Section 6 - Sustainable Construction Specification

Revision 1 **Published: August 2020**

Project: [INSERT SPR – SHORT PROJECT NAME/DESCRIPTION]
Project Team: [INSERT NAMES]
Issued To: [INSERT NAME OF CONSULTANT/CONTRACTOR]
Issue Date: [INSERT DATE ISSUED]

Contents

1. Introduction and Background

The principle target audience for this guide is project Design Teams and Project Managers. It provides a framework to minimise the operational energy consumption of buildings and to deliver wider sustainability benefits in line with University Environmental Sustainability and Energy Policies, University Compliance Obligations, and our commitment to the UN Sustainable Development Goals, social, and environmental justice.

It places a focus on operational energy consumption (and CO_2 emissions) and places a clear emphasis on outcomes and going beyond compliance (i.e. Part L Building Regulations). The proposals a Design Team make in relation to a single project could make a difference of thousands of tonnes of CO_2 over the building's lifetime and will have a significant impact on energy and maintenance costs.

This framework replaces the University's previous requirement for construction projects with a construction value greater than £1m to achieve Building Research Establishment Environmental Assessment Methodology (BREEAM) 'Excellent' as a minimum. It forms part of the University's wider suite of project briefing documents, which define the University's requirements across all aspects of construction.

This framework sets out *minimum* expectations. Deviation from the requirements will require a life cycle costing analysis to be presented to the University and discussed with all relevant stakeholders including, where relevant, the Project Steering Group. Subsequent written approval from the University is required for any deviation.

Project Teams are encouraged to bring forward proposals which demonstrate innovation beyond the minimum requirements set out in this document – our intent is that this framework provides both rigour and flexibility to allow Project Teams to be at the leading edge of sustainable construction.

2. Key principles and objectives

The overall objective of this guide is to enable the design and construction of sustainable buildings and landscapes that support the delivery of the University's vision and strategy, and the University's Climate Action Plan in pursuit of our Net-Zero carbon target.

Project Teams shall make themselves immediately aware of our Environmental Sustainability Policy and our Energy Policy.

This document is divided into key issues or compliance areas; each of these is accompanied by a summary of its rationale, the expected responsibility for delivery and any evidence requirements. The guidance should be consulted throughout the project and an updated Compliance Checklist (included at the end of this document and as a separate MS Excel file) must be submitted to the Sustainability Team with each stage report. Significant changes should also be reported as they occur during each stage to enable adequate time for review.

Issue

2.1 Operational Energy / Carbon - Passive Design

Responsibility

Architect / M&E Designer

Rationale

Ensuring design decisions are targeted on minimising operational energy consumption supports the long-term interests the University. This requires the setting of clear energy benchmarks to enable Project Teams to make informed choices. As the carbon intensity of the UK grid(s) fluctuates based on the UK energy mix, energy consumption in $kWh/m^2/yr$ is a more consistent measure of performance than carbon performance as calculated within Part L of the Building Regulations, SBEM etc.
The appropriate benchmark will depend on the type of project but should be agreed (during RIBA stage 1) to ensure that design decisions support achievement of the target.
For more complex projects (deemed those over £5m construction cost) a more granular assessment of energy consumption is required. CIBSE TM54 has been demonstrated by University projects, and by the wider industry, to provide an accurate prediction of energy consumption and also a sound basis for seasonal commissioning analysis.
TM54 models are only as good as their inputs so, to ensure departments are well informed on their energy budget and the energy impacts of operational/design decisions, time must be invested in agreeing reasonable operational diversity scenario/s.
It is expected that achievement of the energy benchmark will require a considerable focus on passive design principles and for some projects the Passivhaus certification process may be appropriate, however we recognise that this may not be feasible, or even desirable, for some projects for example where a planning requirement to connect to a district energy system exists.

Requirements

- Energy Benchmark = 0-35kWh/m2/yr (Passivhaus benchmark for space heating 15kWh/m2/yr)
- Consumption benchmarks (both environmental conditioning and primary energy) must be agreed in RIBA Stage 0 at the latest.
- Appropriate energy to carbon conversion factors must be agreed with the Sustainability Team and both energy and carbon forecasts updated at each RIBA stage review. Energy and carbon forecasts shall be expressed in kWh and tCO2e per annum respectively.
- All projects over £5m should complete a CIBSE TM54 analysis.
- The TM54 analysis should be updated for each design stage review.
- Changes during contractor/sub-contractor design should be clearly communicated and their impact recorded.
- Completed projects must be audited against the revised energy benchmark.

Key RIBA Stages

0-7

Evidence and Monitoring

- Energy & Carbon benchmarks recorded in RIBA stage reports and reported to Steering Group.
- TM54 reports.
- Records of contractor/sub-contractor change agreements including assessment of energy consumption impact.
- Post-completion audit requirements

Related Issues / References

- UKGBC Net Zero Framework
- RIBA Sustainable Outcomes Guide
- Passivhaus Planning Package (PHPP) (inc. EnerPHit for refurbishments)

Issue

2.2 Embodied Energy / Carbon

Responsibility

All Project Team disciplines.

Rationale

The operational energy consumption and associated CO_2 emissions of new buildings is being progressively reduced through improved construction standards, renewable technologies, etc. As this happens, the proportion of total lifetime carbon emissions arising from embodied carbon within the construction materials of the building itself increases up to as much as 70% of the total building construction emissions.

