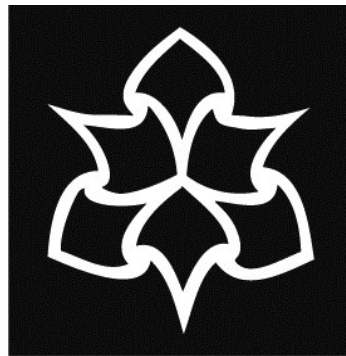




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Appendix A - Environmental Design Principles for New Buildings and Refurbishments



**Manchester
Metropolitan
University**

Environmental Design Principles

For New Buildings and Refurbishments

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Introduction

This document supplements the **University’s Building Design Requirements** for new build and refurbishment projects. This document will act as a baseline requirement for the design/ construction and refurbishment of buildings, ensuring the University’s environmental requirements are understood and considered.

The University has an **Environmental Sustainability Policy and Strategy**, which outlines a number of environmental commitments and targets. With regards buildings the University has committed to:

Achieve Energy Performance Rating (EPC new buildings) B rating or above upon completion.

Achieve BREEAM rating on new buildings of ‘Excellent’ with a stretch target of ‘Outstanding’

Achieve SKA accreditation for appropriate refurbishment projects, with a target of ‘Silver’

Other Environmental Policy commitments also relate to how our buildings are designed and refurbished. Issues to be considered include:


1. **Carbon and Energy**
2. **Building Materials**
3. **Water Consumption and Drainage**
4. **Biodiversity**
5. **Travel**
6. **Waste**
7. **Pollution Control**
8. **Climate Change Adaptation and Resilience**
9. **Customer Awareness and Use**

Whole life costing methods and options should be presented for all projects, to ensure that the best options can be considered for the lifetime of the building and not simply the lowest capital expenditure. For example, this whole life costing should include an evaluation of the utility and carbon costs for the life of the building.

Implementation and Monitoring

New Builds

All new build projects require the appointment of an external Environmental Sustainability Advisor who will be part of the design team. All new build projects also require a bespoke Environmental

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Sustainability Tracker (EST) that will include project specific environmental targets and specifications. The Environment Team and the appointed Environmental Sustainability Advisor will develop the EST in collaboration with the design team.

The appointed Environmental Sustainability Advisor will check compliance against the EST throughout the project, reporting to the Head of Environmental Strategy and Environment and Energy Systems Manager. Compliance against the EST will be an agenda item on project progress meetings. The design team will be required to submit an EST compliance reports at regular intervals.

All relevant environmental legislation must be complied with (construction or designed related).

Refurbishments


When a refurbishment project is considered/ approved the Project manager should inform the Environment and Energy Systems Manager to ascertain if the project requires a SKA assessment and the appointment of an external SKA assessor. It will depend on the scope of the project.

The Contractor Code of Practice must also be issued to all contractors working on the University Campus during refurbishment and new build projects. <http://www.mmu.ac.uk/health-and-safety/manual/a-to-e.php>

Table 1 below provides an overview of the requirements for new build and refurbishment projects.

Table 1

Project	Tool	Consultancy support	Target
All New build projects	BREEAM	BREEAM Assessor	BREEAM Excellent with stretch target of Outstanding
	Mandatory TM54	TM54 Assessor	
	Environmental Sustainability Tracker	External Environmental Sustainability Advisor to work alongside the design Team	Targets set within the EST
Building refurbishments	SKA Assessment*	External SKA assessor	Silver

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	<p>* Advice must be sought from the Environment and Energy Systems Manager to ascertain if a SKA assessment is required; it will depend on the scope of the project.</p> <p>Contractor Code of Practice must be issued to all contractors working on campus.</p>	NA	
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Principle 1- CARBON AND ENERGY

The University's Environmental Policy commitment and target is set out below:


<p><i>Reduce operational energy consumption and carbon emissions in line with our targets</i></p> <p>Reduce carbon emissions (scope 1&2) gas, and electricity by 50% by 2020/21 from 2005/06 baseline</p> <p>Achieve an average Display Energy Certificate (DEC) rating across our university buildings of C or above</p>

1.2 Energy Principles

Following the energy hierarchy is one of the most effective ways in which to reduce the energy related environmental impacts of buildings. The University has a policy to follow the energy hierarchy when designing and refurbishing new buildings. The energy hierarchy has four stages to follow, as outlined in Figure 2 and is detailed further in this document.

