Sustainable Construction& Refurbishment Guidelines

Northumbria University
NEWCASTLE

Sustainable Construction & Refurbishment Guidelines

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Introduction

Northumbria University is committed to realising significant enhancements to the environmental sustainability of our campus and operations, including further improvements in carbon emissions and reduction in waste and the use of plastics.

Our estate has a major part to play in allowing us to meet our sustainability goals. We need to ensure that all construction and refurbishment projects work towards reducing our negative impacts, and where possible enhance the environment.

To help achieve these improvements there are six Key Themes which include targets and requirements for all projects. These Key Themes need to be embedded at all stages of any refurbishment or new construction, from project inception through to completion.

The Key Themes are:

- Towards Zero Carbon Buildings – Minimizing all regulated and unregulated energy and water use and embedded carbon.
- Smart Buildings – Buildings must adapt to the changing occupancy patterns automatically to minimise energy use.
- Living Labs – Provision of facilities and data monitoring to enable our buildings and estate to be a tool for teaching, partnerships and research.
- Greening the Campus – Enhance Biodiversity and Wellbeing through appropriate green spaces and green walls and improved habitats.
- Reducing waste – Through appropriate design, minimise waste from construction and also from end of life disposal. Maximise use of recycled products.
- Climate Change Adaptation – Designs must take into account future predicted temperatures and mitigate against the effects of increased extreme weather events.

It is recognised that on occasion the objectives within these Guidelines may not be possible due to factors outside of the University's control, such as location and transport links.

Where these objectives are not possible, or measures required are impracticable, minimum standards in energy, water and materials must be agreed at the start of the project. These must follow the principles set out in these guidelines, and throughout the project it must be demonstrated that every effort is being made to get as close to the objectives as possible.

Key Themes

Towards Zero Carbon Buildings

Objectives

New Buildings and extensions

- A+ EPC rating - All new buildings should be zero carbon for regulated emissions
- A rated DEC after one year – Covering all emissions including regulated and unregulated
    - Total energy use should be calculated at design stage using TM54 methodology to estimate DEC rating
    - Seasonal Commissioning with monitoring of energy use throughout the first twelve month period to ensure the target is met
- BREEAM outstanding rating
- Embedded Carbon Footprint of construction materials to be calculated at design stage and the five most significant cost-effective opportunities to reduce the embodied carbon emissions associated with the project identified (e.g. through leaner design, designing out waste, reusing materials, and selecting materials with lower embodied carbon over the project life-cycle) Quantify the savings made through individual design changes, and report actions and outcomes as part of the Carbon Efficiency Plan.
- Develop and Implement a Carbon Efficiency Plan[1]
    - provide the Carbon Efficiency Plan, together with supporting calculations and energy/carbon models, within design stage reports and on completion of the project, reporting predicted performance of the design and of the as-built installation.
- All HVAC plant and lighting must respond to the changing occupancy levels of the spaces, with appropriate zoning to minimise energy use during low occupancy.
- Building Heating Systems must be designed for low temperature heat, with flow temperatures of 50 degrees C.

Refurbishments

- Lighting to be upgraded to LED, with occupancy and daylight controls
- Where building fabric elements are being changed, they should be brought up to current Part L requirements
- Any new HVAC must be able to respond to occupancy levels to minimise energy use, through occupancy sensors and CO_2 sensors.
- Where there are changes to heating systems, they must be designed for low temperature heat, with flow temperatures of 50 degrees C.
- Projects to be assessed under SKA ratings
    - up to £100,000 minimum Bronze SKA rating
    - £100,000 to £500,000 minimum Silver SKA rating
    - Over £500,000 Gold SKA rating
- Major refurbishments (over 50% of building) to achieve minimum of B rated DEC after one year

[1] Procurement requirements for carbon efficiency – WRAP 2011

Smart Buildings

Smart Buildings adapt to changing conditions and occupancy, automatically controlling the building operations and systems to deliver optimum comfort during occupancy, whilst ensuring the lowest costs and environmental impact.

The University buildings' occupancy varies greatly day to day and month to month. All buildings must be able to adapt effectively to these changes to optimise building performance. This strategy applies to all energy using systems, from HVAC and lighting to Display Screens and Computers.

The aim is to have zero energy use in unoccupied spaces.

