MANCHESTER CITY COUNCIL

MANCHESTER CLIMATE CHANGE AGENCY

Manchester City Council
Capital Programmes Manchester Low Carbon Build Standard

Preface

Manchester City Council's (MCC) ambition aligns to the city's Climate Change Framework[1]. It aims for all new developments to be zero carbon and climate resilient from 2023. To mitigate the impact of capital projects on the environment. it has been agreed that all Manchester City Council projects should use as a basis for their specification a Low Carbon Build Standard to mitigate the impact on the environment. The Manchester Low Carbon Build Standard provides a stepping-stone which will enable the Council to move towards this its 2023 target. The Standard sets minimum expectations which should be followed by all MCC officers, with zero carbon exemplar schemes actively encouraged. The Standard has achieved the endorsement of the Manchester Climate Change Agency.

All project team members including staff, consultants, designers, contractors and suppliers are required to read and take note of Manchester City Council's declaration of a climate emergency and the need to operate in a more sustainable fashion - https://secure.manchester.gov.uk/news/article/8194/manchester_city_council_debate_climate_emergency_motion

Whilst the primary focus of this iterative Standard is the reduction of carbon in-use, the importance of understanding the impact of embedded carbon in construction materials should not be understated. Embodied carbon is a significant source of Manchester's total carbon footprint (beyond direct emissions) and is an emerging priority for the Council. This Standard provides a proposed initial approach to embodied carbon (Appendix D), which will be built upon in forthcoming iterations of the Standard.

Low Carbon Build Standard

All projects delivered by/for Manchester City Council (MCC) should endeavour to follow a standard methodology with regards to low carbon. To ensure a consistent approach MCC has based its low carbon delivery on the RIBA Sustainable Outcomes Guide 2019. This gives a set of common and clear standards that are backed and delivered by a leading professional institution covering all aspects of the built environment: https://www.architecture.com/-/media/GatherContent/Test-resources-page/Additional-Documents/RIBASustainableOutcomesGuide2019pdf.pdf

All major new build and refurbishment projects should target compliance with the RIBA Sustainable Outcomes Guide 2019 with regard Operational Energy and should target maximum use in line with this guide with targets reducing over time. All projects should target a stretch goal of the next milestone e.g. in 2025, design for 2030.

The RIBA Guide has been chosen as it provides a simple, open framework of targets that can be applied and stepped down over time in a structured manner.

[1] https://www.manchesterclimate.com/sites/default/files/Manchester%20Climate%20Change%20Framework%202020-25.pdf

Operational Energy targets for MCC projects:

	Commercial / non- domestic	Domestic
2020	< 170 kWh/m^2/yr	< 105 kWh/m^2/yr
2025	< 110 kWh/m^2/yr	< 70 kWh/m^2/yr
2030	< 0 - 55 kWh/m^2/yr	< 0-35 kWh/m^2/yr

For minor refurbishment and repair projects (typically between £75,000 and £1,000,000) it is not practical to meet such large wholesale targets, therefore a simple "carbon evaluation" tool will be used to demonstrate the carbon efficiency of the project as per Appendix A.

For FM / repair / maintenance of service projects (typically below £75,000 in value) it is accepted that specific low carbon measurements may not be practical, but all those specifying these projects should be aware of the contents of this guide, the basic Top 10 Carbon Priorities, the carbon calculators and use it to help specify the use of lower carbon technologies. These projects will have a simple "carbon evaluation" as per Appendix A.

Manchester Low Carbon Build Standard Ethos

The model specification targets low carbon and energy use in projects using the following hierarchy:

1. Reduce – use as little energy or carbon as possible both during build and in use, by in most cases taking a fabric first approach using low embodied carbon materials from local sources
2. Re-use – look at opportunities for waste energy to be captured and re-used e.g. wastewater heat capture
3. Renewables – use efficient and economically viable methods to generate energy from technologies such as solar, ground source heat, grey water recycling

It is the responsibility of all clients and project staff to ensure that all the principles contained within this standard are considered where applicable to their project.

The model specification is based upon the "Top 10 Carbon Priorities" set out in Appendix B.

In addition, Appendix C includes a series of elemental specification targets which all projects should aim to achieve.

If during either the development of the project or during delivery, a project cannot achieve the targets set out then the project team should seek a formal derogation from the Strategic Capital Board for these targets.

