WIC House
BREEAM Stage M&E Evidence Report

For Oxord Biomedica

26/09/2018

Ref: TS1036368

T-SQUARED

Document History

Paper copies are valid only on the day they are printed. Contact the author if you are in any doubt about the accuracy of this document.

Revision History

Revision No.	Issue Date	Summary of Changes	Author
Draft	22/12/20	Issue for BREEAM Assessor initial comment	IM
Issue	25/01/21	Issue for Planning	DS

Reference Documents

Document Name	Document Number	Author
BREEAM NC18 PRE-assessment WIC House – Third Pass Credits		Richard Knight, Stantec
Energy Statement/LZCT Report		DS
M&E Design Assumptions		IM/PM
HVAC Strategy Zoning Drawings		IM
Major Plant Replacement Strategy		IM

Distribution List

Name	Position	Company
Richard Knight	BREEAM Assessor	Stantec

Contents

1 Introduction

The first section of this document summarises the provisions within the ***mechanical & electrical services design*** to allow the credits targeted in the BREEAM pre-assessment stage for the Oxford Biomedica WiC House project to be claimed.

The overall BREEAM strategy is summarised in Stantec document, “BREEAM NC18 PRE-assessment WIC House – Third Pass Credits”

The second section of this document captures the basis of design which has been used to inform the m&e servicing provisions encapsulated within the current architectural scheme.

This basis of design has been used to inform the following early stage strategies:

- Plant space and riser provisions
- Services distribution provisions
- Major plant replacement strategies
- Part L compliance strategy
- BREEAM Excellent compliance strategy

Should the basis of design change via client feedback or further briefing, then these strategies may also require to be updated accordingly.

2 BREEAM Credits targeted (related to M&E strategy)

This section summarises the credits targeted in the BREEAM pre-assessment stage where there is a contribution to the claimed credits from the ***mechanical & electrical services design***.

For the overall BREEAM strategy refer to the Stantec document, "BREEAM NC18 PRE-assessment WIC House – Third Pass Credits"

For each applicable BREEAM section the following standard format is followed:
- The number of credits targeted
- The general basis for claiming the credits targeted
- The particular requirements for each credit claimed (from BRE guidance)
- The evidence included at this stage to allow the credit to be claimed

2.1 MAN 04 Commissioning and Handover

Credits targeted	Basis of claiming targeted credits
4	• Commissioning - testing schedule and responsibilities (one credit) • Commissioning - design and preparation (one credit) • Testing and inspecting building fabric (one credit) • Handover (one credit).

Commissioning - testing schedule and responsibilities

- 1 Prepare a schedule of commissioning and testing. The schedule identifies and includes a suitable timescale for commissioning and re-commissioning of all complex and non-complex building services and control systems and for testing and inspecting building fabric.
- 2 The schedule identifies the appropriate standards for all commissioning activities to be conducted, where applicable, in accordance with:
  - 2.a: Current Building Regulations
  - 2.b: BSRIA guidelines[1]
  - 2.c: CIBSE guidelines[2]
  - 2.d: Other appropriate standards (see Methodology).
  - Exclude from the assessment any process or manufacture-related equipment specified as part of the project. However, include such equipment in cases where they form an integral part of the building HVAC services, such as some heat recovery systems.
- 3 Where a building management system (BMS) is specified:
  - 3.a: Carry out commissioning of air and water systems when all control devices are installed, wired and functional
  - 3.b: Include physical measurements of room temperatures, off-coil temperatures and other key parameters, as appropriate, in commissioning results
  - 3.c: The BMS or controls installation should be running in auto with satisfactory internal conditions prior to handover
  - 3.d: All BMS schematics and graphics (if BMS is present) are fully installed and functional to user interface prior to handover
  - 3.e: Fully train the occupier or facilities team in the operation of the system.
- 4 Appoint an appropriate project team member to monitor and programme pre-commissioning, commissioning and testing. Where necessary include re-commissioning activities on behalf of the client.
- 5 The principal contractor accounts for the commissioning and testing programme, responsibilities and criteria within their budget and the main programme of works. Allow the required time to complete all commissioning and testing activities prior to handover.