From a life cycle perspective, it is therefore increasingly important to focus on *both* operational and embodied CO_2 emissions. In 2018/19 CO_2 emissions from construction were estimated to account for approx. 50% of University scope 3 (supply chain) emissions. Methodologies for calculating embodied carbon have historically been weaker than those for operational energy, however tools are now available which calculate embodied carbon by direct reference to volumes of material derived from the BIM model. Whilst total emissions will remain an estimate even when using these tools, data quality is greatly improved from previously available estimation techniques.

In all University projects where level-2 BIM is a contractual requirement, software tools which calculate embodied carbon by reference to the BIM model will be used from RIBA stage 1 to inform design development. At the time of writing, OneClickLCA is an example of a tool which will enable compliance with this requirement. Project Teams shall not be limited to use of this tool if an alternative, equal and approved, BIM-integrated tool is available.

The embodied carbon tool will be used from concept stage to inform decision making around key structural and building fabric elements in order to achieve the embodied carbon target below:

Requirements

- Minimise embodied carbon of the project as much as practicably possible - with a maximum benchmark of 800 $kgCO_2e$ per m^2 of project space area unless the project in question is a specialist facility with stringent requirements, in which case a new benchmark should be discussed.
- All Level-2 BIM projects to report embodied carbon at each RIBA stage report, using a university approved BIM integrated embodied carbon tool.
- Changes during contractor/sub-contractor design significantly impacting on embodied carbon should be clearly communicated and their impact recorded.
- Completed projects must be audited against the embodied carbon benchmark.

Key RIBA Stages

0-7

SUSTAINABLE DEVELOPMENT GOALS

7 AFFORDABLE AND CLEAN ENERGY | 12 RESPONSIBLE CONSUMPTION AND PRODUCTION | 13 CLIMATE ACTION

Evidence and Monitoring

- Outputs reports from approved embodied carbon tool.
- Embodied carbon values recorded in RIBA stage reports and reported to Steering Group.
- Records of contractor/sub-contractor change agreements including assessment of embodied carbon impact.
- Post-completion audit requirements

Related Issues / References / Other Stakeholders

Issue

2.3 Air-tightness

Responsibility

Architect / M&E Designer

Rationale

Unmanaged air infiltration and leakage can account for up to 50% of a buildings heating load, drafts are a significant factor in occupant discomfort and air leakage in building fabric can result in condensation and structural damage. Air-tightness is therefore a key consideration in providing productive, cost-effective and robust University workspaces. Complexity and buildability are significant risks to delivering an air-tight envelope that is robust for the long term. To mitigate these, and the risk of cost premium, air-tightness should be an early consideration in the design process and be subject to early contractor review. It should not be retrospectively applied to a developed concept, and should be appropriately tested during the construction period. Suitable products, warranted for the purpose and required lifespan, should be used for key details, junctions and penetrations.
Tests at positive and negative pressures are required to ensure that tapes and seals are robustly installed and will perform in all scenarios. Construction areas must be appropriately sealed-off to ensure realistic testing of partial-refurbs

Requirements

- An air-tightness target should be agreed at Stage 1 (≤3m3/hr/m2 at 50Pa).
- For refurbished buildings, a managed supply of any required make-up air should be considered where air-tightness is significantly improved.
- The air-tightness delivery strategy should be clearly detailed in stage reports, including planning sectional testing for refurbishments.
- A clear contractual requirement for attainment and testing should be agreed.
- Air tightness products with an appropriate life expectancy should be specified.
- Testing should be completed in line with BS EN 13829 by operatives qualified to test to TS3. Average positive and negative pressure tests between 10 and 100 Pa should be taken.
- Air-tightness risks should be clearly communicated in O&M's to ensure it is protected from penetrations.

Key RIBA Stages

1-4

SUSTAINABLE DEVELOPMENT GOALS

3 GOOD HEALTH AND WELL-BEING · 7 AFFORDABLE AND CLEAN ENERGY · 13 CLIMATE ACTION

Evidence and Monitoring

- Air-tightness target referenced in the project brief.
- Air-tightness line clearly drawn on plans and junction details.
- Agreed specifications for tapes, membranes and gaskets.
- Photographic record of junction details during construction.
- Signed ATTMA test certificate.

Related Issues / References

- Indoor air quality
- Ventilation and cooling etc.

Issue

2.4 Fabric Performance (Refurbishments).

Responsibility

Architect

Rationale

An energy performance benchmark (section 2.2) will determine fabric performance requirements. Refurbishments represent a rare opportunity to lock-in energy savings for 20-50 years while optimising the comfort and productivity of working environments. The expectation is that all projects will strive for best practice, minimising U-values, but that requirements should be reviewed in proportion to their potential benefit, costs and any constraints of the existing fabric.

Significant investment in fabric improvement and a nominally excellent U-value can be undermined by detailing that fails to consider risks such as thermal bridging and thermal bypass. It is critical that enhancements are rigorously checked at both design and construction phase.

Requirements

- Potential options for improving the performance of individual fabric elements (over-cladding, roof/floor insulation, internal insulation, window replacement, secondary glazing etc.) should be appraised for their deliverability at feasibility stage in consultation with the ESS.
- Appraisals should consider benefits in terms of economics (ROI), comfort (surface temperatures) and health (condensation and mould) with window and fabric performance U-values independently appraised.
- Façade adaptation, solar shading and glazing films to reduce gains should be considered holistically with thermal improvements.
- The potential to design out thermal bridges at material junctions should be considered for all existing and proposed details.
- Air-tightness (section 2.4) should be considered holistically with fabric. Care should be taken to ensure that non certified projects do not suffer from over-heating (section 2.6).

