k)	Proposed U-values (W/m ² .k)
Floors	0.25	0.13	NA Party Floor
External Walls	0.30	0.18	0.16
Party Wall between dwelling	0.20	0.00	0.00
Roof	0.20	0.13	0.11
Windows	2.0	1.40	1.2
Doors	2.0	1.00	N/A
Y-value (W/m ² .k)	0.15	~0.05	0.08-0.12 ACD's
Air permeability (m ² /h.m ² @ 50 pa)			
All buildings	10.0	3.0	3.0

In line with SAP 2012 conventions, the U-value for the Door is not applicable for the majority of the apartments This is due to the corridors to the apartments being assigned as heated spaces, and the lower level apartments having heated spaces beneath them, thus no U values are required for these elements.

In elemental terms these are not heat loss elements and as such no u-value is applicable.

The 4 number Part L1B units will follow the minimum required U value improvement standards as outlined within Table 2 & 3 contained within the Part L1B Building Regulations as can be seen from the following figure.

Figure 4: Thermal Upgrade U Values Part L1B

Table 3 Upgrading retained thermal elements		
Element¹	(a) Threshold U-value W/(m²·K)⁸	(b) Improved U-value W/(m²·K)⁸
Wall – cavity insulation ²	0.70	0.55
Wall – external or internal insulation ³	0.70	0.30
Floor ^{4,5}	0.70	0.25
Pitched roof – insulation at ceiling level	0.35	0.16
Pitched roof – insulation between rafters ⁶	0.35	0.18
Flat roof or roof with integral insulation ⁷	0.35	0.18

¹ 'Roof' includes the roof parts of dormer windows and 'wall' includes the wall parts (cheeks) of dormer windows.
² This applies only in the case of a wall suitable for the installation of cavity insulation. Where this is not the case, it should be treated as 'wall – external or internal insulation'.
³ A lesser provision may be appropriate where meeting such a standard would result in a reduction of more than 5% in the internal floor area of the room bounded by the wall.
⁴ The U-value of the floor of an extension can be calculated using the exposed perimeter and floor area of the whole enlarged building.
⁵ A lesser provision may be appropriate where meeting such a standard would create significant problems in relation to adjoining floor levels.
⁶ A lesser provision may be appropriate where meeting such a standard would create limitations on head room. In such cases, the depth of the insulation plus any required air gap should be at least to the depth of the rafters, and the thermal performance of the chosen insulant should be such as to achieve the best practicable U-value.
⁷ A lesser provision may be appropriate if there are particular problems associated with the load-bearing capacity of the frame or the upstand height.
⁸ Area-weighted average values.

4.1.1 HEATING DEMAND

The heating energy demand will be reduced by providing good insulation of the building envelope in order to minimise heat losses.

An all-electric solution has been suggested in this instance, direct acting electric room heater with programmer and room thermostats for control is proposed for the duplex's.

At the moment the carbon factor provided for an all electrical system is significantly greater than one that utilises gas. It has been announced by the BRE that the intention is to lower the carbon factor by over 50% of what in currently stands to bring this in line with gas.

This is due the lesser reliance on fossil fuels by the grid for electrical generation. This change enhances the merits of utilising an all-electric system, and although the SAP methodology does not yet take account of this, it is believed that this strategy is a more efficient and cost-effective way of providing heating and hot water for significant developments such as this. It is quite simply reducing the reliance on fossil fuels.

The 4 number Part L1B apartments will include the same heating strategy as the new build apartments to follow the whole building strategy, this also allows for ease of construction given that these are being built within the constraints of the existing building.

4.1.2 HOT WATER DEMAND

The hot water demand will be met through the use of electric hot water immersion tank within each apartment to feed hot water needs. This will be a 210 Litre water cylinder located within each apartment.

As there are no centralised plant for hot water, this reduces the amount heat lost through centralised pipework.

The 4 number Part L1B apartments will include for the same hot water strategy as identified above as for the new build apartments to follow the whole building strategy

4.1.3 VENTILATION

The ventilation strategy for each of the apartments will adhere to all of the appropriate criteria with Part F of the Building Regulations. The strategy described in this report may be subject to change during the progression of detailed design, however the criteria will still be adhered to.

Each individual dwelling will take advantage of a decentralised Mechanical Ventilation Heat Recovery (MVHR) system. This assists with reducing energy demand in term so heating the dwelling by recovering otherwise wasted heat. This assists in reducing the CO₂ emissions of the dwelling and assists with achieving the appropriate level of ventilation criteria described in Part F of the Building Regulations highlighted previously in this report.

MVHR is, in its simplest form a heat exchanger. The system extracts warm stale air from within the dwelling, at the same time drawing in cooler fresh air from outside. These are then ducted into the actual MVHR unit itself, at which point the heat is exchanged without mixing the air, therefore fresh, warm air is vented into the dwelling.