Commissioning - design and preparation

- 6 Achieve criteria 1 to 5.
- 7 During the design stage, the client or the principal contractor appoints an appropriate project team member (see criterion 4), provided they are not involved in the general installation works for the building services systems, with responsibility for:
  - 7.a: Undertaking design reviews and giving advice on suitability for ease of commissioning.
  - 7.b: Providing commissioning management input to construction programming and during installation stages.
  - 7.c: Management of commissioning, performance testing and handover or post-handover stages.
  - For buildings with complex building services and systems, this role needs to be carried out by a specialist commissioning manager (see Definitions).

Testing and inspecting building fabric

- 8 Achieve criteria 1 to 5.
- 9 Complete post-construction testing and inspection to quality-assure the integrity of the building fabric, including continuity of insulation, avoidance of thermal bridging and air leakage paths (this is through airtightness testing and a thermographic survey). A suitably qualified professional (see Definitions) undertakes the survey and testing in accordance with the appropriate standard.
- 10 Rectify any defects identified during post-construction testing and inspection prior to building handover and close out. Any remedial work must meet the required performance characteristics for the building or element as defined at the design stage (see Methodology).

Cost plan allowance for testing & remedial works
Specification to be developed during

Handover

- 11 Prior to handover, develop two building user guides (see Methodology) for the following users:
  - 11.a: A non-technical user guide for distribution to the building occupiers.
  - 11.b: A technical user guide for the premises facilities managers.
  - A draft copy is developed and discussed with users first (where the building occupants are known) to ensure the guide is most appropriate and useful to potential users.
- 12 Prepare two training schedules timed appropriately around handover and proposed occupation plans for the following users:
  - 12.a: A non-technical training schedule for the building occupiers.
  - 12.b: A technical training schedule for the premises facilities managers.

Evidence Statement

During Stage 5 a schedule of commissioning and testing shall be prepared in accordance with the requirements of criteria 1 and 2. The Building Management System shall be commissioned, tested and handed over in line with Criteria 3

The construction programme accounts for commissioning & testing prior to handover and this shall be developed as the project progresses.

A specialist commissioning manager shall be appointed as described in criteria 7

Building user guides as described in criteria 11 shall be provided at handover.

Training schedules as described in criteria 13 shall be provided at handover.

2.2 MAN 05 Aftercare

Credits targeted	Basis of claiming targeted credits
3	• Aftercare support (one credit) • Commissioning - implementation (one credit) • Post-Occupancy Evaluation (POE) (one credit).

Aftercare support

- 1 Provide aftercare support to the building occupiers through having in place operational infrastructure and resources. This includes as a minimum:
  - 1.a: A meeting between the aftercare support team or individual, and the building occupier or management team (prior to initial occupation, or as soon as possible thereafter) to:
    - 1.a.i Introduce the aftercare support available, including the content of the building user guide (where it exists) and training schedule.
    - 1.a.ii Present key information about features of the building including the design intent and how to use the building to ensure it operates as efficiently and effectively as possible.
  - 1.b: On-site facilities management training including:
    - 1.b.i a walkabout of the building
- AND
    - 1.b.ii introduction to and familiarisation with the building systems, their controls and how to operate them in accordance with the design intent and operational demands.
  - 1.c: Provide initial aftercare support for at least the first month of building occupation, e.g. weekly attendance on-site, to support building users and management (the level of frequency will depend on the complexity of the building and building operations).
  - 1.d: Provide longer term aftercare support for occupiers for at least the first 12 months from occupation, e.g. a helpline, nominated individual or other appropriate system to support building users and management.
- 2 Establish operational infrastructure and resources to coordinate the collection and monitoring of energy and water consumption data for a minimum of 12 months, once the building is substantially occupied. This facilitates analysis of discrepancies between actual and predicted performance, with a view to adjusting systems and user behaviours accordingly.