Key RIBA Stages

2-4

SUSTAINABLE DEVELOPMENT GOALS

7 AFFORDABLE AND CLEAN ENERGY

13 CLIMATE ACTION

Evidence and Monitoring

- Site evaluation with an Environmental Sustainability team representative.
- Fabric options appraisal report/matrix.
- Evidence of independently reviewed U-value calculations.
- Drawings of key details and site implementation photographs.
- Workshops with contractors to ensure design intent is communicated clearly.

Related Issues / References

- Air-tightness

Issue

2.5 Ventilation and Cooling

Responsibility

Architect / M&E Designer

Rationale

Adequate and controllable ventilation is fundamental to providing comfortable and productive University work spaces. Research clearly demonstrates a connection between air-quality and productivity and well-designed ventilation is critical to delivering year-round comfort (section 2.6).

A lack of consideration for ventilation early in design and/or poorly designed ventilation and cooling systems can lead to a costly requirement for cooling being designed in or to be required as a retrofit early in occupation. Active cooling is also a significant ongoing cost in terms of maintenance, energy costs and University carbon emissions as well as creating compliance requirements.

In order to be effective and to deliver energy reductions for the long-term, ventilation designs should be simple and engage users in their effective operation.

Requirements

- Spaces should be designed to maximise the potential of natural ventilation to deliver cooling in peak conditions;
- High density office spaces should ideally provide for cross ventilation;
- Natural ventilation controls must be accessible, lockable in a number of positions and consider potential conflicts with security concerns early in RIBA stage 2, consider the location of furniture,
- Ventilation designs should consider conflict with the operation of glare blinds.
- Any night purge strategy should be simple, minimise BMS control requirements, clearly address security risks and its requirements of occupants must be agreed with the occupying department to ensure viability in operation.
- Any BMS proposal including control philosophy, associated hardware and software (inc. graphic design, points list, etc.), shall follow the latest version of the University's BMS specification and any proposals must be approved by the University's Sustainability Team.
- Cooling should be localised and controlled to deliver parity with naturally ventilated space.
- Localised cooling must be disabled by opened windows in the same space.
- Plant for large meeting spaces must consider efficiency at low occupancy.
- Any unavoidable cooling plant required must utilise refrigerants out of scope of being phased out within the Montreal Protocol and any other associated legislation. Cooling systems must also be designed to utilise the lowest GWP refrigerant feasible for its application.

Key RIBA Stages

2-4

SUSTAINABLE DEVELOPMENT GOALS

13 CLIMATE ACTION

7 AFFORDABLE AND CLEAN ENERGY

Evidence and Monitoring

- IES dynamic thermal model reports and TM52 analysis for complex projects.

Related Issues / References

- Design development workshops.
- Stage reports outlining strategy and design details.
- Specifications.

Issue

2.6 Thermal Comfort

Responsibility

Architect / M&E Designer

Rationale

Comfort is subjective, complex and dependent on a wide-range of factors including clothing, radiant temperature, relative air velocity and relative humidity. Passive design will reduce the impact of many of these factors but detailed modelling is essential to ensure risks to providing an appropriate environment for staff and students are understood. CIBSE and Passivhaus compliant comfort can be provided without the need for comfort cooling in most circumstances. University experience of the impact of density of occupation, ventilation, and thermal mass and industry best practice should all play a part in ensuring this is delivered.

Requirements

- CIBSE TM52/TM59 (or current best practice) analysis should be completed for all projects >£1m.
- Assumptions and diversity of occupant numbers, heat generating equipment and operational hours must be realistic, clearly agreed with occupants and documented.
- Designers must model against both current and future climate weather files - provision for cooling connection and plant space allocation is acceptable for future scenarios but should not influence day 1 plant unless significant change is expected within 10 years.
- Where Passivhaus is not targeted, triple-glazing should be retained for all elevations enclosing spaces where sedentary work will be undertaken.
- Where designs rely on mixed mode operation by users the wording of in-room instructional notices must be agreed at an early stage.
- Exposed thermal mass should be maximised in heavy weight structures and thermal mass enhancements considered for lightweight structures.
- Unless there is demonstrable research need, cooling set-points should be 24°C +/- 1°C.

Key RIBA Stages

2-4

SUSTAINABLE DEVELOPMENT GOALS

7 AFFORDABLE AND CLEAN ENERGY

13 CLIMATE ACTION

Evidence and Monitoring

- IES dynamic thermal model reports and TM52 analysis for complex projects.

Related Issues / References

- Air-tightness
- Operational energy, Passive design
- Vent and cooling

Issue

2.7 Controls

Responsibility

Architect / M&E Designer

Rationale

Poorly designed or over-complex controls will disengage building occupants and are likely to lead to performance issues and dissatisfaction. University projects have demonstrated that giving occupants influence over their environment through simple, well explained, easy to understand and accessible controls has proven most successful.
Complex controls have resulted in buildings being challenging to commission, incurring a long-term maintenance burden and costs, and in some cases requiring replacement. The design of controls should foster a shared responsibility for delivering on the buildings design intent.
Third party controls systems have resulted in a legacy of costs for the University, delays for modifications and are frequently a barrier to the effective control, optimisation and continuous commissioning of buildings.

Requirements

- Controls should be simple, intuitive, appropriate to the technical knowledge of occupants and reviewed with users prior to being confirmed.
- The BMS Specification within the University Project Briefing Document set outs our requirements in detail.