MCC is committed to improving air quality across the city and the services designs shall be in line with this commitment. At design stage it should be demonstrable that low emission technologies with regard air pollutants (e.g. low NOx, CO2) have been used to their maximum. It is not proposed that Capital Programmes track air quality through the project design and delivery.

https://secure.manchester.gov.uk/info/200075/pollution/7697/air_quality

This document will be reviewed on an annual basis as a minimum.

Quality and Version Control

Date	Version	Author	Comment
28/09/2020	V0.0	BNH	Pre-publication DRAFT for final comments
01/10/2020	V0.1	CH	Issued to Corporate Estates for comments and
05/10/2020	V0.2	CH	Minor amends made. Issued for feedback to internal partners.
07/10/2020	V0.3	CH	Final amends made prior to issue to external partners
02/11/2020	V0.4	CH	Version contains recommended feedback from external partners
06/11/20	V0.5	CH	Version contains recommended feedback from Energy Team
10/11/20	V1.0	CH	Capital Programmes feedback prior to recirculation to partners.
02/12/20	V1.1	CH	Updated information following discussion with external partners.
18/08/21	V1.2	CH	Six month review undertaken. Further review March 2022.

Appendix A – Example carbon saving calculators

Currently MCC targets are based on calculating a buildings CO2 equivalent for regulated emissions based on consumption figures for electricity and gas only.

For major renewal projects where building regulations approval is required a formal evaluation of energy use will be prepared using an SBEM / BRUKL systems.

For minor projects where individual elements or smaller scale refurbishments are taking place it is accepted that a simple approach will be taken looking at the following elements:-

Appendix A1 - Lighting replacement
Appendix A2 - Heating source or emitter improvements
Appendix A3 - BMS and controls projects
Appendix A4 - Fabric improvement
Appendix A5 - Installation of renewable energy sources

Carbon equivalent will be calculated from UK Government factors - https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2020

The following section provides details of MCC's required evidence base. It should be used by clients to provide to designers when designing projects.

Details of air conditioning/mechanical cooling, ventilation or refrigeration can be located in Appendix B.

Appendix A1 Lighting replacement

The number of fittings removed with their manufacturer's stated wattage will be compared to the number of fittings being fitted with their manufacturer's stated wattage, the difference in wattage fitted will then be multiplied by the number of hours estimated to be in use (based on end user consultation) and the difference will then be reduced by 25% to allow for variability in real life vs. bench test circumstances and allow for errors in estimation of hours.

Example calculation page from Arndale Market project:

ARNDALE MARKET - ENERGY EFFICIENT LIGHTING												
Building		Arndale Centre Market	#########			**Cost of Electricity per unit**				**£0.12**		
Floor		Basement				**Re-lamping Cost per 4 years**				**£15.00**		
Ceiling		Solid				**CO2 per KWH**				**0.38146**		
		Lights Surface IP65	**Existing Lighting**		**Replacement Lights**				**Energy Reduction**			
Room No	**Room Type**	**Type of lighting**	**Watt per light**	**Total Watt Area**	**Type**	**Watt per Light**	**Watt Area**	**Energy Saving**	**Time On**	**Fit Move Sensor**	**Annual Energy saving KWh**	**CO2e Saved per year metric tons**
B01-B1-001	Stairs	Not from MCC Supply										
B01-B1-002	Lift Motor Rm	Not from MCC Supply										
B01-B1-003	Circulation	Not from MCC Supply										
B01-B1-004	Service Lift	Not from MCC Supply										
B01-B1-005	Traders Store	Single Lamp 58 Watt fluorescent fitting	54.5	2452.5	A	28.3	1273.5	1179	55%	No	5680.422	2.17
B01-B1-005	Traders Store	Single Lamp 58 Watt fluorescent fitting	54.5	1035.5	Aem	28.3	537.7	497.8	55%	No	2398.4004	0.91
B01-B1-006	Traders Store	Single Lamp 58 Watt fluorescent fitting sealed to IP65 (Wall mounted)	54.5	218	A	28.3	113.2	104.8	55%	No	504.9264	0.19
B01-B1-006	Traders Store	Single Lamp 58 Watt fluorescent fitting sealed to IP65 (Em) wall mounted	54.5	163.5	Aem	28.3	84.9	78.6	55%	No	378.6948	0.14
B01-B1-007	Traders Store	Combined with room 011										
B01-B1-008	Cold Store	Within room 007.										
B01-B1-009	Traders Store	Now combined with room 011										
B01-B1-010	Cold Store	Within room 007.										
B01-B1-011	Traders Store	Single Lamp 58 Watt fluorescent fitting	54.5	545	A	28.3	283	262	55%	No	1262.316	0.48
B01-B1-011	Traders Store	Single Lamp 58 Watt fluorescent fitting	54.5	272.5	Aem	28.3	141.5	131	55%	No	631.158	0.24
B01-B1-012	Traders Store	Single Lamp 58 Watt fluorescent fitting	54.5	109	A	28.3	56.6	52.4	55%	No	252.4632	0.10
B01-B1-012	Traders Store	Single Lamp 58 Watt fluorescent fitting	54.5	109	Aem	28.3	56.6	52.4	55%	No	252.4632	0.10
B01-B1-013	Traders Store	Cold Store within room 012										
B01-B1-014	Gas Meter	Not from MCC Supply										
B01-B1-015	Circulation	Single Lamp 58 Watt fluorescent fitting	54.5	109	Aem	28.3	56.6	52.4	55%	No	252.4632	0.10
B01-B1-016	Circulation	Single Lamp 58 Watt fluorescent fitting	54.5	109	Aem	28.3	56.6	52.4	55%	No	252.4632	0.10
B01-B1-017	Tank Room	Included in room 005										
			TOTAL ANNUAL SAVING								**11865.77**	**4.53**