Commissioning - implementation

- 3 Complete the following commissioning activities over a minimum 12-month period, once the building becomes substantially occupied:
  - 3.a: Complex systems: The specialist commissioning manager will:
    - 3.a.i Identify changes made by the owner or operator that might have caused impaired or improved performance.
    - 3.a.ii Test all building services under full load conditions, i.e. heating equipment in mid-winter, cooling and ventilation equipment in mid-summer and under part load conditions (spring and autumn).
    - 3.a.iii Where applicable, carry out testing during periods of extreme (high or low) occupancy.
    - 3.a.iv Interview building occupants (where they are affected by the complex services) to identify problems or concerns regarding the effectiveness of the systems.
    - 3.a.v Produce monthly reports comparing sub-metered energy performance to the predicted one (see Ene 01 Reduction of energy use and carbon emissions).
    - 3.a.vi Identify inefficiencies and areas in need of improvement.
    - 3.a.vii Re-commission systems (following any work needed to serve revised loads), and incorporate any revisions in operating procedures into the operations and maintenance (O&M) manuals.
  - ~~3.b: Simple systems (naturally ventilated): The external consultant, aftercare team or facilities manager will:~~
    - ~~3.b.i Review thermal comfort, ventilation, and lighting, at three, six and nine month intervals after initial occupation, either by measurement or occupant feedback.~~
    - ~~3.b.ii Identify deficiencies and areas in need of improvement.~~
    - ~~3.b.iii Re-commission systems and incorporate any relevant revisions in operating procedures into the O&M manuals.~~

Post-Occupancy Evaluation

- 4 The client or building occupier commits to carry out a POE exercise (see Definitions) one year after the building is substantially occupied. This gains comprehensive in-use performance feedback (see criterion 5.b.v) and identifies gaps between design intent and in-use performance. The aim is to highlight any improvements or interventions that need to be made and to inform operational processes.
- 5 An independent party (see Definitions) carries out the POE covering:
  - 5.a: A review of the design intent and construction process (review of design, procurement, construction and handover processes).
  - 5.b: Feedback from a wide range of building users including facilities management on the design and environmental conditions of the building covering:
    - 5.b.i Internal environmental conditions (light, noise, temperature, air quality)
    - 5.b.ii Control, operation and maintenance
    - 5.b.iii Facilities and amenities
    - 5.b.iv Access and layout
    - 5.b.v Energy and water consumption (see criterion 2 and Methodology)
    - 5.b.vi Other relevant issues, where appropriate (see Definitions)
- 6 The independent party provides a report with lessons learned to the client and building occupiers.
- 7 The client or building occupier commits funds to pay for the POE in advance. This requires an independent party to be appointed to carry out the POE as described in criterion 5. Evidence of the appointment of the independent party and schedule of responsibilities which fulfils the BREEAM criteria are acceptable to demonstrate compliance.

Evidence Statement

Aftercare support to the building occupiers shall be provided in accordance with criteria 1.
It is intended that arrangements shall be made for the collection and monitoring of energy and water consumption data for a minimum of 12 months following completion in line with criteria 2

Seasonal commissioning shall be carried out in line with criteria 3

It is intended that a post occupancy evaluation shall be commissioned by **OXFORD BIOMEDICA** in accordance with criteria 4-7.

2.3 HEA 1 Visual Comfort

Credits targeted	Basis of claiming targeted credits
2	• Control of glare from sunlight (one credit) • ~~Daylighting (up to two credits – building type dependent)~~ • ~~View out (one credit all buildings, two credits healthcare buildings with inpatient areas)~~ • Internal and external lighting levels, zoning and control (one credit).

Control of glare from sunlight

- 1 Identify areas at risk of glare using a glare control assessment. The glare control assessment also justifies any areas deemed not at risk of glare.
- 2 Where risk has been identified within a relevant building area a glare control strategy is used to design out the potential for glare.
- 3 The glare control strategy does not increase energy consumption used for lighting. This is achieved by:
  - 3a Maximising daylight levels in all weather, cloudy or sunny AND
  - 3b Ensuring the use or location of shading does not conflict with the operation of lighting control systems.