Key RIBA Stages

1-4

SUSTAINABLE DEVELOPMENT GOALS

7 AFFORDABLE AND CLEAN ENERGY

13 CLIMATE ACTION

Evidence and Monitoring

- Design development workshops.
- Stage reports outlining strategy and design details.
- User group feedback.
- Specifications.

Related Issues / References

- Vent and cooling

Issue

2.8 Low and Zero Carbon (LZC) technologies

Responsibility Architect / M&E Designer / Contractor

Rationale

Achieving the University's net-zero carbon target will by definition require increased investment in both on and off-site renewable technologies. Opportunities for integrating LZC systems within University projects must be examined in detail. Project teams must aim for systems which contribute towards net-zero, and avoid the use of fossil fuel based solutions.

We recognise that integrating renewable technologies into existing University energy systems is challenging and an LZC workshop should be held (at RIBA stage 1) to consider the opportunities and issues relevant to each project.

Probably the easiest technology to deploy is solar PV – integration of PV into the building design should be considered a given, and the design should aim to minimise the cost of deployment and maximise yield (e.g. by avoiding over shading).

Innovative design proposals and/or suggestions of new, upcoming and lesser known LZC technologies are welcome and should be considered at RIBA Stage 1.

Requirements

- Designs and controls should be a simple as possible and target consistent operation rather than introduce complexity by chasing efficiency.
- Briefs must require that buildings are optimised for PV and to eliminate shading.
- PV systems should only be installed on roof finishes with a design life >20 years and not in contravention of warranty conditions.
- Condition of existing roofs must be reviewed with the ESS Maintenance team.
- Simple controls and operation strategy agreed during stage 3 shall ensure the installed PV system is integrated with, and array(s) added to, the University's existing 'SolarEdge' system. Any PV proposal must therefore include the necessary hardware (inverters, optimisers, etc.) to allow for the addition of the site to the University's SolarEdge platform.
- Where LZC technologies are applied for heating purposes (e.g. heat pumps), the COP of the system should be maximised as much as feasibly possible, with a minimum COP of 3.
- Risk of DC interference to research equipment reviewed with department.

Key RIBA Stages 1-5

SUSTAINABLE DEVELOPMENT GOALS

Evidence and Monitoring

- Inclusion in brief
- Design team workshops with Sustainability and Maintenance teams.
- Written confirmation that DC poses no risk to research equipment operation.

Related Issues / References

Issue

2.9 Metering

Responsibility

M&E Designer / Contractor / Metering sub contractor

Rationale

Metering of utilities and heat should ensure that the consumption and performance of major plant, systems and loads can be monitored effectively. Designs should anticipate the needs of both continuous commissioning and the potential future sub-division of space between different occupiers to ensuring that sufficient granularity of data can be extracted.
Key meters should be connected to the University's remote monitoring system (this will require separate meters in-line with revenue meters) to enable the significant cost savings that this affords in the long term. Previous projects have demonstrated the importance of completing, properly commissioning and verifying this work prior to occupation.

Construction site supplies should be separately metered and the basis of billing and settlement agreed with the contractor prior to site set-up.

Requirements

- The metering strategy should be agreed before the end of stage 3.
- Renewable systems metering must comply with the requirements of Ofgem.
- Construction site metering should be installed and the contractual arrangement for bill settlement agreed with the Sustainability Team pre-start.
- Meters should be accessible and readable without the need for access equipment or manual handling.
- All meters should be connected, commissioned and verified pre-occupation.
- The latest version of the University's Metering Specification within the University Project Briefing Document set outs our requirements in more detail.

Key RIBA Stages

1-4

SUSTAINABLE DEVELOPMENT GOALS

Evidence and Monitoring

- Inclusion of requirements in brief.
- Metering workshop with Sustainability Team in stage 2/3.
- Provision of metering schematic(s) showing agreed meter references
- Provision of construction site metering information to Energy Team prestart.
- Meter commissioning records (including photos of each meter) supplied pre-occupation.

Related Issues / References

Issue

2.10 Daylighting and View Out

Responsibility

Architect / M&E Designer / Contractor

Rationale

Access to daylight and views are significant factors in the wellbeing and productivity of occupants. Maximising these in University buildings is critical to delivering space that is fit for purpose and brings co-benefits in reducing the energy consumption and cost of artificial lighting.
Over-glazing spaces can however lead to negative effects such as solar gain, glare (requiring continuous use of blinds that negate views), additional costs in provisioning shading and cooling, additional maintenance and occupant discomfort for the lifetime of the building. Very careful attention should therefore be given to glazing ratios and design.

Requirements

- 75% of workspaces (excluding spaces with specific daylight restrictions) should be within 7.5m of a view window or have a direct view of sky.
- Glazing below 800mm should be minimised.
- The building form should design out glare risk.
- Glare blinds should be included to all risk elevations. Controls should be accessible, consider the location of furniture and should not conflict with ventilation.

Key RIBA Stages

1-4

SUSTAINABLE DEVELOPMENT GOALS

3 GOOD HEALTH AND WELL-BEING

7 AFFORDABLE AND CLEAN ENERGY

13 CLIMATE ACTION

Evidence and Monitoring

- Design development workshops.
- Stage reports outlining strategy and design details.
- Marked-up drawings.
- Specifications.

Related Issues / References

- Vent and cooling
- Thermal comfort

Issue

2.11 Water

Responsibility

M&E Designer / Contractor / Metering sub contractor

Rationale

The University's Environmental Management System includes objectives and targets for reducing the University's water consumption. Water is a significant cost to the University and projects should go as far as possible towards minimising water use.