Note: Energy consumed by existing lighting control gear (starters/ballast etc) have not been included within this calculation.

Appendix A2 – Heating system (or partial system) replacement

PLEASE NOTE: All projects which include replacement heating systems should specify gas alternatives. Where this is not possible a business case should be submitted to senior management for approval.

Comparison of new boiler vs new heat source based on manufacturers data and ratings with a 25% reduction for variability in real life vs. bench test circumstances and allow for errors in estimation of hours.

Example calculation – boiler replacement
A 10 year old gas boiler rated at 150kW is currently using 94,080 kWh of gas

To be replaced with an electric solution expected to have a 20% increase in efficiency in energy used

Current system 94,080 kWh x 0.20374 (CO2e gas) = 19,168 kg Co2e / annum

New system less 20% = 75,264 kWh x 0.23314 (CO2 elec) = 17,547 kg Co2e / annum

Effective estimated saving = 1,621 kg Co2e / annum

For project reporting and benchmarking this may be reduced by up to 25% to reflect real world situations vs. theoretical savings – any adjustment of this nature should be agreed between the designer and the client.

It is recommended that any/all electrical replacement heating equipment be installed with dedicated sub-metering at allow retrospective validation of assumed efficiency gains and CO2 saving.

Appendix A3 – BMS or controls projects

Estimation of hours of use that will be saved by introduction of better controls multiplied by average rate of use over those hours reduced by 25% for real life variations.

Addition of time clocks to tea boilers – saving 2.2kWh /wk electricity

Redefining set points on BMS
Electricity 1.1kWh / wk electricity
Gas 12 kWh / wk gas

Total savings – assuming 51 weeks allowing 1 week total closure at Christmas
Electricity 2.2 x 51 wks = 112.2kWh /yr – CO_2 0.23314 kg/Wh – saving 26.58 kg CO_2/yr
Electricity 1.1 x 51 wks = 56.1kWh /yr – CO_2 0.23314 kg/Wh – saving 13.29 kg CO_2/yr
Gas 12 x 51 wks = 112.2kWh /yr – CO_2 0.20374 kg/Wh – saving 124.69 kg CO_2/yr

Total estimated saving 164.56 kg CO_2 / yr

For project reporting and benchmarking this may be reduced by up to 25% to reflect real world situations vs. theoretical savings – any adjustment of this nature should be agreed between the designer and the client.

Where feasible existing control systems should be reviewed, and consideration made for replacement of smart control and metering systems.

Appendix A4 – Fabric upgrade

Generally, this will be the introduction of additional insulation to roofs or through window replacement. In both circumstances there should be a reduction in energy use through improved insulation so the calculation will be the heat loss measured by improved U value multiplied by the area to which the improvement is applied multiplied by an assumption of heating season e.g. 8 hours per day 5 days per week for 32 weeks and a 25% reduction for variability in real life vs. bench test circumstances and allow for errors in estimation of hours.

Example calculation – fabric upgrade

During remedial works at a facility it is decided to upgrade the roof to include 100mm of foam glass insulation to gain an approx. U value improvement of 0.2

600 sq m roof x 0.2 improvement = 120 W theoretical saving x 0.25 for real life factors

90 W saving for 1280 hrs of heating season = 115kWh saving – assuming current systems are gas fired x 0.20374 (CO_2e) **= 23kg Co2e / annum**.