Internal and external lighting levels, zoning and control

Internal lighting

- 7 Internal lighting in all relevant areas of the building is designed to provide illuminance (lux) levels and colouring rendering index in accordance with the SLL Code for Lighting 2012[1] and any other relevant industry standard. Internal lighting should be appropriate to the tasks undertaken, accounting for building user concentration and comfort levels.
- 8 For areas where computer screens are regularly used, the lighting design complies with CIBSE Lighting Guide 7[2] sections 2.4, 2.13 to 2.15, 2.20, and 6.10 to 6.20. This gives recommendations highlighting:
  - 8a Limits to the luminance of the luminaires to avoid screen reflections. (Manufacturers' data for the luminaires should be sought to confirm this.)

- 8b Any area where a surface is used to reflect light into a space, such as uplighting, the recommendations refer to the luminance of the lit ceiling rather than the luminaire; a design team calculation is usually required to demonstrate this.
- 8c Recommendations for direct lighting, ceiling illuminance, and average wall illuminance.

External lighting

- 9 All external lighting located within the construction zone is specified in accordance with BS 5489-1:2013 Code for the practice for the design of road lighting. Lighting of roads and public amenity areas[3] and BS EN 12464-2:2014[4] Light and lighting - Lighting of work places - Part 2: Outdoor work places. External lighting should provide illuminance levels that enable users to perform outdoor visual tasks efficiently and accurately, especially during the night.
- 10 Where no external light fittings are specified (either separate from or mounted on the external building façade or roof), the criteria relating to external lighting do not apply and the credit can be awarded on the basis of compliance with criteria 7–8.c above. If no internal lighting is specified, the credit cannot be awarded.

Zoning and occupant control

- 11 Internal lighting is zoned to allow for occupant control. Zoning is in accordance with the criteria below for relevant areas present within the building:
  - 11.a: In office areas, zones of no more than four workplaces
  - 11.b: Workstations adjacent to windows or atria and other building areas separately zoned and controlled
  - 11.c: Seminar and lecture rooms: zoned for presentation and audience areas
  - 11.d: Library spaces: separate zoning of stacks, reading and counter areas
  - 11.e: Teaching space or demonstration area
  - 11.f: Whiteboard or display screen
  - 11.g: Auditoria: zoning of seating areas, circulation space and lectern area
  - 11.h: Dining, restaurant, café areas: separate zoning of servery and seating or dining areas
  - 11.i: Retail: separate zoning of display and counter areas
  - 11.j: Bar areas: separate zoning of bar and seating areas
  - 11.k: Wards or bedded areas: zoned lighting control for individual bed spaces and control for staff over groups of bed spaces
  - 11.l: Treatment areas, dayrooms, waiting areas: zoning of seating and activity areas and circulation space with controls accessible to staff.
- ~~12 Areas used for teaching, seminar or lecture purposes have lighting controls provided in accordance with CIBSE Lighting Guide 5[5].~~
- ~~13 In addition, the building type criteria in Table 5.7 (where relevant).~~

Evidence Statement

It is intended that rooms with windows in which close works shall be undertaken which are at risk from glare, shall be identified by the **ARCHITECT** in a glare risk review, and specified with suitable blinds.

Lighting in all relevant areas of the building shall be designed to provide illuminance (lux) levels and colouring rendering index in accordance with the SLL Code for Lighting 2012

In areas where computer screens are regularly used, the lighting design shall comply with CIBSE Lighting Guide 7 sections 2.4, 2.13 to 2.15, 2.20, and 6.10 to 6.20

2.4 HEA 2 Indoor Air Quality

Credits targeted	Basis of claiming targeted credits
2	• Indoor air quality (prerequisite) • Ventilation (one credit) • ~~Emissions from construction products (up to two credits)~~ • ~~Post-construction indoor air quality measurement (one credit).~~

Indoor air quality

- 1 A site-specific indoor air quality plan has been produced and implemented in accordance with the guidance in Guidance Note GN06. The objective of the plan is to facilitate a process that leads to design, specification and installation decisions and actions that minimise indoor air pollution during occupation of the building. The indoor air quality plan must consider the following:
  - 1a Removal of contaminant sources
  - 1b Dilution and control of contaminant sources:
    - 1bi Where present, consideration is given to the air quality requirements of specialist areas such as laboratories
  - 1c Procedures for pre-occupancy flush out
  - 1d Third party testing and analysis
  - Maintaining good indoor air quality in-use.

