

## Sustainable Construction Guidance.

### Introduction:

Sustainability is at the heart of Newcastle University's ethos as a world-class civic University responding to global challenges through education and research. Environmental sustainability is one of five key institutional objectives, and sustainability is one of three societal challenge themes we use to provide focus to our interaction with civil society.

Our Environmental Sustainability Policy (available at: <http://www.ncl.ac.uk/sustainable-campus/about/policy.htm>) sets out our commitments and objectives. Our environmental management system (EMS), certified to the international standard ISO14001, provides the framework for ensuring continual improvement in environmental performance. See more on our objectives and targets at <http://www.ncl.ac.uk/sustainable-campus/about/ems/>.

Construction and refurbishment are important aspects of University sustainability; the environments we create are important for inspiring students in relation to sustainability, for enabling world class research, and for furthering civic engagement. Ensuring that sustainability is integrated throughout our construction projects is essential to meet our sustainability commitments and objectives.

### Sustainability Targets

- All projects to have ESS Sustainability Team input from inception, leading to agreed Sustainability Targets, with signoff at RIBA stage review milestones.
- Targets will be embedded in tender documents and contracts through unambiguously worded requirements. Project managers will ensure these requirements are delivered through all stages of projects. Compliance with performance targets will be demonstrated through commissioning.
- All New Build projects to have agreed Sustainability targets which will include *one or more* of the following:
  - An agreed BREEAM Rating – usually 'Excellent' as a minimum.
  - Energy Performance Certificate (EPC) 'A'
  - Display Energy Certificate (DEC) 'A'
  - Defined Energy / CO<sub>2</sub> targets e.g. kWh/m<sup>2</sup> or CO<sub>2</sub>/m<sup>2</sup>
  - Bespoke sustainability objectives/targets as applicable to the project e.g. aligned to research activity to take place within the building.
- Refurbishment projects to have agreed Sustainability targets which will include *one or more* of the following:
  - An agreed SKA Rating – usually 'Gold'.
  - Energy Performance Certificate – improvement of rating band e.g. 'C' to 'B'
  - Display Energy Certificate – improvement of rating band e.g. 'C' to 'B'
  - Bespoke sustainability objectives/targets as applicable to the project e.g. aligned to research activity to take place within the area covered by the project.
- Major maintenance projects e.g. those carried out under Long Term Maintenance have agreed Sustainability targets applicable to the project concerned, agreed in advance with the ESS Sustainability Team.

## 1 Project minimum sustainability standards

Issue	Standard to be achieved
Sustainability Management	<p>The designer must implement an auditable management system to prompt and track sustainability throughout the design and development process.</p> <p>The designer/contractor will report at each stage review gateway on each relevant section in this guide.</p> <p>The University will require the contractor to prove throughout the design process this was developed and implemented. Project management, the Soft Landings process, commissioning and post project reviews will be used to confirm objectives and standards are achieved.</p> <p>The ESS Sustainability Team will review progress throughout the project development process and at handover.</p>
Considerate Construction	The Contractor must be registered with the Considerate Constructors scheme and must achieve a score of above 35 by the end of the construction phase of the works.
Life Cycle Assessment (LCA)	LCA must be carried out on key building elements / cost items. The elements to be assessed to be agreed in writing with the ESS Sustainability Team during RIBA Stage 2.

The following standards shall be achieved in all construction and refurbishment contracts over £1.5 million. LTM projects over this value should refer only to elements being replaced.

### 2.1 Energy efficiency and climate change mitigation

Issue	Standard to be achieved
CO <sub>2</sub> Emission Target	The building shall be designed to operate in a manner that minimises carbon dioxide emissions. These shall not exceed 15kgCO <sub>2</sub> /m <sup>2</sup> per year for regulated energy in new build and 22kgCO <sub>2</sub> /m <sup>2</sup> per year in refurbishments.
Massing	The building must be designed to maximise heat exchange potential and building operational efficiency.
Building Orientation	The design must demonstrate the optimisation of the available site to enhance wherever possible day lighting and natural ventilation potential whilst accommodating any acoustic issues.