Appendix A5 – Installation of renewable energy source

PLEASE NOTE: Solar PV should be specified for all new build projects together with a target for 20% of the developments energy to come from on-site renewable sources. An assessment of the viability of installing solar PV should be done for all refurbishment projects.

Any renewables installation should come with a proposed generation calculation e.g. PV SOL spreadsheet for solar PV installations.

Example extracted below from proposal document for Arcadia Sports Centre rooftop solar installation.

The yield

PV Generator Energy (AC grid)	84,974 kWh
Direct Own Use	74,802 kWh
Grid Feed-in	10,172 kWh
Down-regulation at Feed-in Point	0 kWh
Own Power Consumption	88.0 %
Solar Fraction	17.5 %
Spec. Annual Yield	729.51 kWh/kWp
Performance Ratio (PR)	85.0 %
Yield Reduction due to Shading	1.1 %/year
CO_2 Emissions avoided	50,984 kg / year

It is recommended that the overall site electricity usage (from grid) prior to renewables to illustrate expected scale of the new generation capacity eg 5%, 20% 80% of building requirement should be incorporated into the baseline.

Appendix B – Manchester Top 10 Carbon Priorities

1 FABRIC FIRST

- Designers must ensure the building envelope uses the most energy efficient design and materials to for the whole envelope to exceed the thermal requirements of the current Building Regulations Part L by 5%.
- Air leakage on new buildings or recladding solutions shall be not greater than $3m^3/hr/m^2$ at 50Pa.
- All new doors and windows shall include thermally broken sections
- Designers shall allow for the provision of sufficient opening windows to comply with the ventilation requirement above.
- Where refurbishment or remodelling allows, opportunity should be taken to improve the insulation of the building envelope where it is more than 5 years old and where possible align with thermal targets in current Building Regulations.
- As part of the upgrade an analysis shall be completed identifying the likely impact in energy / carbon saving.

2 EFFICIENT BOILERS

- Designers must fully explore alternative fuels to gas for primary boilers such as hydrogen / fuel cell based boiler technologies, heat pumps etc.
- Installation of high efficiency gas boilers must only be installed as an absolute last resort where there is no other option and a clear business case must be submitted to senior leadership for approval.

3 IMPROVE LIGHTING

- Design to maximise daylighting using shading to avoid overheating and glare.
- LED lighting is the only acceptable source of illumination, alternatives need approval from an MCC representative on the project to progress.
- Designers must comply with the latest MCC minimum standard on design - the 2020 minimum is an average 140 lumens / watt.
- Automatic lighting controls suitable for building function must be used in all areas e.g. timed, daylight and/or presence with manual overrides where appropriate to the space (manual on - auto off, ie absence detection).

4 ENERGY CONTROLS AND METERING

- Designers must include a means of monitoring and remote shut off controls of fittings and equipment in hours of inactivity unless dictated by statute.
- Energy metering must be carefully planned by the designers. It must provide transparent measurement & monitoring of energy use, it should highlight ongoing opportunities to reduce consumption with effective management procedures.
- Metering must be referenced to CIBSE TM39: Building Energy Metering & be capable of monitoring energy use by building system and functional area/department as required.
- Metering and controls equipment should be capable of being linked to MCC remote monitoring systems where practical.

5 IMPROVE VENTILATION

- Natural ventilation must be prioritized wherever feasible to the building type/function. This must be part of a combined strategy addressing air quality, noise overheating & cooling.
- Where natural ventilation alone cannot be provided a mixed mode solution is acceptable with heat recovery and used over the winter months to improve efficiency.
- Supply & extract air ventilation systems should incorporate high efficiency air to air heat recovery methods.

6 RENEWABLE ENERGY SOURCES

- On all projects designers should consider the potential for onsite renewable energy generation either in the form of electricity or heat.
- Where roofs are to be replaced or re-covered the designers shall provide options to the client how it could be upgraded to house solar thermal / PV cells, green or brown roof systems in addition to additional thermal insulation.
- To reduce energy demand and the harmful impact of using energy from non-renewables, in line with UDP Part 1 Policy E1.5, designers should aim for at least 20% of final site energy demand to be met by on-site renewable energy technologies.
- Renewable energy targets can be achieved more readily by undertaking the measures to reduce the total energy demand of the building.