Ventilation

- 2 The building has been designed to minimise the indoor concentration and recirculation of pollutants in the building as follows:
  - 2a Provide fresh air into the building in accordance with the criteria of the relevant standard for ventilation
  - 2b Ventilation pathways are designed to minimise the ingress and build-up of air pollutants inside the building (see Methodology)
  - 2c Where present, HVAC systems must incorporate suitable filtration to minimise external air pollution, as defined in BS EN 16798-3:2017[1]. The specified filters should achieve supply air classification of at least SUP 2.
  - 2d Areas of the building subject to large and unpredictable or variable occupancy patterns have carbon dioxide (CO_2) or air quality sensors specified and:
    - 2di In mechanically ventilated buildings or spaces: sensors are linked to the mechanical ventilation system and provide demand-controlled ventilation to the space
    - ~~2dii In naturally ventilated buildings or spaces: sensors either have the ability to alert the building owner or manager when CO_2 levels exceed the recommended set point, or are linked to controls with the ability to adjust the quantity of fresh air, i.e. automatic opening windows or roof vents~~
  - ~~2e For naturally ventilated or mixed mode buildings, the design demonstrates that the ventilation strategy provides adequate cross flow of air to maintain the required thermal comfort conditions and ventilation rates in accordance with CIBSE AM10[2].~~

Evidence Statement

Please refer to the draft Air Quality Assessment for planning and the Indoor Air Quality Plan.

2.5 HEA 4 Thermal Comfort

Credits targeted	Basis of claiming targeted credits
3	• Thermal modelling (one credit) • Design for future thermal comfort (one credit) • Thermal zoning and controls (one credit)

Thermal modelling

- 1 Thermal modelling has been carried out using software in accordance with CIBSE AM11[1] Building Energy and Performance Modelling.
- 2 The software used to carry out the simulation at the detailed design stage provides full dynamic thermal analysis. For smaller and more basic building designs with less complex heating or cooling systems, an alternative less complex means of analysis may be appropriate (such methodologies must still be in accordance with CIBSE AM11).
- 3 The modelling demonstrates that:
  - For air-conditioned buildings, summer and winter operative temperature ranges in occupied spaces are in accordance with the criteria set out in CIBSE Guide A Environmental design[2], Table 1.5; or other appropriate industry standard (where this sets a higher or more appropriate requirement or level for the

building type); or the thermal environment in occupied spaces meet the Category B requirements for PPD, PMV and local discomfort set out in Table A.1 of Annex A of ISO 7730:2005. ○ ~~For naturally ventilated buildings:~~ ▪ ~~Winter operative temperature ranges in occupied spaces are in accordance with the criteria set out in CIBSE Guide A Environmental design, Table 1.5. Or other appropriate industry standard (where this sets a higher or more appropriate requirement or level for the building type).~~ ▪ ~~The building is designed to limit the risk of overheating, in accordance with the adaptive comfort methodology outlined in either of the following standards as appropriate; CIBSE TM52: The limits of thermal comfort: avoiding overheating in European buildings[3] or CIBSE TM59: Design methodology for the assessment of overheating risk in homes[4].~~ ○ 4 For air-conditioned buildings, the PMV (predicted mean vote) and PPD (predicted percentage of dissatisfied) indices based on the above modelling are reported via the BREEAM assessment scoring and reporting tool.
Design for future thermal comfort
• 5 Criteria 1 to 4 are achieved. • 6 The thermal modelling demonstrates that the relevant requirements set out in criterion 3 are achieved for a projected climate change environment • 7 Where criterion 6 is not met, the project team demonstrates how the building has been adapted, or designed to be easily adapted in future using passive design solutions in order to subsequently meet the requirements under criterion 6. • 8 For air-conditioned buildings, the PMV and PPD indices based on the above modelling are reported via the BREEAM assessment scoring and reporting tool.
Thermal zoning and controls
• 9 Criteria 1 to 4 are achieved. • 10 The thermal modelling analysis (criteria1 to 4) has informed the temperature control strategy for the building and its users. • 11 The strategy for proposed heating or cooling systems demonstrates that it has addressed the following: ○ 11.a: Zones within the building, and how the building services could efficiently and appropriately heat or cool these areas. For example consider the different requirements for the central core of a building compared with the external perimeter adjacent to the windows. ○ 11.b: The degree of occupant control required for these zones. This is based on discussions with the end user (or alternatively building type or use specific design guidance, case studies, feedback) and considers: ▪ 11.b.i User knowledge of building services. ▪ 11.b.ii Occupancy type, patterns and room functions (and therefore appropriate level of control required). ▪ 11.b.iii How the user is likely to operate or interact with the systems, e.g. are they likely to open windows, access thermostatic radiator valves (TRV) on radiators, change air-conditioning settings etc. ▪ 11.b.iv The user expectations (this may differ in the summer and winter) and degree of individual control (i.e. obtaining the balance between occupant preferences, for example some occupants like fresh air and others dislike draughts). ○ 11.c: How the proposed systems will interact with each other (where there is more than one system) and how this may affect the thermal comfort of the building occupants. ○ 11.d: The need or otherwise for an accessible building user actuated manual override for any automatic systems.
Evidence Statement
Please refer to the Thermal Modelling Report