University projects have encountered significant issues and costs derived from the specification of rainwater harvesting systems and from systems providing boiling and chilled potable water, and from water purification systems in laboratories. Careful attention to the design and specification of these systems is therefore required.

Requirements

- The primary (fiscal) water meter and any submeters should include AMR connected to the University's remote monitoring system. These works should be managed in liaison with the University's water monitoring contractor, Demeter.
- Water pressure should be tested and fittings should be specified to the following max flow rates up to 5 bar with pressure reducing valves installed for pressures in excess of this:

WC (dual flush)	6/4 litre
Showers	< 6 litres/min
Urinals (inc. control devices or waterless)	< 1 litres/hour
Kitchen/ette Taps (should be aerating)	< 4 litres/min
Basin Taps (should be aerating and with minimised percussion timing)	< 4 litres/min

- Flow rates should be verified at commissioning.
- Boiling water taps should be avoided and, where specified, should have simple user interfaces allowing control to hours of operation and should not require specialist maintenance contracts.
- Rainwater harvesting systems should be limited to gravity fed designs providing for landscaping maintenance.

Key RIBA Stages

1-4

SUSTAINABLE DEVELOPMENT GOALS

3 GOOD HEALTH AND WELL-BEING · 13 CLIMATE ACTION · 6 CLEAN WATER AND SANITATION

Evidence and Monitoring

- Specifications.
- Commissioning records (e.g. flow rate and duration for taps)
- Meter commissioning records (including photos of each meter) supplied pre-occupation.

Related Issues / References

Issue

2.12 Materials and Equipment

Responsibility

Architect / Contractor

Rationale

The University's Environmental Sustainability Policy requires sustainable practices (such a lifecycle assessment, LCA) to be integrated into all purchasing practice. The policy also requires circular economy principles to be applied in our use of resources.

Construction projects require significant volume of materials with a plethora of potential impacts including deforestation, mineral extraction, manufacturing, transport and end-of-life disposal. The embodied carbon and embedded lifetime environmental footprint of University projects will also be heavily influenced by specification decisions.
The specification of plug-in equipment in projects can have a significant impact on operational costs.

Requirements

- All timber must be from chain of custody certified sources (FSC, PEFC or GIB) or reclaimed.
- All non-timber floor finishes/coverings should have an A/A+ rating in the BRE's Green Guide or an ISO 14025 compliant environmental product declaration.
- At least 80% of insulation by volume should have an A/A+ rating in the BRE's Green Guide or an ISO 14025 compliant environmental product declaration.
- Multi-foil insulation products should not be specified.
- All paints, coatings, polishes and varnishes should have the EU Ecolabel or an ISO 14025 compliant environmental product declaration.
- At least 80% of hard landscaping materials by volume should have an A/A+ rating in the BRE's Green Guide.
- White goods and plug-in equipment should achieve the highest standards of energy efficiency (e.g. A+++) – unless LCA demonstrates this to be uneconomic.

Key RIBA Stages

1-5

Sustainable Development Goals

12 Responsible Consumption and Production; 13 Climate Action

Evidence and Monitoring

- Inclusion in brief.
- Clear requirements within the specification.
- Evidence that installed products comply with the specification.
- Chain of custody delivery notes for all specified timber and for any used on site.
- Delivery notes or invoices.

Related Issues / References

- Embodied carbon
- Waste

Issue

2.13 Waste

Responsibility

Architect / Contractor

Rationale

Construction projects inevitably result in the production of significant volumes of waste. Project teams should aim to apply the waste hierarchy in treatment of all 'wastes' from the construction process (i.e. waste minimisation should be prioritised, reuse is preferred to recycling, recycling preferred to treatment via energy recovery etc.) unless specific examples dictate a more appropriate solution e.g. transport to a local energy from waste plant as opposed to shipping long distances for recycling. All projects should aspire to achieving zero (non-hazardous) waste to landfill. Data relating to waste production and treatment route should be collected for all projects and form part of ongoing project reporting. Relevant documentation (e.g. waste transfer notes) should be maintained as evidence and be available for audit under the University's ISO14001 EMS.

The University's Environmental Sustainability Policy requires circular economy principles to be applied in our use of resources.

Consideration must be given to how waste can be minimised during the construction process, and how materials can re-enter the resource cycle at the end of their life – including at the end of the building's life.

Project design should adequately account for operational waste management. Workspace waste and recycling bins should be consistent with the requirements of the University's waste contract(s). Bin stores should be adequately sized to enable appropriate segregation of waste. Proposals require engagement with the University Waste Manager during (RIBA stage 3).

Requirements

- A Resource Management Plan must be completed for all projects. This must comprise a pre-refurbishment and/or pre demolition audit detailing all waste streams, quantified by estimated weight and identifying disposal routes. The Plan must be shared and agreed with the University Waste Manager prior to the commencement of works.
- Items that could be re-used should be identified and referred to the Sustainability Team at least two months prior to removal from the space. High value equipment must be reviewed with the Uni Green Scheme.
- Contractors must produce a construction Resource Management Plan and record waste quantities by stream and tonnage.
- Diversion from landfill of non-hazardous waste should be evidenced by waste transfer notes and a summary monthly report:

Key RIBA Stages

1-6

Evidence and Monitoring

- Plans demonstrating adequate waste provision for completed project.
- Resource Management Plans.
- Waste transfer notes and monthly summary reporting.