7 REDUCE WATER CONSUMPTION

- All projects involving new systems, upgrades or replacements of domestic water consuming components must carry out an analysis of the potential for water efficiency improvements. Consideration should be given to WC's, urinals, sink fittings, water fountains, showers.
- Designers should assess current water consumption & project forward new water consumption percentage reduction.
- Where feasible rainwater harvesting should be considered or greywater recycling must be explored to further reduce potable water consumption.
- Include water monitoring sub metering and leak detection systems where possible connected to the BMS where provided.

8 USE LOW ENERGY EQUIPMENT

- All new powered furniture, white goods and equipment used in a building shall be 'A' energy rated or better and have certification contained in O&M manuals.
- All powered equipment shall be connected to suitable controls that can automatically shut the item down remotely or send it into power save mode after being unused for a period of time.

9 PERFORMANCE MEASUREMENT

- The asset shall be evaluated against its estimated design target in terms of energy performance in use at 12 months (one full heating and cooling season) after practical completion and occupation.
- Any changes in occupational use from the original brief intention should be recorded and factored into any assessment.
- The design commission shall identify that sufficient funds be set aside to enable the design team to analyse where performance diverges from the design intent and provide users with solutions enabling building performance to be realigned.

10 RE-USE & RECYCLE

- The designers shall look to reuse and recycle existing on site materials where possible and practicable.
- During construction the target is to have zero waste carted off site to landfill unless the material is contaminated

Appendix C- Manchester Low Build Standard Principles

This is set out by elements with targets given for each element, area or type of installation

Fabric

1. Floors
2. Walls
3. Roof
4. Fenestration
5. External works

Services – Electrical

6. Lighting
7. Heating
8. Communications
9. Small power
10. Power distribution
11. Electrical infrastructure
    a. VSD – variable speed drives
    b. Voltage optimisation
    c. Lifts

Services – Mechanical

12. Heat emitters
13. Ventilation
14. Drainage
15. Heat recovery

Services – Controls

16. Local controls
17. Centralised BMS / remote monitoring

Services – Renewable energy sources

18. Solar PV
19. CHP – Combined Heat and Power

1. Floors

1.1 All floors to have a minimum U value of 5% better than building regulations

1.2 Floors to have suitable thermal mass

1.3 Floors to be constructed to minimise acoustic transfer.

2. Walls

2.1 Walls to have a minimum U vale of 5% better than building regulations

2.2 External wall construction to be non-flammable

2.3 Walls to be constructed to minimise acoustic transfer

2.4 Building superstructure to give air leakage better than $3m^3/hr/m^2$ at 50Pa.

3. Roof

3.1 Roof to have a minimum U vale of 5% better than building regulations

3.2 Roof to be constructed as to minimise noise transfer from rain

3.3 Roof to be constructed to take account of future need for on-site renewable energy generation

3.4 Roof drainage to be constructed so as to minimise chance of overflow into building

3.5 Building superstructure to give air leakage better than $3m^3/hr/m^2$ at 50Pa

3.6 Structural options should be available for green / brown roof construction

3.7 Roof drainage to be controlled to prevent overwhelming of local drainage infrastructure via baffles or weirs at roof level or SUDS within the external areas of the building

3.8 Any roof construction should recognise the need to prevent overheating by solar gain

3.9 Roof lights may provide additional daylighting but need to be designed to take account of all other issues i.e. maintenance, safe access, air leakage, U values and potential for solar gain.

4. Fenestration

4.1 Windows to have a minimum U vale of 5% better than building regulations

4.2 Roof glazing to have a minimum U vale of 5% better than building regulations

4.3 All fenestration to meet minimum standards of secure by design

4.4 Avoid non-renewable or non-recyclable materials in fenestration elements.

5. External works

5.1 Surface water drainage from the development to be controlled to prevent overwhelming of local drainage infrastructure via baffles or weirs at roof level or SUDS within the external areas of the building

5.2 Consider use of recycled aggregates

5.3 Consider rainwater harvesting to be incorporated including passive design features to minimise maintenance issues e.g. gravity feed rather than pumped supplies, easily accessible and maintainable filters, etc.

5.4 Prior to setting finished levels of a project a cut and fill rationalisation should be carried out to ensure the minimum of materials are exported during development.

5.5 A minimum of 10% of car parking spaces to have charging points for electric vehicles (EV)

5.6 Design of external lighting installation should be compliant with low energy, dark skies initiatives and national planning policy guidelines

5.8 Within any site design due consideration should be given to potential to enhance the blue / green infrastructure and natural habitats in and around the site.