Objectives

- All HVAC equipment to have suitable occupancy controls and respond to occupancy
    - Specialist HVAC, such as labs, should utilise real time sensing of contaminants in the room environment and exhaust to enable, where possible, reduced fan speeds.
- All HVAC equipment to be linked to the University BMS system (Appendix 2 - Guidelines for the Engineering and Programming of NUU Building Management Control System (BMS))
- All lighting must be zoned appropriately, with occupancy and, where there is daylight, daylight sensors (Appendix 1 – Specifications and Requirements for Lighting).
- Ensure that use of electricity and water can be monitored, managed and minimised.
    - Separate meters are required for:
        - lighting – a minimum of one sub-meter per floor and per tenancy area within a floor;
        - water – a minimum of one sub-meter per floor and per tenancy area within a floor;
        - small power – a minimum of one sub-meter per floor and per tenancy area within a floor;
        - renewables – PV units and other renewable energy sources to monitor performance to be added to the University's existing web portal;
        - humidification;
        - major fans with air handling units with greater than 10kW input power;
        - lifts;
        - cooling systems with greater than 20kW input power;
        - data centres;
        - space heating (including combined heating and cooling systems such as variable refrigerant flow (VRF) systems with greater than 50kW input power);
        - domestic hot water– a minimum of one sub-meter per floor and per tenancy area within a floor (excluding tea points); and
        - any other major energy consuming items that is considered a specialist area
    - All meters to be added to the TREND BMS System, the University Invisible Systems AMR web portal or Demeter water monitoring, as agreed with the University

Living Labs

Living Labs is all about using our buildings and Campus as a real life environment for teaching and research. Offering the opportunity to achieve greater engagement with the study material, and a more well-rounded educational experience, whilst also fostering collaboration and research.

Objectives

At the earliest stage of a project consideration needs to be given to how it can contribute to Living Labs:

- Stakeholder engagement at the design concept to determine what can be added to enhance or develop research and teaching opportunities
- Ensure, through a SMART Buildings approach, that data from the building is available via the University's existing monitoring software

Greening the Campus

Green spaces are proven to help with staff and student wellbeing, as well as benefitting local wildlife. Green spaces also help absorb air pollutants, leading to a healthier Campus.

Objectives

- All projects should look for opportunities to enhance and increase green spaces and biodiversity
- For projects involving external landscaping, at least 25% of the landscape area should be vegetation (see also SuDS requirements in Climate Change Adaptation)
    - Plant species identified within the Biodiversity Action Plan should be used.
    - Habitat enhancements, such as bird boxes or insect hotels, should be added.
- If a project impacts upon an area identified as having high biodiversity value in the Biodiversity Action Plan, a new area of higher biodiversity will need to be created

Reducing waste

The UK construction industry is the largest consumer of natural resources, and in 2012 was responsible for sending 11.6 million tonnes of waste to landfill.

Objectives

- All projects to aim for zero waste to land fill
- Identify opportunities to Design out Waste
    - follow guidance in WRAP: Designing out Waste: A design team guide for buildings
- Identify all elements that can be reused, recovered or recycled on site
- For refurbishments at least 25% of waste should be re-used on or off site, or recycled through a closed loop scheme (e.g. manufacturer's take back scheme)
- Preference should be given to suppliers who operate a take back scheme
- For new builds, consideration needs to be given to suitable compound space for storage for bins

Climate Change Adaptation

Climate Change is happening, and no matter what we do now the effects will continue to be felt over the next century and beyond.

Predicted climate models for Newcastle upon Tyne[2] suggest that

- Summer mean temperatures could increase from the current average of 13.5°C to between 14.6°C and 18.2°C by 2050.
- Summer rainfall will reduce, but winter rainfall could increase
- Extreme rainfall events and flash floods could increase in intensity and frequency
- Likelihood of heatwaves and droughts in summer will increase

With these potential changes, existing lightweight buildings and existing infrastructure and drainage may not be fit for purpose by 2050.