Insulation	Low U-value components must be used, with the average U value for the whole building including the external fabric, glazing, windows, roof, walls and floors to be 25% above current building regulations for new build and 0.25W/m <sup>2</sup> /°C maximum for refurbishments.
High Thermal Mass	Use is to be made of the internal exposed high thermal mass of building structures to absorb heat energy.  This high thermal mass is to be taken into account in the design of any heating / cooling and ventilating systems to reduce plant and system size.
Air Leakage	For new buildings the amount of air leakage shall be minimised to be below 3 m <sup>3</sup> /hr/m <sup>2</sup> @50Pa to reduce the building heating / cooling loads as per best practice in CIBSE TM23. For refurbishments the amount of air leakage shall be minimised below 10 m <sup>3</sup> /hr/m <sup>2</sup>
Energy Consumption of Appliances and Electric Motors	All electrical appliances and fixtures must be energy efficient and rated at a minimum A+. Electric motors for fans and pumps etc. above 1.0 kW shall be premium efficiency (IE3) and variable speed, with separate individual inverter controls complete with harmonic filtration.
Ventilation Efficiency	Natural passive ventilation utilising one side, low/high window openings, cross ventilation or stack ventilation shall be used as the highest priority and where mixed mode mechanical ventilation is necessary, efficient air to air heat recovery methods shall be used with a minimum efficiency of 80%.  Supply and extract air ventilation systems shall incorporate high efficiency air to air heat recovery methods such as thermal wheels.  Air conditioning for comfort cooling (i.e. non-process related) is not permitted without the written approval of the Deputy Vice Chancellor (pro forma available on request from ESS Sustainability Team).
Plant Energy Usage	Modular plant and equipment such as boilers, pumps etc. shall be sized to operate at maximum efficiency and used to enable plant to be turned down to match building loads out of season.
Site Renewables	Low and zero carbon energy generation should be reviewed as part of the project. Technologies should be included if they meet required pay-back or if they have wider strategic benefits, such as University research or teaching related to the technology.

Natural Day Lighting	<p>Window and glazing design is to be such that maximum daylighting is provided to the occupied areas whilst solar gain is reduced e.g. by shadowing and natural shading forms of solar shading, external blinds / brise soleil and solar control glazing with heat reflective properties.</p> <p>Light tubes shall be considered for providing daylight in building interiors, corridors, lavatories etc.</p> <p>Daylight factors of 5% are to be achieved as set out in BRE Good Practice guide 245 with due respect to life cycle costing.</p>
Artificial Lighting	<p>Internal lighting designs shall minimise energy usage and shall use dedicated LED fittings. Non-LED fittings may only be installed with express written approval from the ESS Sustainability Team. All areas shall include automatic controls inc. absence and presence detection as a minimum and daylight / constant lux where appropriate. Manual controls shall also be provided as appropriate. Internal lighting control strategy shall be agreed by the ESS Sustainability Team.</p> <p>External lighting shall use white light and LED fittings with appropriate daylight shut off / hold off devices.</p> <p>External security lighting shall be LED complete with PIR controls and daylight sensors where appropriate - control strategy must be agreed by University Security Service.</p>
Building Management System	<p>A fully tested and commissioned Building Management System (BMS) must be provided to ensure that all building systems can be closely controlled and monitored.</p> <p>Seasonal commissioning will be included in the contract to improve performance.</p> <p>The BMS is to be connected to / integrated with the existing University BMS system(s).</p> <p>There will be adequate space temperature sensors installed to cover all elevations all elevations of the building to give a reasonable average space temperature for the associated zone.</p> <p>Optimum Start/Stop modules will be used for all heating zones. Variable Temperature circuits will be compensated to outside and inside air temperature.</p> <p>Cascade control will be used on air handling units where space temperature setpoints set points will have limits 18oC 18°C and 24oC24°C.</p> <p>For more detailed information please see the BMS Specification elsewhere within the Project Briefing Document.</p>

Metering	All metering must be in accordance with the Metering Specification provided elsewhere within this Project Briefing Document
User Controls	<p>The building shall allow for users to have some control over their internal environment. This can be e.g. via openable windows in summer Thermostatic Radiator Valves (TRV's) etc. TRV's must have tamperproof limiting pins, and heating should be interlocked with cooling – including opening windows.</p> <p>In addition, in new developments, The users shall in general be able to users should generally be given control over their internal environment as set out below:</p> <p>[a] Temperature: +/- 2°C either side of the BMS set point  [b] Ventilation/air quality +/- 10% either side of the BMS set point.</p> <p>Thermostatic radiator valves must have tamperproof limiting pins.</p>
Plant Efficiencies and Zoning	<p>Plant equipment and engineering systems must be specified and designed to operate efficiently under part loads. Typically plant and equipment must operate at an average efficiency of no less than 87% when at 25% of full load capacity.</p> <p>Zoning of building systems is to be maximised such that defined zones of the building can operate efficiently independently, particularly areas where occupancy profiles (are likely to) differ from surrounding areas.</p>
Internal Design Conditions	<p>From May 30 to September 30 and from 0900 to 1630, Monday to Friday, there should be no more than 120 hours when the internal air temperature in the building rises above 28°C.</p> <p>Internal design conditions for occasionally let space to be agreed with Central Teaching/Conferencing teams, although the general principles as above should apply.</p> <p>The average internal to external air temperature during occupied hours shall not exceed 5°C difference during this period.</p>
Plant Selection and design	The design and choice of equipment shall be selected to maximise the possibility of grant funding/discounts. If grant funding is available during the course of development, design and construction the developer will be required to provide information and submissions to support the application process.