Designers should also evaluate **operational energy** use more fully, and accurately, at the design stage. **They should evaluate operational energy use using the methodology and reporting format set out in CIBSE TM54: 2013. TM54 should be carried out at RIBA (plan of work 2013) Stage 2* and repeated at stages 3,4,5 (Detailed, Technical and Specialist Design) and 6 (Construction) . [*when building energy model has been completed].**

We would also request that the contractor reviews energy consumption after the first year of operation and provides a report comparing calculated energy consumption (TM54), with actual

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energy consumption, with reference to the first years sub metered energy data. Reasons for discrepancy should be identified by the contractor along with suggestions to improve performance. Targets for refurbishments based on the DEC target or a percentage CO2 reduction for refurbishment will be set in the EST.

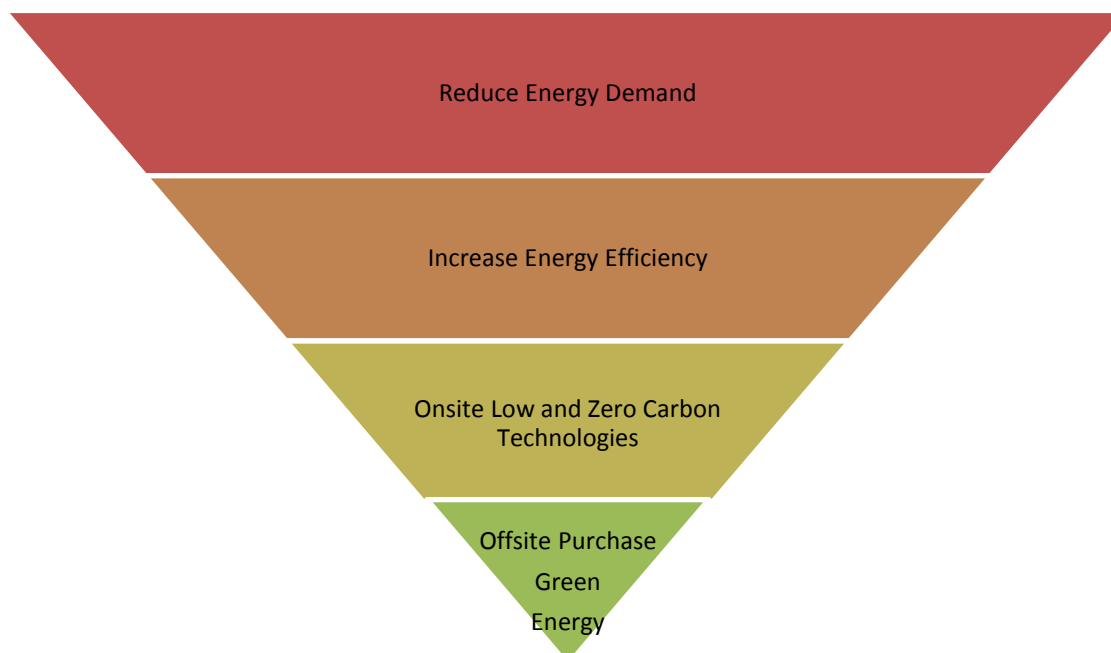



Figure 2- Energy Hierarchy

The Energy Hierarchy

Step 1- Reduce Energy Demand

In the design and refurbishment of new builds, designers should aim to reduce the quantity of energy required for heating, lighting and cooling via fabric efficiency and passive design. This includes considering:

- U Value and air tightness
- Enhanced insulation of pipes, ducts and vessels
- Solar control glass and/or shading louvres
- Use natural environmental systems instead of artificial systems, such as passive solar gains, natural ventilation and natural daylighting

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Step 2- Energy Efficiency

Energy efficient services, appliances and controls should be used, such as:

- High efficiency condensing boilers
- High efficiency chillers
- Underfloor heating
- Chilled beams
- Pumps and fans with variable speed motors (DC or EC)
- Pipework and ductwork with larger diameters
- Efficient controls systems
 - Low-energy lighting, such as: LED (light emitting diode) lamps
 - Natural daylight and presence detection controls

Energy efficient white goods (fridges, freezers etc) should also be purchased- minimum of A rated.