Objectives

- Design in passive cooling measures and design out the need for mechanical cooling
    - Increase thermal mass of buildings
    - Careful exclusion of solar gain
    - Green walls and green roofs should be used where possible
    - High levels of insulation and airtightness
- Thermal comfort calculations should be based on predicted temperatures in 2050
- Design suitable Sustainable Drainage Systems (SuDS) which also add greenery and enhance biodiversity, such as urban swales (see also requirements in Greening the Campus)
    - Consideration must be given to how the project can help develop a holistic approach to water management across the Campus
- Provide external shading through appropriate planting
    - Plants should be suitable for potentially drier summers
- Reduce water demand
    - Install low water useage equipment which is on the Water Technology List (WTL) or has an EU Water Efficiency Label.
    - Install water leak detection devices or add submeters to the BMS with alarms for out of hours water use
    - Re-use brown water from sinks and showers for flushing toilets

[2] Climate change impacts: evidence base for Newcastle upon Tyne (Newcastle City Council, 2016)

Appendix 1 – Specifications and Requirements for Lighting

When considering the solutions/design, the luminaires should not be replaced on a 'like for like' basis. Designs and proposals must be in accordance with:

1. BS EN 12464-1: 2012,
2. the SLL Code for Lighting
3. CIBSE Lighting Guides for the specific area.
4. 18th Edition Wiring Regulations (BS 7671 IET).
5. NICEIC approved installation

Installation should include all necessary modifications to the existing cable management systems, circuit cabling, final connection points, suitable plant and access equipment, protection of surfaces, storage, management and supervision of works.

The application of the luminaires needs to be considered with regards to environment, glare, uniformity and aesthetics so they are sympathetic to the building fabric and student activities.

All lighting must have controls for occupancy and, where there are windows, daylighting.

Luminaire requirements:

Luminaires

- To meet British Standards and Regulations for external and internal LED luminaires
- Meet current requirements within the Energy Technology List Guidelines
- Minimum Colour Rendering Index of 80
- Minimum Life expectancy of 50,000 hours (L80 B10)

Supply Warranty

- Minimum Parts Warranty for the fittings is **5 years**
- Minimum Labour Warranty for **24 months**
- Attendance for repair within **5 working days** of reported fault
- Attendance classed as emergency repairs (e.g. lights not working, controls not adjustable which make the area unusable) in all areas within **24 hours**.
- After the labour warranty period, replacement lamps must be received within 7 days of the reported issue. Replacement lamps must be dispatched prior to the return of the malfunctioning lamp.

Install Warranty

- Labour Warranty for **12 months** regarding any faults confirmed relating to install
- Attendance for repair within **5 working days** of reported fault
- Attendance classed as emergency repairs (e.g. lights not working, controls not adjustable which make the area unusable) in all areas within **24 hours**.

Lighting Controls

The control strategy must be designed by the contractor and agreed with the University prior to commencement, but as a minimum we expect the lighting to be capable of operating in the following way:

Teaching Rooms: Absence detection set at 20 minutes. Photocells for daylight control where appropriate. Manual switches at entrance door. Row of lights next to whiteboard/screen must be able to be dimmed.

Hub Areas and open plan areas: Lighting must operate on a Presence setting. Lighting should be zoned within each area and each zone individually controlled by sensors. Presence detection set to 20 minutes. Photocells for daylight control where appropriate.

Corridors and Circulation spaces: Presence detection, with daylight dimming. Lighting to turn off after 5 minutes without presence.

Toilets: Presence detection. Lighting to turn off after 20 minutes without presence.

Staircase: Presence detection with daylight dimming/off. Care must be taken in the design and location of sensors (e.g. a detector on a landing turns on lights to floor above and below). Sensors must be sufficient and appropriate to maximise savings of lights closest to windows. This may require a sensor per lamp. Lights to turn off after 5 minutes without detection.

Small Office spaces and meeting rooms: Absence detection set at 20 minutes. Photocells for daylight control where appropriate. Manual switches at entrance door.

<u>Documentation</u>

Contractors must provide upon practical completion:

- Provide Certificates to confirm install and work carried out meets requirement of BS:7671
- LUX levels across each zone and commissioning test sheets
- Waste transfer documents for old fittings (Contractor to allow for disposal of all existing fittings) and other waste generated on site.
    - Waste records summary to be presented in the spreadsheet format (Total, % recycled)
- Full O&M pack as described in the prelims document (incl. DALI configuration details and as built drawings in CAD and PDF format) to be provided no later than 7 working days after final completion.
- Dyno-Labelling of all new and existing light switches referring to the relevant DB and zone. The exact labelling to be agreed with Campus Services and Sport Central staff.
- Demonstration session to internal client and stakeholders.