5.9 Consider maximising soft landscaped areas (so long as not drained to sewer) and the use of permeable surfaces for hard standings and car parking etc. As well as providing surface water attenuation, this will help reduce Surface Water Highways drainage charges.

6. Lighting

6.1 Utilise daylight to maximum taking account of glare, solar gain and overheating.

6.2 All lighting shall be high efficiency LED unless prior agreement with senior management

6.3 An average across scheme of 140 lumen / watt shall be a minimum requirement of any lighting specification and design

6.4 No individual light fitting should have an output of less than 100 lumen / watt

6.5 In all appropriate circumstances it is required that automatic controls for daylight dimming, presence detection and absence detection are included within the installation.

7. Heating and/or cooling

7.1 Unless prior approval is given, gas is not to be used as a primary source of heat. All alternative fuel sources should be considered ahead of specifying gas as a fuel source. If gas is to be specified senior management approval is required to be given.

7.2 Building design and thermal characteristics should be utilised to ensure that a minimum requirement for heating

7.3 The incorporation of renewable heat sources and including solar thermal should be considered where project scopes allow.

7.4 Building design and thermal characteristics should be utilised to ensure that a minimum requirement for mechanical cooling, a strategy of natural ventilation and passive measures should be incorporated ahead of mechanical cooling.
NB. Localised cooling to server rooms may be an acceptable derogation.

7.5 As a basic principle boilers should be considered for provision of space heating only with hot water being provided by Point Of Use (POU) units. Factors to be considered in specifying boilers or work on existing systems

- Low water content boilers.
- High efficiency boilers above 95% efficient.
- Use of energy boosters fitted within the flue discharge for the older boilers etc.

7.6 Chillers where required should use the following factors in specifying and designing of systems:-

- Units should have a COP in excess of 6.5(Coefficient of Performance)
- Units/System should operate low GWP (Global Warming Potential) less than 9.5
- Preferred refrigerant medium is R1234ze with GWP 6.0.

8. Communications

8.1 Due consideration of power consumption of communications and CCTV equipment should be given when specifying these installations

8.2 Specifying units with low heat output to minimise need for cooling in comms room.

9. Small power

9.1 When considering the installation of small power circuits, consideration should be given to alternative requirements of users including power over ethernet and low voltage circuits.

9.2 Heat gains from small power and appliances should be considered and taken into account within heating system design.

10. Power distribution

10.1 Mains and sub mains should be designed in such a manner to allow logical and meaningful sub metering in accordance with CIBSE TM39 Building Energy Metering (a guide to energy sub-metering in non-domestic buildings).

10.2 Spare capacity and future proofing should be built into main power panels and boards such that at future dates renewable energy sources, battery storage and electric vehicle charging can be increased to be built with capacity for input from future solar inverters and other renewables

10.3 Consider providing specific circuits for charging batteries and end user devices ranging from electric scooters to laptops.

10.4 Sub-metering is to be installed as required by the Building Regulations and recommended by the guidance given in CIBSE TM39.

10.5 The meters are to be MODBUS meters and data is to be recorded to the sites building management system.

10.6 Sub metering should include the following as a minimum:

- Internal lighting
- External lighting
- Domestic Hot Water
- Water usage from each water distribution system
- Ventilation load
- Cooling load
- Auxiliary Power
- Heating (process and space heating)
- Water
- Small Power
- Gas or electric to heating plant (to suit plant type)
- Gas or electric to kitchens (to suit appliance type)
- Other sub-metering as may be required by a project specific design or end user consideration

10.7 The BEMS and sub-metering data shall be configured to allow the MCC Energy Management Unit to view the systems and remotely control set points and other controls agreed by the FM company and MCC Energy Management Unit.

10.8 There should be the capability for utilities to be remotely monitored by the utility provider.

11. Electrical Infrastructure

11.a Variable Speed Drives

- Designers must fully explore the use of Variable Speed Drives (VSDs) to control the speed of motors, fans and pumps - matching their speed and torque to the requirements of the application to deliver savings in electricity used.
- IVSDs convert the incoming electrical supply of fixed frequency and voltage into a variable frequency and variable voltage output to the motor with a corresponding change in the motor speed and torque. The VSD manages the motor's speed from zero rpm through to typically 100-120% of its full rated speed whilst up to 150% rated torque can be achieved at reduced speed.
- Using a Variable Speed Drive to slow a fan or pump motor from 100% to 80% can save as much as 50% of the energy used.
- Every fan, pump or HVAC motor needs a VSD - dramatically reducing the electricity used to match the real need rather than running at full speed.
- Reducing the speed and torque of the motor to more closely match the environment and requirements of the process, rather than running at full speed all the time - reduces the amount of electricity being used. This reduction in speed relates directly to a reduction in power and energy.
- Variable Speed Drives offer significant savings in electricity consumed and can be applied in a variety of applications. The designers must investigate and demonstrate the incorporation of the VSD's and the savings which would be provided by utilising VSD's

11.b Voltage Optimisation

- The designer shall fully investigate the implementation of Voltage Optimisation to reduce energy consumption in voltage dependent loads by reducing and in some cases controlling voltage levels to within European Harmonised voltage levels to return an energy saving.