This system recovers heat from within the dwelling which otherwise would be lost, therefore reducing the amount of energy required to maintain temperature within the dwelling.

Typically across the entire development the MVHR units offer a 5% – 7% reduction in CO₂ betterment than Building Regulations require.

In addition, openable windows will be utilised for Purge ventilation scenarios and to allow further fresh air to enter to the dwellings, thus further increasing the minimum amount of air changes per hour.

Linking with the fabric improvements, a lower air permeability rate as described earlier allows for more heat to be recovered by the MVHR system making it more efficient. In terms of the SAP methodology this cannot be accommodated or quantified, however in real world terms this does in fact make an improvement.

The 4 number Part L1B units will follow the same ventilation strategy as the rest of the refurbishment units to follow the overall building design philosophy.

4.1.4 LIGHTING

The proposed light fittings will be low energy efficient fittings, in this instance LED fittings only throughout.

4.2 REDUCTIONS AFTER FABRIC FIRST APPROACH

The Fabric first approach enables the development to achieve the Fabric Energy Efficiency (FEE) aspect of Building Regulations.

The Dwelling Fabric Energy Efficiency results show a 15.2% improvement over the Target Fabric Energy Efficiency which is a significant improvement.

- Target Fabric Energy Efficiency 41.93 kWh/m²/yr

- Dwelling Fabric Energy Efficiency 35.55 kWh/m²/yr

At this stage the CO₂ emissions are still greater than that of the target, this is as a result of the fact that the fabric first approach must work in conjunction with the systems that are included, and the systems are chosen as a result of the fabric that has been incorporated.

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 CO₂ 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:

- Pollution discharged from the CHP unit may not be appropriate given the site locality and the number of people passing the site, given the proximity to the city centre and local building usage and the increase in pedestrian activity due to this development
- Noise pollution is a consideration given the function of the development
- Economic viability is heavily dependent on the constant demand for heat and power, as well as the price of electricity and gas
- As described previously, utilising an all electrical system lessens the demand on fossil fuels

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

4.3.2 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 City as for a District Heating network. The development is not in close proximity to an existing nor a potential District Heating transmission line.

At the moment there is no decentralized energy network available and in particular a district heating network in the proximity of the proposed development site that would allow the development to connect to such a network.

On this basis the proposals are to provide individual Direct Acting Electric Heaters throughout the WC area's and AC Air Source Heat Pump systems for the offices.

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.

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.

4.4.2 SOLAR WATER HEATING

Solar thermal panels utilise the sun 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.

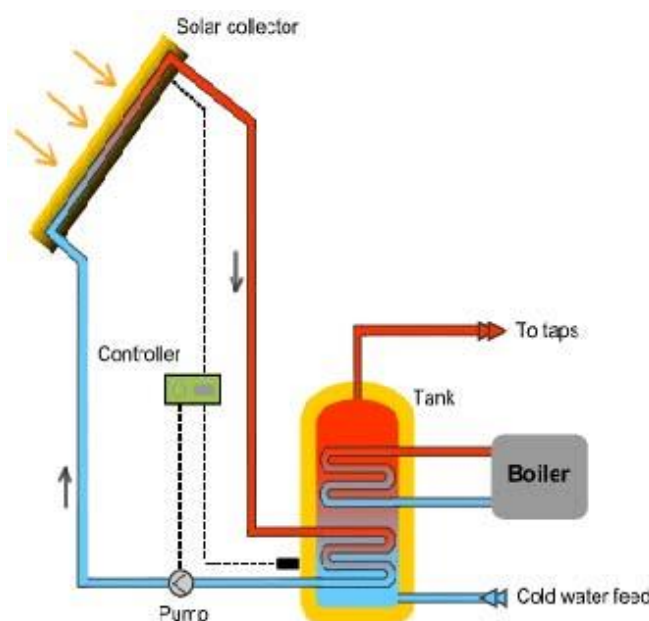


Figure 3 Solar Thermal Diagram

As the intention is to utilise the roof space for Photovoltaic panels which provided greater CO₂ reductions per £, as well as the increased servicing required to maintain a Solar Water Heating system.

This system alone would not generate a large enough CO₂ reduction in proportion to other comparable technologies.

This technology has been discounted due to the inflated cost of installation with regards additional pipe runs, maintenance requirements and the significant roof area that would be required.

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 5 Wind Turbine



The use of wind turbines on the development will also have a significant visual impact on the city centre location and neighbouring buildings, as well as low frequency noise source and hence it is likely to meet opposition within the local area.

For the reasons detailed above wind turbines are not considered viable for the development in a city centre location.