Laboratory space	<p>Laboratory designs should be discussed with ESS Sustainability Team at the earliest opportunity. The energy use of all lab plant equipment shall be minimised where possible:</p> <ul style="list-style-type: none"> <li>• Fume Cupboards – where provided shall be low energy and low face velocity. Features such as auto sash closers will be provided where appropriate</li> <li>• Lab ventilation shall incorporate variable air volume (VAV) controls</li> <li>• Autoclaves shall be low energy</li> <li>• Plug-in equipment inc. refrigeration (freezers, ULT freezers etc.), drying cabinets, sample heating blocks etc. shall be of 'best in class' energy consumption standards – consult the ESS Sustainability Team for current recommendations.</li> </ul>
Data Centres	<p>Requirements must be discussed with NUIT at feasibility stage as the University has centralised data centre provision.</p> <p>Where requirements cannot be accommodated by the centralised NUIT Data Centre(s) (this to be approved by written exception from NUIT), evaporative cooling or other low energy systems shall be used to minimise environmental impact of running any server rooms (or similar) incorporated into the building.</p>
Entrance foyers	<p>Draught lobbies should be provided to all main entrances.</p>

## 2.2 Sustainable use of Water

Issue	Standard to be Achieved
Improving Water Efficiency	<p>Developments must reduce the total water consumption to &lt; 5m<sup>3</sup> per person per year. This is to be achieved through the use of dual flush WCs, percussion low flow taps, automatic flow regulators and the design of systems.</p> <p>Products from the ECA Water Technology list shall be used and available grants claimed.</p>
Rain Water Harvesting	Rainwater collection for irrigation should be considered as part of the development and should be subject to Life Cycle Assessment.
Flood Risk from Surface Runoff	<p>Sustainable Drainage Systems (SuDS) principles shall be used in the design considering as a first resort options such as soakaways etc. aiming to minimise discharge to drains. SuDS designs should also consider the potential to impact positively on University biodiversity. The development should not increase the rate of surface run off from the site and where possible reduce the rate to positively affect the surrounding area.</p> <p>All development should refer to the CIRIA SuDS Manual (C753) and in smaller refurbishment projects refer to the CIRIA Retrofitting to manage surface water (C713) guidance to ensure no opportunities to retrofit are missed. The University is committed to the City wide Newcastle Declaration on Blue Green Infrastructure, whereby we commit to expanding the amount of blue and green infrastructure within the City, this should be clearly reflected in all development.</p>
Flood Risk from Water Courses	The development must avoid increasing the risk of flooding from water courses and minimise the risk of surface and ground water pollution.

## 2.3 Minimise use of materials and optimise sustainable sourcing

Issue	Standard to be achieved
Recycled Content	<p>All developments must use the WRAP process (see <a href="http://www.wrap.org.uk/sites/files/wrap/Setting%20a%20requirement%20for%20recycled%20content%20in%20building%20projects.pdf">http://www.wrap.org.uk/sites/files/wrap/Setting%20a%20requirement%20for%20recycled%20content%20in%20building%20projects.pdf</a>) for assessing the recycled content of the proposals. A minimum of 30% recycled content by value is required.</p> <p>Contractors are requested to include recycled content over and above this standard as a consideration within the tender, which will be scored as part of the quality aspect of the submission.</p>
Sourcing Materials produced locally	All developments must declare the sourcing of materials and minimise the embodied energy in their transport, manufacture and assembly. All contractors/suppliers shall minimise emissions from transport when sourcing materials.