  Combined Voltage Optimisation & Power Factor Correction
- Voltage Optimisation & Power Factor Correction are complementary technologies that work very well in synergy as a powerful energy saver that is extremely visible on energy bills.
  A combined approach introduces the best of both technologies to reduce energy consumption, remove reactive power penalties, reduce carbon emissions, reduce capacity and availability charges, improve utility and protect electrical equipment from higher than needed voltage levels

11.c Lifts

The designer will carry out a full analysis to establish the lift type required, as well as its size, speed and capacity, to guarantee that the lift system on each project is fit for purpose.
Where possible utilise gearless drive units consume significantly less energy than conventional motors.
Investigate energy saving regenerative drive systems that actively generates electricity which is fed back into the building's electricity supply network.
All lift cars lighting will be LED minimum 105lm/w.

12. Heat emitters

12.1 Designers should promote the use of the highest efficiency emitters which are available.

12.2 Consider within the building and heating strategy if it may be prudent to include for heat reclaim or recovery from areas which may suffer from specific risk of overheating or undue seasonal heat gain

12.3 Low surface temperature emitters or covers are required in many areas including settings involving children of school age or vulnerable adults

12.4 Within the heating design specific consideration should be given to local zoning and controls to minimise areas of low occupation being heated un-necessarily

Alternative heat emitters to be considered to allow use of heat pumps:-

- Underfloor heating
- Chilled beams for heating cooling and ventilation
- Combined heating and cooling via the wall structures.

13. Ventilation

13.1 The ventilation strategy is wherever feasible to promote natural ventilation and passive measures as absolute priorities

13.2 If mechanical ventilation is used then designers should promote the use of the highest efficiency equipment which is available.

14. Drainage

NOTE: Manchester's climate is changing, and new and existing buildings need to be resilient. A best practice case study is attached on the West Gorton Park 'the park that drinks water'.

14.1 Roof drainage from the development to be controlled to prevent overwhelming of local drainage infrastructure via baffles or weirs at roof level or SUDS within the external areas of the building

14.2 Use of grey water / rainwater harvest is to be investigated for toilet flushing and other non-potable uses e.g. vehicle washing. Grey water systems should be designed to so as to minimise the need for additional plant e.g. use of gravity feed ahead of pumped systems.

14.3 Where feasible wastewater heat recovery should be considered.

15. Heat recovery

15.1 Opportunities for heat recovery should be investigated in line with current design guides and seek to achieve a betterment of 5% compared to current regulations for air handling plant.

16. Local controls

16.1 The use of local controls should be promoted to aid user comfort only when it will not conflict with other controls and building management strategies and examples of strategies / technologies to be considered include:

- Open window indicators
- Automatically closing windows
- Zone / room controls and valves linked to window controls
- Any large open plan spaces to be considered for splitting into zones

17. Centralised BMS / remote monitoring / Building Energy Management System (BEMS)

17.1 A Building Energy Management System should be provided including comprehensive monitoring and controlling of associated services and shall be designed in accordance with BSRIA and CIBSE guidance, to suit the building usage, time zones, optimum energy efficiency, minimum carbon emissions and provide load sharing of run and stand-by equipment.

17.2 The BEMS system is intended to be interactive and provide the facility for both users and staff to investigate in real time how a building is performing against targets via web based monitoring software. It should display information on system performance in an educational and entertaining manner, engaging the end user on how they can influence the operation of the buildings and their own carbon footprint.

17.3 The BEMS should carry out comprehensive automatic control and monitoring of all the proposed systems with distributed intelligent control units (outstations) linked via peer to peer communication using TCP/IP Ethernet. This system shall be complete prior to the commissioning period required for the mechanical and electrical services.

17.4 In order to provide flexibility and full integration throughout an interoperable solution the BEMS system should have open protocol architecture.