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 6 PV Examples



It has been determined that the most feasible solution for this development is Photovoltaic panels providing renewable electricity to the landlord areas of the development. The benefit of which can be apportioned correctly within the SAP calculation.

The requirements would be 9.3kWp which equates to be approx. 50m² that would only be included for consumption to the new build apartments.

The PV will be connected to the landlord areas and the benefit will be apportioned utilising the area weighted methodology across all of the apartments contained within the tower element.

4.4.5 VRF AIR 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 would have the benefit of also providing cooling to each room in summer months.

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.

Due to the limited external plant space on the roof and this is deemed to not be applicable for this project.

4.4.6 BIOMASS BOILER

Biomass is considered to be a renewable fuel source as the CO₂ absorbed during the growth period is assessed as being approximately equal to the CO₂ 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 7 Biomass Example



To avoid larger plant areas and flues to the city centre, 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.

5 ENVIRONMENTAL STANDARDS

Contained within a supplementary document to the Manchester Core Strategy named 'Guide to Development in Manchester Supplementary Planning Document and Planning Guidance Adopted April 2007' are the environmental standards that new developments are required to address.

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
- Biodiversity
- Waterways

Each individual section will highlight the points contained within the Guide to Development in Manchester document, that each development should adhere. Each element will then be summarised how the development will achieve this and any relevant third part reports referenced accordingly.

5.1 ENERGY EFFICIENCY

Section 4.5 Guide to Development in Manchester states that in summary, all new developments should endeavour to reduce their CO₂ emission by particular targets. These targets are superseded by the Manchester Core Strategy.

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 CO₂ emissions and meet the targets set in the Manchester Core Strategy Policy EN6.

The Energy Strategy describes how the development follows the Energy Hierarchy approach which the Manchester Core Strategy advocates the use of.

The results of the Energy Strategy describe compliance with both the Guide to Development in Manchester and the Manchester Core Strategy Policy, ultimately offering an overall reduction in CO₂ emissions of 9.05% over and above current 2013 Building Regulations Part L1A.

5.2 RENEWABLE ENERGY

Section 4.6 of the Guide to Development in Manchester document encourages the use of Low Zero Carbon technologies, specifically the use of renewable energy. This again follows the Hierarchical approach encouraged by the Manchester Core Strategy.

The section states that 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.

It also states that 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, PV panels have been determined to be the most applicable and affordable technology for this development.

5.3 ENERGY EFFICIENT DESIGN

This section outlines the design energy efficient measures taken to minimise the building's energy demand and therefore reduce energy use and CO₂ emissions further than the Baseline (Building Regulations compliance).

The energy efficient measures include:

- e) Inclusion of better U-values than the minimum U-values set in the Building Regulations.
- f) Designing for a buildings air permeability exceeding Building Regulations limiting target values.
- g) Utilising the highly efficient heating and hot water systems via an all-electric system.
- h) Utilising low energy efficient lighting such as LED lighting.
- i) Mechanical and Natural ventilation as described in section 4.1.3

The Part L1A modelling software has generated the Target Emission Rates (TERs) for the whole development based on the notional inputs and a block compliance Dwelling Emission rate without the use of renewable technology:

Table 7 Target Emission Rate

TER	DER
kgCO ₂ /m ²	kgCO ₂ /m ²
21.00	22.71

From above can be seen that by utilising the currently proposed systems the development still falls short of the required results in an energy improvement against Building Regulations, thus not meeting EN 06 of the Manchester Plan. Therefore, the inclusion of renewable technology is required.

5.4 ENERGY EFFICIENT DESIGN WITH GREEN TECHNOLOGY

This section outlines the design energy efficient measures taken to minimise the building's energy demand and therefore reduce energy use and CO₂ emissions further than the Baseline (Building Regulations 2013 Part L1A compliance) by including as detailed in 4.3, but including for renewable technology.

The energy efficient measures include:

- j) Inclusion of better U-values than the minimum U-values set in the ADL1A.
- k) Designing for a buildings air permeability exceeding ADL1A target values.
- l) Utilising the highly efficient heating and hot water systems.
- m) Utilising low energy efficient lighting such as LED lighting.
- n) Heating and cooling via electric panel heaters
- o) Hot water by electric immersion
- p) Mechanical and Natural ventilation as described in section 4.1.3
- q) The inclusion of renewable technology

Table 8 Emission Rate Results

Regulated Emissions	Baseline CO ₂ Emissions	Proposed Building CO ₂ Emissions	CO ₂ Emission Savings	% reduction in CO ₂ Emissions
kg of CO ₂ /m ² /yr	21.00	19.10	1.09	9.05%
kg of CO ₂ /yr	21,350.07	19,418.40	1108.17	

The table above proves that by providing VRF air source heat pumps to heat the office spaces then the energy improvement is 9.05% against Part L1A (2013), which results in an improvement of 15.05% against Part L1A (2010) standards.