2.6 HEA 5 Acoustic Performance

Credits targeted	Basis of claiming targeted credits
2	• Acoustic performance (up to three credits for all building types, except Residential institutions (short term and long term stay) • ~~Acoustic performance for Residential institutions (short term and long term stay) (up to four credits available).~~
Acoustic performance	
Site survey Fabric and kit performance targets to be sent by acoustician	

2.7 ENE 1 Reduction of CO2 emissions

Credits targeted	Basis of claiming targeted credits
5	• Energy performance (nine credits) • Prediction of operational energy consumption (four credits) • Exemplary level criteria (five credits)
Energy performance (4 credits targeted & required for Excellent)	

		Minimum standards	
BREEAM credits	EPR NC	Rating	Minimum requirements
1	0.1		Requires a performance improvement progressively better than the relevant national building regulations compliant standard (see Energy performance).
2	0.2		
3	0.3		
4	0.4	Excellent	Requires 4 credits to be achieved (equivalent to an EPR_{NC} of at least 0.4) or 4 credits for Prediction of operational energy consumption (where operational energy performance has been substantially improved).
5	0.5		
6	0.6	Outstanding	Requires 6 credits to be achieved (equivalent to an EPR_{NC} of at least 0.6) and 4 credits for prediction of operational energy consumption.

IES SBEM output design/as built in line with Approved Document Part L2A 2010 Conservation of fuel and power in new buildings other than dwellings, 2013 edition with 2016 amendments - for use in England[3].

An excellent rating must achieve a Building Emission Rating 40 to 50% better than the Target Emission Rate
25/01/2021 update: With 250m2 PV 40% betterment achieved

Prediction of operational energy consumption (4 credits could be targeted)
• Involve relevant members of the design team in an energy design workshop focusing on operational energy performance (see Methodology). • Undertake additional energy modelling during the design and post-construction stage to generate predicted operational energy consumption figures (see Prediction of operational energy consumption). • Report predicted energy consumption targets by end use, design assumptions and input data (with justifications). • Carry out a risk assessment to highlight any significant design, technical, and process risks that should be monitored and managed throughout the construction and commissioning process. Operational energy performance workshop minutes Model predicted operational energy consumption figures & report Assess significant risks to predicted energy consumption targets • Weather (defined in HEA4) • Operating hours for systems • Occupancy hours • Management factors. **RELEVANT NOTES FROM ENE02 description:** CIBSE TM54: Evaluating operational energy performance of buildings at the design stage[2], using actual operational inputs (rather than those used for building regulations calculations). The weather data used should be the average current weather data for the local area. The data on water consumption from the Wat 01 Water consumption issue may be used as inputs for evaluating the energy use of domestic hot water. Unregulated energy usage Does PV offset regulated energy use?? If not, unregulated energy offset by 10% = 1 credit, 50%=2 credits
Exemplary level criteria (2 credits could be targeted)