17.5 Any BEMS system should include ability to isolate spaces not in use.

17.6 The BEMS will form the principal part of the energy monitoring to achieve the energy conservation goals of the project and compliance with the Building Regulations Part L2 — Conservation of Fuel and Power. Energy monitoring features will include:

- Monitoring utility consumption.
- Monitoring energy usage and targets.
- Energy reporting from the user.

17.7 Maintenance will be a key requirement in the BEMS design. Additional user visibility and control will be available at the local control panels via plug in laptops or simple user hand tools. The BEMS head end will provide interactive graphics to allow the plant operators to switch, adjust and monitor the BEMS / Control System. The screen displays will show the current status and value of all displayed controlled and monitored points. Access to the graphics and text pages will be via a simple 'walkthrough' system.

17.8 System alarm handling will be provided, giving the operator visual, audible, printed and electronic (via email or SMS text message) warning of system conditions, such as plant failures, which require operator/maintenance actions. All alarms will be prioritised in a hierarchical fashion dependent on the type of alarm.

18. Renewable energy sources

18.1 Solar PV to be specified for all new build projects. Designers should aim for a minimum of 20% of the developments energy to come from on-site renewable energy sources.

18.2 Viability assessments to be undertaken to identify opportunities for the installation of solar PV on all refurbishment projects.

19 Combined Heat and Power units - CHP

19.1 All CHPs installed shall meet or exceed the standards set out in CIBSE guidance AM-12.

19.2 A CHP solution needs to be based on a number of considerations including technical, financial and operational factors, not just to meet planning or building regulation requirements. CHP only makes savings while running, meaning there must be a reliable need for heat and electricity.

19.3 Implementing energy saving measures after installing CHP could result in an oversized unit, compromising the benefits of the installation. Equally, the sizing should take into account future expected changes in energy demand, such as future development.

19.4 Consider thermal storage. Thermal storage can potentially increase the amount of savings from a CHP. Thermal stores allow a CHP to continue generating consistently, providing an efficiency benefit, even at times of low heat demand.

19.5 A adequate level of security protection from cyber-attacks and other vulnerabilities must be ensured.

Appendix D- Methodology for the Management of Embodied Carbon

Embedded carbon in construction materials is a significant source of MCC's carbon footprint (beyond direct emissions). This section of the Standard provides a proposed initial approach to embodied carbon which will be built upon in forthcoming iterations of the Standard.

It is recommended that designers should utilise the following top ten design considerations to reduce embodied carbon in the construction lifecycle:

1. Apply a consistent metric for all design processes. Such as the RICS methodology1, this provides a sound basis for the while life construction lifecycle.

2. Standard system for measurement of embodied carbon. As a 'Minimum' all projects should demonstrate actions taken to reduce embodied carbon through the provision of a Circular Economy statement (GLA draft2 - 9.7.3, p412). A whole Life-Cycle Carbon Assessment methodology should be demonstrated (GLA draft1 - Policy SI 2 F, p386). All projects should lead by example by disclosing this data. This is to include a calculation on whole Life-Cycle Carmon emissions.

3. Reuse and restore buildings instead of constructing new. Renovation projects typically save between 50 and 75 percent of the embodied carbon emissions compared to constructing a new building. Especially if the foundations and super-structure are preserved.

4. Specify low-carbon concrete mixes. Concrete is the biggest source of embodied carbon in most projects. Consider design of lower carbon concrete mixes by using pulverised fuel ash, granulated blast furnace slag, limestone calcined clay cement, or even lower-strength concrete where feasible.

5. Limit use of carbon-intensive materials. Minimise use of products with high carbon footprints such as: aluminium, plastics and foam insulation. Consider use of recycled steel or mass timber as an alternative.

6. Choose lower carbon alternatives such as low carbon slabs and hollow core and voided slabs.

7. Make the most of structural efficiency. Consider ways to achieve maximum structural efficiency by using optimum value engineering, efficient structural sections, off site construction methods that minimise material use.

8. Reduce use of finishing materials. Design out unnecessary finishes e.g. leave walls with a rustic effect rather than boarding and skimming, use polished concrete slabs as finished flooring, leave ceilings unfinished or minimise aesthetic coverings.

9. Minimise waste. Design to common dimensions to reduce the need to cut down materials. Consider off site construction to standardise the construction process.

10. Reuse and recycle materials. Whenever possible, utilise recycled materials in construction, such as brick, metals, crushed concrete, wood and even reuse of fixtures and fittings.

This proposed approach will be reviewed and enhanced in collaboration with contractor and supply chain partners.