5.5 WATER MANAGEMENT AND WEATHER RESILIENCE

Section 4.9 of the Guide to Development in Manchester encourages 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.

As the development is to an existing building, there is no assumed increase to run off from the development and as such it is assumed that a flood risk assessment is not required for this development.

5.6 WASTE MANAGEMENT

Section 4.10, 4.11 and 4.12 of the Guide to Development in Manchester describe how proposals should deal with the disposal or recycling of waste materials.

The proposed development will include the re-use of the existing building and associated elements and the construction of the new multi-storey dwellings on it's roof.

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

The Waste Management plan will constantly be reviewed for opportunities to improve the procedures and will also review areas where reductions in waste, or an increase in recycling waste can be made.

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.

5.7 CONSTRUCTION MANAGEMENT

Section 4.13 and 4.14 of the Guide to Development in Manchester encourages 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 understood 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.

5.8 BIODIVERSITY

Section 4.15 of the Guide to Development in Manchester requires plans and designs to be put in places to protect any wildlife found to be occupying the site. This is also to limit the loss of any existing tree and valuable fauna on site. Developers are required to demonstrate compliance with Manchester's Biodiversity Strategy by demonstrating how they have taken account of the effect of the proposed development on the biodiversity of the site.

It is to be understood that should this type of development requires such reports such as ecological surveys eg Bat surveys etc then these shall be carried out in accordance with the Local Authorities criteria. However this is yet to be confirmed as this falls outside the remit of this report.

5.9 WATERWAYS

Section 4.16 of the Guide to Development in Manchester encourages reductions in pollution in city's waterways and see them as an important part of the recreational network.

Developers with proposals within close proximity to these waterways are required to demonstrate how public access and environmental management will be enhanced.

With this development being constructed on an existing building it would be reasonable to assume that current discharge is not into any waterways.

As a result it is anticipated that discharge into these waterways would be dismissed for this site, reducing the risk of any pollution from this development being introduced into the waterways themselves.

This is subject to confirmation.

6 CONCLUSION

The energy strategy for the proposed development at Barclay House has adopted a hierarchical approach of using passive and low energy design technologies to reduce the baseline energy demand and hence CO₂ emissions followed by the feasibility of the application of low and zero carbon technologies as appropriate.

Table 9 Proposed Building Reduction

Regulated Emissions	Baseline CO ₂ Emissions	Proposed Building CO ₂ Emissions	CO ₂ Emission Savings	% reduction in CO ₂ Emissions
kg of CO ₂ /m ² /yr	21.00	19.10	1.09	9.05%
kg of CO ₂ /yr	21,350.07	19,418.40	1108.17	

This is supported by the SAP report to provide compliance in England with the Building Regulations Part L 2013, issued with this report. The analysis has shown that by incorporating passive and low energy design measures, there is a reduction of 9.05% for the developments annual CO₂ baseline emissions, equating to a 15.05% improvement over Part L1a 2010. In addition the Fabric Energy Efficiency of the entire development has been reduced by 15.22%.

- Target Fabric Energy Efficiency (TFEE) **41.93 kWh/m²/year**
- Dwelling Fabric Energy Efficiency (DFEE) **35.55 kWh/m²/year**

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
- Natural ventilation
- Electric Heating and Hot water.
- Low building air leakage rate (3 m³/h/m² at a pressure differential of 50 Pa)
- 100% Low energy lighting through the dwellings
- Low flow aerated showerheads and basin tap inserts to reduce domestic water consumption
- Reducing surface water discharge
- Reducing mains/potable water via water efficient devices and equipment
- Inclusion of 9.3kWp of Photovoltaic Panels.

It has been deemed that this report gives details as to why particular technologies have been discounted, explanations as to why the chosen technology is deemed the most feasible.

It has also been demonstrated the significant inclusion of Renewable Technology that not only assists with achieving both the Core Strategy CO₂ reduction policy and with the Environmental Standards element.

As the 4 conversion apartments fall under Part L1B of the building regulations, they do not contribute to the new build CO₂ reduction requirement however, they will adhere to all of the minimum standards set out within Part L1B of the 2013 Building Regulations.

All aspects of the Environmental Standard have been addressed accordingly and further details on each specific elements can be found the supplementary documents referenced within section 5 of this report.

5. CONCLUSION



It has been demonstrated that full compliance with Policy EN6 of Manchester Core Strategy has been met and that Part L1A regulations, Part F Regulations and Part G regulations will all be adhered to.

7 APPENDICES

Appendix A – SAP Calculations

Appendix A

SAP CALCULATIONS