<p>Environmental Impact of Materials</p>	<p>All the main elements of the building must obtain an A rating from the Green Guide to Specification and BRE guidance. Materials with a low carbon footprint shall be utilised wherever practicable including.</p> <ul style="list-style-type: none"> <li>• Roofs</li> <li>• External walls</li> <li>• Internal walls and partitions</li> <li>• Floors</li> <li>• Windows</li> <li>• External surfacing</li> <li>• Boundary protection</li> </ul>
<p>Sourcing Basic Building Elements</p>	<p>The majority of materials in the following basic building elements must be responsibly sourced.</p> <ul style="list-style-type: none"> <li>• Frame</li> <li>• Ground floor structure</li> <li>• Upper floors structure</li> <li>• Roof structure and finishes</li> <li>• External walls</li> <li>• Internal walls</li> </ul> <p>This means:</p> <ul style="list-style-type: none"> <li>• Low and VOC free products</li> <li>• All timber must be FSC or equivalent certified</li> <li>• Made of recycled materials where appropriate</li> <li>• That cradle to cradle certified products have been assessed for suitability for use (<a href="http://c2ccertified.org/products/registry">http://c2ccertified.org/products/registry</a>)</li> <li>• Avoiding known toxic materials that are injurious to human and ecosystem health</li> <li>• Consideration of future re-use or recycling of materials and avoiding use of composite materials</li> <li>• Sourcing from local suppliers where possible to reduce transport emissions and support the local economy</li> <li>• Materials are EMS certified (ISO14001, EMAS) for their manufacture and supply base</li> </ul> <p>BES 6001 standard should be used for appropriate materials with an aim to achieve 'Very Good' or higher.</p>

<p>Sourcing of Secondary Building and Finishing Elements</p>	<p>The majority of materials in the secondary building and finishing elements shall be responsibly sourced.</p> <p>These include:</p> <ul style="list-style-type: none"> <li>• Stairs and associated ancillaries</li> <li>• Windows and associated ancillaries</li> <li>• External and internal doors and sub frames</li> <li>• Skirtings</li> <li>• Panelling</li> <li>• Fitted Furniture</li> <li>• Facias</li> <li>• Paints</li> <li>• Any other significant use</li> </ul> <p>This means:</p> <ul style="list-style-type: none"> <li>• Low and VOC free products</li> <li>• All timber must be FSC or equivalent certified</li> <li>• Made of recycled materials where appropriate</li> <li>• That cradle to cradle certified products have been assessed for suitability for use (<a href="http://c2ccertified.org/products/registry">http://c2ccertified.org/products/registry</a>)</li> <li>• Avoiding known toxic materials that are injurious to human and ecosystem health</li> <li>• Consideration of future re-use or recycling of materials and avoiding use of composite materials</li> <li>• Sourcing from local suppliers where possible to reduce transport emissions and support the local economy</li> <li>• Materials are EMS certified (ISO14001, EMAS) for their manufacture and key supply base.</li> </ul>
<p>Furniture</p>	<p>ESS Sustainability Team to be contacted at beginning of project to help review the potential for re-use of furniture (e.g. re-upholstering).</p> <p>If furniture is not suitable for re-use within the project ESS Sustainability Team will work with project manager to distribute through WARPit.</p> <p>Reuse and recycling/disposing of furniture/equipment must be factored into the project plan and timescales allocated. All furniture/equipment must be removed in a reasonable timescale before works commence onsite.</p> <p>and as aAs a last resort use a contractor such as ‘Over2Hills’ and/or local charities may be used who will be able to re-use or recycle the furniture on our behalf.</p> <p>Any tender for new furniture should split ‘standard’ furniture from furniture with bespoke/design element. ESS Sustainability Team can provide support for sustainability elements of the furniture tender.</p>

## 2.4 Enhancing connectivity and sustainable transport

Issue	Standard to be achieved
Travel Plan	Development must refer to University Travel Plan and ensure that it meets its key objectives. The ESS Sustainability Team must be contacted at the beginning of development and on occupation University Travel Plan Co-ordinator shall monitor and review travel patterns and targets in line with the University Travel Plan
Reducing the Need for Travel	Ensure that at least one meeting room in the building is suitable for video- conferencing.
Walking Routes	<p>Ensure all walking routes are well lit, footpaths should be lit to at least 10 Lux average and footpaths adjacent to roads should be lit to at least 20 Lux average.</p> <p>CCTV must cover all footpaths.</p>
Cycling Routes and Facilities	<p>Appropriate level and type of cycle parking e.g. Sheffield stands, secure storage, aligned to travel plan cycling targets to be incorporated into development. Location and numbers must be agreed by ESS Sustainability Team.</p> <p>Cycle access requirements must be considered as part of the development.</p> <p>Clear signage for cycle routes and cycle parking facilities to be provided for all development.</p> <p>Showers, changing areas &amp; lockers must be provided for the use of cyclists / walkers / joggers in all new developments and major refurbishments. Consideration must be given to the provision of drying space for wet clothing.</p> <p>There must be a net gain in cycle parking due to the development.</p>
Public Transport	Transport Assessments for major developments may need to consider the available capacity on existing public transport infrastructure relevant to the development or provide new services. Information can be used to determine a modal split and overall mitigation package. It is important to identify peak hours, relevant services, capacity, patronage and measures required to support the development.
Parking	Parking adjacent to building entrances must be provided for disabled building users. Totals will be agreed with ESS accessibility representative. Any additional parking adjacent to building should prioritise car-sharers.