• 10 Achieve maximum available credits in Ene 02 Energy monitoring . ~~In addition, preschools, primary schools, law courts, prisons and multi-residential buildings must meet the requirements of the second credit for sub-metering of high energy load and tenancy areas.~~
• 11 The client or building occupier commits funds to pay for the post occupancy stage. This requires an assessor to be appointed and to report on the actual energy consumption compared with the targets set in criterion 4.
• 12 The energy model (criterion 3) is:
  ○ 12.a: Submitted to BRE and
  ○ 12.b: Retained by the building owner.

2.8 ENE 2 Energy Monitoring

Credits targeted	Basis of claiming targeted credits
2	• Sub-metering of end-use categories (one credit) • Sub-metering of high energy load and tenancy areas (one credit)

Sub-metering of end-use categories

• 1 Install energy metering systems so that at least 90% of the estimated annual energy consumption of each fuel is assigned to the end-use categories (see Methodology).
• 2 Meter the energy consumption in buildings according to the total useful floor area:
  ○ 2.a: If the area is greater than 1,000m², by end-use category with an appropriate energy monitoring and management system.
  ○ 2.b: If the area is less than 1,000m², use either:
    ▪ 2.b.i an energy monitoring and management system or
    ▪ 2.b.ii separate accessible energy sub-meters with pulsed or other open protocol communication outputs, for future connection to an energy monitoring and management system (see Definitions).
• 3 Building users can identify the energy consuming end uses, for example through labelling or data outputs.
Metering strategy CIBSE TM39. Exceptions possible for loads<10% of total predicted consumption assessed as per TM54.
Categories:
3 Lighting and small power
Due to traditional distribution methods, it can be difficult to sub-meter separately and cost-effectively lighting and small power. Lighting and small power can be combined for metering purposes, as long as sub-metering is provided for each floor plate.
4 Heating and hot water
Space heating and domestic hot water may be combined with a single heat or gas meter per tenanted area or function area or department. This is acceptable where a common plant provides more than one building service (e.g. a boiler provides both hot water and space heating, or a reversible heat pump provides space heating and space cooling) and it is impractical to meter end uses separately.
5 Modular boiler systems
Modular boiler systems can be monitored as a whole.
6 Small function areas or departments
For a building consisting of a number of small function areas or departments, sub-metering the heating, hot water and combined electricity energy uses is sufficient to achieve this credit. Individual electricity energy uses within each unit do not need to be sub-metered. For the purpose of this BREEAM issue, a small function area or department is defined as less than 200m².

Sub-metering of high energy load and tenancy areas

• 4 Monitor a significant majority of the energy supply with:
  ○ 4.a: An accessible energy monitoring and management system for:
    ▪ 4.a.i tenanted areas or
    ▪ 4.a.ii relevant function areas or departments in single occupancy buildings.
    ▪ OR
  ○ 4.b: Separate accessible energy sub-meters with pulsed or other open protocol communication outputs for future connection to an energy monitoring and management system for:
    ▪ 4.b.i tenanted areas or
    ▪ 4.b.ii relevant function areas or departments in single occupancy buildings.
• 5 Sub-meter per floor plate in large single occupancy or single-tenancy buildings with one homogeneous function, for example hotel bedrooms, offices.
Covered in metering strategy above
Tenancy split plan required
Functional split plan:
Office buildings
1. Office areas (metering by floor plate)
2. Catering- do we have
~~3. Retail buildings~~
Sales area
2. Storage and warehouse
3. Cold storage
~~4. Offices~~
~~5. Catering~~
6. Tenant units
~~**Industrial units**~~
~~1. Office areas~~
~~2. Operational area~~
~~3. Ancillary areas (e.g. canteens etc.)~~
~~**Hotel buildings**~~
~~1. Office areas~~