Related Issues / References

- Embodied carbon
- Materials and equipment

Issue

2.14 Travel and Transport

Responsibility

Architect / Travel Consultant

Rationale

The University is a major employer in Newcastle City Centre, and (pre COVID-19) over 60% of University staff travelled to work by public transport. Adequate support for connectivity, and in particular measures that support sustainable transport and remove car trips from the road network, remain a key priority for all projects.

There remains scope to increase the number of commuting journeys made by active travel methods. Sufficient facilities for cyclists and other active travellers should be included in all projects and their careful design is paramount; pressure on space has sometimes led to compromises causing costly facilities to become under-utilised.

Projects should support the objectives of the University's Transport Plan.

Requirements

- All internal (enclosed or within building) and external (publicly-accessible) cycle parking, access and facilities must be designed according to the recommended standards set out in London Cycling Design Standards
- Enclosed and access-controlled cycle parking for long stays (e.g. colleagues situated at the building) should be provided at an agreed ratio of spaces per number of building occupants (with an assessment of existing provision in the local area), accessed by smartcard, covered and accessible either at grade or via a shallow ramp with gradient ≤1:8. Charging facilities for e-bikes should be included at a ratio to be agreed with the Sustainability Team. Accessible cycle parking spaces and cycle securing options additional to Sheffield stands and tiered parking systems should be included at a ratio to be agreed with the Sustainability Team, so as to not exclude or disadvantage riders of certain types of cycle.
- Covered, overlooked (by CCTV, public and/or building occupants), well-lit and conveniently located cycle parking for short stays (stands at entrances for destination journeys, e.g. students attending a lecture) should be provided at a ratio of one space per (how many) expected daily occupancy at full capacity either at grade or via a shallow ramp with gradient ≤1:8.
- One shower and dry changing space with seating should be provided per 10 enclosed and access-controlled cycle spaces (minimum 1) or 35 staff.
- Adequate additional changing facilities outside of shower areas and clothing drying space should be provided in all projects.
- Charging points (with electrical installation for allow for future expansion) for operational electric vehicles should be considered and agreed with the Sustainability Team.

Key RIBA Stages

1-4

SUSTAINABLE DEVELOPMENT GOALS

11 SUSTAINABLE CITIES AND COMMUNITIES

13 CLIMATE ACTION

Evidence and Monitoring

- Plans approved by Sustainability Team at RIBA gateway signoffs

Related Issues / References

Issue

2.15 Biodiversity and Landscaping

Responsibility

Architect / Ecologist / Contractor

Rationale

Enhancing habitats on University land is a key deliverable of the Environmental Sustainability Policy. As well as supporting increases in biodiversity, effective planting can reduce heat gain through shading and evapotranspiration, supporting both energy and comfort objectives. It can also assist with surface water management, improve occupant experience of a building, promote sustainable behaviours and reduce CO_2 and pollutants.

Failure to consider biodiversity pre-demolition and during construction can be a statutory risk. Failure to re-survey following project pauses has also led to significant impacts on University project cost and programme.

Conflicts with building use, maintenance and lighting reviewed to ensure the maximum benefit is delivered.

Requirements

- A net gain in biodiversity is a minimum requirement in all projects.
- Where a project potentially affects existing habitats, an extended phase one habitat survey should be carried out before any demolition or in Stage 2.
- Habitats should be re-surveyed following a project pause exceeding 1 year.
- A planting/habitat strategy and management plan should be developed with the appointed Ecologist to deliver a net biodiversity increase that supports the habitat survey findings, pollinating insects and other relevant UK BAP species. It should list interventions, rationale and proposed management.
- Planting should be drought resistant (excluding green wall watering systems) and tree species must be selected to limit disease risk.
- Behavioural and experiential planting e.g. green walls should be considered.
- Green roofs should include fire breaks at 40m intervals and designs should be reviewed with the University's insurers at Stage 3.
- The impact of lighting on bats & birds should be reviewed with an Ecologist, where the feasibility for 'bat bricks' should be considered, with locations for these proposed as part of building design.
- Hedgehogs – hedgehogs are now classified as 'vulnerable to extinction' by the IUCN and measures to protect the species must be considered. Specific considerations include; hedgehog friendly flora within any planting proposals, provision of highways/corridors, establishing 'wild' corners, hedgehog presence survey(s) prior to the commencement of works, and the restoration of any removed shrub/scrubland i.e. bramble or hawthorn within a 2km radius.
- Natural SUDS schemes should be shallow sided, more than 0.6m deep and contain submergent, emergent and marginal planting of native species.
- Natural SUDS schemes must have a specific management plan.
- Consideration should be given to the origin of hard landscape materials e.g. European rather than Chinese granite.

Key RIBA Stages

0-5

SUSTAINABLE DEVELOPMENT GOALS

11 SUSTAINABLE CITIES AND COMMUNITIES | 13 CLIMATE ACTION | 15 LIFE ON LAND

Evidence and Monitoring

- Inclusion in brief.
- Design development workshops.
- Stage reports outlining strategy and designs.

- Specifications.
- Plans approved by Grounds and Sustainability Teams at RIBA stage 4.

Related Issues / References

Issue

2.16 Pollution

Responsibility

Architect / M&E Designer / Contractor

Rationale

The University's Environmental Sustainability Policy requires that appropriate controls are put in place to prevent pollution. A building's materials, systems, positioning, layout and features (including the installation of equipment to reduce or detect pollution) should be considered from Stage 1 to support the University in meeting its compliance obligations and to prevent pollution during normal, abnormal and emergency scenarios. Consideration should be given to preventing or managing connections between pollution sources (e.g. back-up generators, chemical stores, kitchens and carparks), pathways (drains, land, extraction) and receptors (air, land, water).