## 2.5 Minimise Occupancy Waste / Maximise Re-use and Recycling

Issue	Standard to be achieved
Waste management throughout construction	Site Waste Management Plans must be produced for all projects over £300k and shall include reduce/reuse/recycling targets that incorporate best practice.
Disposal of construction waste	The University has a list of approved skip companies that have been assessed for recycling levels which can be recommended for use within contracts. The University has a contract in place for general waste and recycling collections, including skips. The University recommends that the same company is used for all skips on the campus, including construction, refurbishments and small projects. Details of the appointed company can be requested from Sustainable.Campus@ncl.ac.uk.
Diverting Waste from Landfill	<p>This section is relevant to new build/complete refurbishment of building only.</p> <ul style="list-style-type: none"> <li>• Internal recycling facilities must be installed in areas which they will not compromise fire safety and not more than 20m from each work area. These must be accessible to disabled people.</li> <li>• Enough bins must be provided to segregate: paper/card, plastics, metals/cans, food waste (for composting), glass, general waste. These bins must be a minimum of 60 litres each, except food (7 litre) and glass (30 litre) collections.</li> <li>• New external bins located near entrances must allow for segregation of waste.</li> </ul>
Re-use of materials	The designer/contractor must look for opportunities to re-use within the development and report on progress. Services such as <a href="http://sitesurplus.co.uk">http://sitesurplus.co.uk</a> may be able to help meet this requirement.
Waste/recycling facilities	All fixed facilities (internal and external) must allow for recycling as well as disposal of general waste.

## 2.6 Biodiversity

Issue	Standard to be achieved
Improving biodiversity on University owned sites	All developments must have a net-positive impact on University biodiversity and compliment the University Biodiversity Action Plan.
Enhancing habitat	<p>Any planting must incorporate a mix of native species, trees should be native if possible (or, if not, to have proven biodiversity benefits) and include a mixture of fruit and seed bearing species.</p> <p>Planting should maximise the complexity of vegetation structure by planting a mixture of plant forms such as grasses, herbs, shrubs and trees.</p> <p>Opportunity should be considered to plant 'butterfly bars' that contain an abundance of flowers with different structures, including open, flat flowers for generalist species, and tubular flowers for more specialist pollinators such as long-tongued bumblebees. Avoid double-flowered cultivars that provide little or no nectar or pollen resources.</p> <p>Review the potential for mixed hedgerows to be incorporated into the development.</p> <p>Planting, especially cover such as shrubs and hedgerows, should aim to link up with other similar areas in order to create wildlife corridors.</p>
Nesting sites	<p>Identify potential for log piles, bee hotels etc. within the development.</p> <p>Assess the potential for bird boxes, nesting sites within the development.</p> <p>Assess the potential for before /after habitat surveys e.g. completed as a student project.</p>

## 2.7 Social and Economic Value

Issue	Standard to be achieved
Local employment opportunities	<p>The contractor will look to maximise opportunities for local employment in site construction and use reasonable endeavours to procure themselves and their sub-contractors. This should include:</p> <ul style="list-style-type: none"> <li>• Notifying all vacancies to local agencies in the pursuit of employment of local out of work Newcastle residents.</li> <li>• Providing apprenticeship opportunities.</li> <li>• Providing unpaid work placement opportunities.</li> <li>• Providing graduate placement opportunities</li> <li>• Providing work experience opportunities.</li> </ul>

## 2.8 Post Occupancy

<b>Issue</b>	<b>Standard to be achieved</b>
Review dates	Post-occupancy review dates to be agreed at handover and be used to inform future projects.
Seasonal re-commissioning	The buildings services will be re-commissioned on a quarterly basis in the year following project handover.