Step 3- Onsite renewable, low and zero carbon technologies

Low or zero carbon (LZC) generation technologies should be considered to provide as much energy as is technically and economically feasible from the following sources:

- Combined heat and power and heat networks
- Heat pumps (either ground source or air source)
- Solar water heating
- Solar photovoltaic panels
- Fuel cells and storage


Project Specific Energy design standards will be developed in the EST.

Step 4 – Purchase Green Energy

MMU will purchase all remaining electricity requirements on a Green Energy Tariff (electricity generated from off-site renewable energy) that supports the development of new large-scale renewable energy generation and infrastructure.

1.3 Energy Metering and Energy Performance Certification

As well as the BREEAM requirements, CIBSE guide TM39 (Building Energy Metering) should be followed for metering strategies for new building and major refurbishments.

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The University requires that all new meters should have a pulsed output that is connected to the University Building Management System. All necessary equipment required to ensure that each metering unit can be connected onto the Building Management system, including data points, power supplies, pulse loggers etc shall be provided as part of the project. Allowances shall be made for modifying and/or extending the existing data collection system as required, ensuring that it is sufficiently sized to accommodate the additional metering units within the building. Specific details for electrical and mechanical metering arrangements will be addressed in Part 5 of the University's Design Guide.

As required by the Energy Performance of Buildings Directive, once any new building is physically complete, the University should be supplied with an Energy Performance Certificate (EPC) and a recommendation report. It is the responsibility of the person carrying out the construction to supply the University with this. At design stage, a target EPC rating should be set through liaison with the University. The minimum EPC target rating will be B.

Principle 2- BUILDING MATERIALS

The University's Environmental Policy commitments and targets in relation to ethical and sustainable procurement as outlined below:


Consider the economic, social and environmental impacts and whole life costs of purchasing decisions and take appropriate action

The construction and refurbishment of buildings consumes a large quantity of materials including timber, bricks, concrete, metals and glazing. Before arriving at site, these materials have been extracted, processed, manufactured and transported with each stage potentially resulting in significant environmental impact.

The environmental impacts of materials can include resource depletion, deforestation, contribution to climate change, water extraction, eutrophication and ozone depletion. It is important that opportunities be taken to minimise the lifecycle impacts of materials during refurbishment, fit-out and new construction projects at the University.

The designer should implement the following principles by:

- Investigating opportunities to use reclaimed materials. This particularly applies to materials such as block work and timber. Companies such as *Source Reclaim* supply a wide range of reclaimed materials in the North West.

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- If reclaimed materials are not feasible, investigate potential to use recycled materials or materials with recycled content. For example, concrete is widely available with high levels of recycled aggregate and dense block work is widely available with recycled content above 93%.
- Materials should be sourced as locally as possible in order to reduce impacts from transport. For example, importing reclaimed block work from China is not considered sustainable.
- Surplus materials and packaging should be taken back on an ongoing basis. Suppliers should also take back all unwanted packaging.

Several materials have specific sustainable sourcing requirements:

Where new timber or wood products are used, they must be responsibly sourced. Timber must be supplied with a chain of custody from one of the following forest certification schemes:

- a. Forest Stewardship Council (FSC);
- b. Sustainable Forestry Initiative (SFI);
- c. Canadian Standards Association (CSA).

Where paints are specified or used they should either be awarded the EU Eco label, be at least 90% recycled or be supplied with an Environmental Product Declaration.


The design team should provide a report on materials selection that will form a section of the overall EST gateway process, with justification provided for any move away from local sustainable materials.

The new CIBSE TM56 (Resource Efficient Building Services) is a good reference document for this Policy area.

Principle 3-WATER CONSUMPTION AND DRAINAGE

The University's Environmental Policy commitments and targets in relation to water and drainage are:

<p><i>Effectively manage and reduce our mains water consumption across our estate and increase the deployment of sustainable drainage and flood prevention measures.</i></p> <p><i>Reduce total water consumption by 25% by 20/21 from 2010/11 baseline</i></p>

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Reduce mains water consumption by 35% by 20/21 from a 2010/11 baseline

The designer should implement these commitments by:

- Reducing the demand for water by installing water efficient technologies.
- Maximise the use of rainwater and recycled water or other non-mains sources e.g. groundwater, grey water.
- Reduce the rate and quality of surface water run off using sustainable urban drainage systems e.g. green roof, swales, rainwater harvesting, permeable paving.