Careful specification of insulation and of systems containing refrigerants can help limit ozone layer damage. Attention to the design of these systems can also deliver lower maintenance operation and lower energy costs.

Oil traps, sump-pumps (including appropriate detection alarms and isolation) and the location and design of spaces containing chemical stores, waste management and back-up generators should all be considered in relation to potential pathways and receptors. Basement groundwater sump-pump systems also introduce a problematic maintenance burden, discharge costs and compliance risk to the University and should be avoided in the design stage.

Requirements

- All specified insulation (thermal, pipe, fire, acoustic) must have a GWP of <5.
- For systems using refrigerants, the Direct Effect Life Cycle (DELC) CO_2 per kW cooling should be calculated to BS EN 378-1 and must be ≤ 1 T CO_2e/kW. Refrigerant specification must be approved in advance.
- Where refrigerant systems have a charge over 3kg and/or refrigerant with a GWP ≥ 5 leak prevention to BS EN378-1: 2008A2:2012 must be provided alongside an appropriate leak detection system.
- A pollution risk assessment must be undertaken for the design of generators, chemical stores, kitchens and carparks at Stage 3.
- All projects should include the consideration of University drainage plans, and as far as practicable, ensure planned/designed building operations allow the University to meet the requirements of its trade effluent consents.
- The requirement for groundwater sump-pumps should be designed out.
- Grease traps (BS EN 1825-1:2004/1825-2:2002) should be designed in to all food preparation areas to comply with Part H of the Building Regulations.
- Periodic environmental reports detailing routine inspections on where pollution incidents have been found must be provided to the University Sustainability Team.

Key RIBA Stages

1-6

SUSTAINABLE DEVELOPMENT GOALS

Evidence and Monitoring

- Inclusion in the brief.
- Insulation specification, manufacturers' data sheets and delivery notes.
- DELC calculation substantiated by manufacturers' literature.

- Leak prevention/detection clause in specification and clear verification at PC.
- Kitchen/food preparation area specifications.

Related Issues / References

- Embodied carbon
- Materials and equipment

Issue

2.17 Social Value (TOMs)

Responsibility

Architect / M&E Designer / Contractor

Rationale

The University is committed to integrating the principles of social justice into all that we do; social justice is about the distribution of society's benefits and burdens, and about addressing the unfair outcomes that result from the coming together of social inequalities and institutions. By working in partnership with our supply chain, the University aims to measure and actively increase the social value resulting from our construction projects.

Requirements

- Completion of the National TOM's framework for projects over £5m updated at RIBA stages 2,3, and 4.
- Social Value workshop at RIBA stage 3

Key RIBA Stages

0-7

SUSTAINABLE DEVELOPMENT GOALS

Evidence and Monitoring

- Completed TOMs Framework at RIBA RIBA Stages 2, 3 and 4
- Inclusion of TOM's metrics in sub contractor requirements

Related Issues / References

- TOMs Framework (https://socialvalueportal.com/national-toms/)

3. Project Management / Delivery

Issue

3.1 Lifecycle Cost and Value Engineering

Responsibility

Architect / M&E Designer / Contractor

Rationale

University projects are often typified by a tension between capital and operational cost considerations. While capital savings will be attractive to a cost challenged project, their long term cost to the University in terms of maintenance, energy and potentially rectification can be onerous and should be well understood at the point such a decision is taken. This analysis is also of value when applied to decisions to invest in plant that may require a long-term specialist maintenance contract.

Robust whole life cost analysis should be undertaken for all decisions and for fabric considerations, the Passivhaus methodology has the advantage that reliable operational energy implications can be modelled easily for small projects upwards to enable this.

Requirements

- Value engineering options with energy implications should be evaluated using the BSi/BICS PD 15685-5:2008 lifecycle cost tool using PHPP energy data.
- Market tested specialist maintenance contract costs should form part of the evaluation for investments in plant such as heat pumps and CHP.

Key RIBA Stages

1-6

SUSTAINABLE DEVELOPMENT GOALS

7 AFFORDABLE AND CLEAN ENERGY

13 CLIMATE ACTION

Evidence and Monitoring

- VE options reports in an appropriate format.
- Sample maintenance contracts.

Related Issues / References

Issue	## 3.2 Soft Landings, Commissioning and Seasonal Commissioning
Responsibility	Architect / M&E Designer / Contractor
Rationale	Commissioning and hand-over can cement or undermine design and construction work, defining user experience and successful operation for the long-term. Seasonal commissioning is essential to ensure that this process is repeated for the various modes in which the building will operate. Both have been demonstrated to be critical to the success of University projects. Staff can become disenfranchised quickly and should be actively engaged in the process of verifying a building is meeting its design criteria. The BSRIA Soft Landings framework shall be used throughout the project to deliver the operational outcomes defined in this specification and the wider University project briefing documents.
Requirements	• An independent Commissioning Engineer or non-novation of the M&E designer must be included for all complex projects. • Training should be provided only when systems are operational and only training on essential systems should be provided pre-PC. • Seasonal commissioning should be well defined and started 6 months post PC. • A clear communication plan for any post occupation commissioning and seasonal commissioning should be defined and agreed with the occupants during construction as part of the Soft Landings Strategy. • BMS data recording services should be considered for seasonal commissioning but only where their review can be adequately resourced.
Key RIBA Stages	1-7
SUSTAINABLE DEVELOPMENT GOALS	7 AFFORDABLE AND CLEAN ENERGY; 13 CLIMATE ACTION
Evidence and Monitoring	• Soft landings meetings / reports / schedules. • Commissioning strategy workshops and reports.
Related Issues / References	

Issue

3.3 Building User Guide

Responsibility

Architect / M&E Designer / Contractor

Rationale

User understanding of a building's function is critical to occupants experience of it and to its long term energy performance but full understanding of the buildings design intent is likely to be held by a relatively small number of people by occupation. Where University projects have invested time and resources in communicating this to all occupants it has delivered significant performance improvements and levels of satisfaction.
There is no best-practice pro-forma as appropriate formats will vary significantly based on a buildings function and complexity. Brief, visual instructions that can be left/mounted near controls in workspaces or web-based guidance and videos have proven most successful in engaging users and remaining accessible for new occupants.