Principle 4-BIODIVERSITY

The University's Environmental Policy commitments and targets in relation to Biodiversity are:

Protect and enhance biodiversity across the University and promote its benefits for students, staff, visitors and local communities

Measure and maintain habitat &/or species diversity from a 15/16 baseline


Measure and maintain habitat connectivity from a 15/16 baseline

Although much of the MMU estate is in an urban environment, designers have the responsibility to protect biodiversity and identify opportunities for enhancement.

These commitments will be implemented on projects by:

- Ensuring that all habitats are protected during construction works. If necessary, habitat and species surveys should be undertaken and mitigation measures put in place if potential impacts to local ecology are identified.
- Opportunities should be identified to improve biodiversity as a result of new projects. For example, this might include green roofs, green walls, bat boxes, additional planting or the inclusion of water bodies. This is particularly important for public realm works.
- Opportunities should be identified to include growing spaces as part of new projects.
- Where enhancements are included, they should be promoted and communicated to staff, students and the wider community.

Principle 5-TRAVEL

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The University's Environmental Policy commitments and targets in relation to travel are:

Minimise the impact of staff and student travel and encourage the use of efficient modes of transport that reduce environmental impact, congestion and air pollution.

Increase percentage of bicycle parking facilities by 18% by 2020/21 from a 13/14 baseline

In order to encourage sustainable travel behaviour during the operational phase of buildings, it is important that opportunities are taken during the design phase. The following principles should be followed on all relevant new projects:

- Provision for transport user's needs in a hierarchy, with pedestrians, cyclists and mobility impaired users at the top, followed by public transport users and then private cars;
- Legible and safe pedestrian routes for key routes within campus and the immediate surroundings to be strengthened through the design process (including signage);
- Application of Manual for Streets guidance, including shared space principles with regards to the wider public realm;
- Cycle storage facilities should be installed in line with requirements in BREEAM and the specific user requirements of the buildings. Facilities include shelters, lockers, showers, drying cabinets, changing facilities, repair/pump stations etc;
- Consideration should be given to the level of local public transport provision and opportunities taken to ensure sufficient provision;
- Car Parking should be reviewed to determine any net change in provision and the associated demand. Parking provision should be identified as part of a holistic review via a Transport Assessment/Statement and reflect MMU Parking Policies;
- Electric Car Charging infrastructure should be proposed where appropriate alongside any allocated car share/pool car/visitor bays;
- Disabled parking should be provided where appropriate and reflect the local design standards;
- Any requirement for access control through barriers, pay and display machines and supporting signage should be determined;
- Highway Safety should be assessed to reflect current/proposed road layouts, access arrangements, traffic regulation orders, street lighting, crossing facilities, road speeds (5mph limit on campus), accident analysis etc;
- Delivery and Servicing arrangements should reflect the requirements of the build, consolidate movements and where possible be segregated from pedestrians;

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- Any phasing of works should be stated alongside access/parking arrangements during the construction phase;
- The design team will be expected to work closely with the Local Highway/Planning Authority and related public bodies to ensure that all requirements for the site specific Transport Assessment/Statement and Environmental Impact Assessment are met;
- The relationship with committed/proposed neighbouring/area based transport investments, should be appraised to acknowledge impacts, incorporate opportunities and build long term resilience in to the design; and
- A Travel Plan should be developed to define how car based trips will be minimised and alternative forms of transport promoted with associated targets and measures. This should reflect the overarching Travel Plan for the University and make use of the available survey data.

Principle 6-WASTE

The University's Environmental Policy commitments and targets in relation to waste are:


<p><i>Embed the principles of the waste hierarchy to prevent, reduce, reuse, recycle and dispose of our waste</i></p> <p><i>Increase reuse and recycling (on-site) by 60% by 2020/21</i></p> <p><i>Divert 85% of waste from landfill (including waste from all building projects)</i></p>

The Environmental Policy commits the University to implementing the waste hierarchy (prevent, reduce, reuse, recycle, and dispose). There are significant opportunities to reduce the amount of waste generated during the excavation, demolition, construction and refurbishment phases of a building design.

Although most relevant to new-build and larger refurbishment projects, there are five key principles of designing out waste, as set out by the Waste and Resource Action Programme (WRAP), that should be followed on all projects:

The Design team should implement these principles through:

- **Design for reuse and recovery:** consider whether materials from excavation or demolition can be used in another part of the project and whether cut and fill balance can be achieved.
- **Design for off-site construction:** consider whether the design or part of the design can be manufactured off site.

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- **Design for materials optimisation:** consider whether the design can be simplified to avoid unnecessary cutting and joining of materials. Consider also using standard dimensions and a standardised set of materials to encourage re-use of offcuts.
- **Design for waste efficiency procurement:** consider setting waste targets for contractors during the construction phase and involving contractors early to ensure construction methods that reduce waste are chosen. Use of the Wrap Net Waste Tool¹ should be considered on larger projects.
- **Design for deconstruction and flexibility:** consider whether the design is adaptable for a variety of purposes during its lifespan and whether building elements can be upgraded, replaced and maintained without producing waste. Consider whether elements and components of the design can be easily disassembled for reuse.

Measurement of waste, monitoring and legal compliance

The contractor should use either a Site Waste Management Plan or similar, to log all waste data (in tonnes) from project inception to end, taking into account the design principals above, University waste and recycling targets, and for larger new builds BREEAM targets. The plan should also include legal duty of care documentation- EWC codes, destination of waste and all carrier/ transfer/ consignment note detail. The plan will be reviewed and monitored by the Waste and Recycling Manager during the works and spot checks will be carried out throughout the project phases. The contractor is expected to provide an up to date plan when requested and provide all data at the end of the project to the Waste and Recycling manager.

Waste Handling and Storage


During the design phase, The Design Team will refer to the requirements in the bin and operational design brief document, which is available from the Waste and Recycling Manager. This provides detail on the waste collection process and the types and sizes of containers required for operational use.

Principle 7- POLLUTION CONTROL

The University's Environmental Policy commitments and targets in relation to pollution control are:

Prevent pollution by minimising local discharges to air, land and water

¹ Wrap Net Waste Tool: <http://www.wrap.org.uk/content/net-waste-tool-0>

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Aim for zero pollution incidents on campus

This is especially important during construction and refurbishment activities on the University’s Campus. All contractors must comply with the University’s Contractors Code of Practice for **Health, Safety, and Environment**.

It is also required that during all projects (construction or refurbishments) the construction contractor will provide evidence of the adoption of the Considerate Constructors Scheme Code of Practice. To address but not limited to; noise, cleanliness, safety and good neighbour relations.

Principle 8- CLIMATE CHANGE ADAPTATION AND RESILIENCE

Climate change will have significant implications for the built environment, including buildings and energy, transport, water and ICT infrastructure. Infrastructure assets and buildings are in operation or use for many years, which means that decisions made now about their design and construction will have long-term consequences.


The built environment and infrastructure are already vulnerable to extreme weather such as flooding, storms, heatwaves, and droughts. Most of today’s buildings have been designed for a climate that existed when they were built and are not necessarily equipped to cope with current and future climates. Around 70% of buildings that will be in use in the 2050s already exist, but there are opportunities for innovative building design and services to minimise the identified risks and ensure our buildings and infrastructure are future ready.

Designers should consider the risks to buildings and infrastructure, due to our changing climate and propose design solutions to reduce the risks identified. The risks identified by national and local governments should be considered (e.g. the UK Climate Change Risk Assessment)

Principle 9 - CUSTOMER AWARENESS AND USE

The University’s Environmental Policy commitments in relation to communication are:

- Communicating the environmental benefits of building design and technologies to our key stakeholders,***
- Ensuring that building users possess the knowledge and awareness to operate building systems efficiently.***

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Designers should assess opportunities to communicate the environmental benefits of a refurbishment project or capital development to our key stakeholders. This could include the installation of appropriate signage, communicating the key project facts and environmental benefits to relevant stakeholders (staff, students and local community). The University’s Press Office and Marketing and Communications Co-ordinators should also be informed for wider dissemination.

For larger projects BSRIA soft landings process should be followed by the project team, to facilitate a smooth handover of the building and continual engagement with the building managers.

CHANGES TO THE DOCUMENT

REASON FOR THE CHANGE
V2 issued -updated to incorporate University Building Design Requirements
V3 Issued – Updated to include Climate change Adaptation and resilience
V4 Issued – Updated to incorporate the new Environmental Strategy Targets