Requirements

- User guides should consider the range of staff knowledge and staff turnover.
- Detailed user guides should be produced by the main contractor for all occupant facing systems and controls.
- User guides should signpost the key University sustainability initiatives for operational buildings.
- Web based user guides should be considered where thermal comfort strategies require a variety of occupant interventions dependent on conditions.

Key RIBA Stages

1-4

SUSTAINABLE DEVELOPMENT GOALS

7 AFFORDABLE AND CLEAN ENERGY

13 CLIMATE ACTION

Evidence and Monitoring

- Cost allowance from stage 1.
- Building User Guide workshop at stage 3.
- Building User Guide.

Related Issues / References

4. Room Type Specific requirements

Issue	**4.1 Building Entrance Design**
Responsibility	Architect
Rationale	Balancing requirements for accessibility, traffic volumes, security, comfort and energy conservation has been challenging for University buildings. Entrance design will be a key architectural element of any project and considering these often conflicting priorities at an early project stage is essential to ensure that requirements are adequately incorporated and that the experience of all users of the completed building is optimised. Small changes to design including orientation, façade treatments and landscaping, can have a significant impact on the effect of wind on heat loss as well as on the function of automatic door mechanisms. The location of any internal reception desk in relation to the entrance must be carefully considered; the thermal comfort of reception staff should be an important factor influencing the design.
Requirements	• Major entrance orientation should be between NE-SE or W-N where possible. • Wind breaks/landscaping to prevailing wind directions must be considered. • The need for over-door air heaters/curtains should be designed out wherever possible. • Adequately sized draft lobby's should be included where possible to reduce heat loss and reception occupant discomfort.
Key RIBA Stages	1-4
SUSTAINABLE DEVELOPMENT GOALS	3 GOOD HEALTH AND WELL-BEING 7 AFFORDABLE AND CLEAN ENERGY 13 CLIMATE ACTION
Evidence and Monitoring	• Design development workshops. • Stage reports outlining strategy and design details.
Related Issues / References	• Vent and cooling • Thermal comfort

Issue

4.2 IT Facilities

Responsibility

Architect / M&E Designer / Contractor

Rationale

The provision of IT and data support for research facilities can account for a significant proportion of a buildings energy consumption while driving energy intensive cooling requirements. University projects have also suffered from the challenge of anticipating the growth of IT requirements leading to the installation of over-sized, inefficient and costly plant. Cloud-based and off-site options are inherently more energy efficient and can deliver operational savings for departments, free up costly space within buildings, reduce stress on the provision of electrical power and facilitate reductions in the University's carbon emissions.

Requirements

- Data storage should integrate with the central / off site facilities managed by NUIT
- The NUIT data and cabling spec must be complied with.
- Local network rooms should be located so as to allow cooling by outside air.
- Any cooling plant installed to meet peak loads should be designed to ensure efficient operation at a variety of potential load scenarios.

Key RIBA Stages

1-4

SUSTAINABLE DEVELOPMENT GOALS

Evidence and Monitoring

- IT needs assessment.
- Plant efficiency sensitivity analysis.

Related Issues / References

- NUIT Data and cabling spec
- Thermal comfort

Issue

4.3 Laboratories

Responsibility

Architect / M&E Designer / Contractor

Rationale

Laboratories are energy intensive by nature; 40% of energy may be consumed by plugged in equipment and 30-50% by ventilation equipment (all of which also represent a major capital cost). For these reasons their energy efficient design and operation is a key target in the University's Climate Action Plan.

Impacts on safety should always be considered for any potential energy savings.

Requirements

- Air change rates should be scrutinised for their measurable safety benefits to ensure appropriate safe and correctly sized design.
- Plant should be designed to ensure efficient operation at normal, as well as peak loads and close environmental control limited to areas needing this.
- Appropriate automated control should be considered for equipment at risk of being left on.
- Designs should engage users in saving energy, enable and normalise energy efficient behaviour such as fume hood closure and equipment sharing.
- Designs should also allow for flexibility in the use of the space to promote the use of multiple faculties and disciplines simultaneously.
- ULT freezers should be co-located in rooms positioned to enable free cooling.
- Ventilated storage should be provided separate to fume hoods where required.
- Waste types that will be generated within the labs should be identified, with space for appropriate waste streams/facilities identified within the labs as well as any waste storage areas.
- S-labs and Labs21 Environmental Performance Criteria should be consulted.

Key RIBA Stages

1-4

SUSTAINABLE DEVELOPMENT GOALS

7 AFFORDABLE AND CLEAN ENERGY

13 CLIMATE ACTION

Evidence and Monitoring

- Cost allowance from stage 1.
- Building User Guide workshop at stage 3.
- Building User Guide.

Related Issues / References

S-Labs and Labs 21