2. ~~Catering (e.g. kitchen, restaurant)~~
3. ~~Conference suites~~
4. ~~Swimming pool or leisure facilities~~
5. ~~Hotel bedrooms metered per floor, core, floor plate in a strategy that would provide a benefit to the facilities management~~

~~It is acceptable for the electric heating system to be combined with lighting and small power for metering purposes, as long as sub-metering is provided for each floor, core or floor plate. The benefit to the facilities management can be measured by carrying out a comparison with similar building areas where it would be possible to identify any unusual or excessive energy consumption.~~

~~Education buildings~~

1. ~~Kitchens (excluding small staff kitchens and food technology rooms)~~
2. ~~Computer suites~~
3. ~~Workshops~~
4. ~~Lecture halls~~
5. ~~Conference rooms~~
6. ~~Drama studios~~
7. ~~Swimming pools~~
8. ~~Sports halls~~
9. ~~Process areas~~
10. Laboratories
11. High containment suites within laboratories
12. ~~Controlled environment chambers~~
13. ~~Animal accommodation areas~~
14. ~~Data centres~~
15. ~~IT work and study rooms, including IT-equipped library space and any space with provision of more than one computer terminal per 5m²~~

~~Individual sub-metering of standard classrooms or seminar rooms is not required.~~

~~**Hospitals and other healthcare facilities**~~

1. ~~Operating departments~~
2. ~~Imaging departments~~
3. ~~Radiotherapy departments~~
4. ~~Pathology departments~~
5. ~~Dialysis departments~~
6. ~~Medical physics facilities~~
7. ~~Mortuary and post mortem departments~~
8. ~~Rehabilitation when including hydrotherapy pools~~
9. ~~Central sterile supplies departments (or equivalent)~~
10. ~~Process areas (e.g. commercial-scale kitchens and laundries)~~
11. IT rooms
12. ~~Pharmacy departments~~
13. ~~Laboratories~~
14. ~~Tenancy areas (e.g. catering, retail, laundry)~~

In small healthcare buildings (< 999m²) with no high energy load areas (as defined above), a single meter per floor plate is sufficient to achieve this credit. Individual areas within each floor plate do not need to be sub-metered.

Other buildings

Other types of single occupancy buildings should use the above lists of function areas as a guide to the level of sub-metering provision required to comply. The above should consider that the aim of the credit is to encourage the installation of energy sub-metering that facilitates the monitoring of in-use energy consumption (in this case by area).

6.1 ENE 3 External Lighting

Credits targeted	Basis of claiming targeted credits
1	• 1 No external lighting (which includes lighting on the building, at entrances and signs). OR • 2 External light fittings within the construction zone with: ○ 2.a: Average initial luminous efficacy of not less than 70 luminaire lumens per circuit Watt ○ 2.b: Automatic control to prevent operation during daylight hours ○ 2.c: Presence detection in areas of intermittent pedestrian traffic.

External light fittings within the construction zone

The individual luminous fluxes of all luminaires within the construction zone are summed (in lumens), then divided by the total circuit Watts for all the luminaires.

For lamps other than LED lamps, the luminous flux of a luminaire using those lamps can be determined by multiplying the sum of the luminous fluxes produced by all the lamps in the luminaire by the light output ratio of the luminaire (as confirmed by the luminaire manufacturer).

LED lamps are typically integral to the luminaire (LED luminaires). As such, the manufacturers' literature will encompass both lamp and luminaire as a whole.

6.2 ENE 4 LZC Technologies

Credits targeted	Basis of claiming targeted credits
2	• Passive design (two credits) • Low and zero carbon technologies (one credit).

Passive design (one credit from PDA)

As a minimum, the passive design analysis should cover:

1. Site location
2. Site weather
3. Microclimate
4. Building layout
5. Building orientation
6. Building form
7. Building fabric
8. Thermal mass or other fabric thermal storage
9. Building occupancy type
10. Daylighting strategy
11. Ventilation strategy
12. Adaptation to climate change

Any savings resulting from the incorporation of passive design measures should be demonstrated by comparing the energy demand and CO_2-eq emissions for the building with and without the proposed passive design measures adopted, as identified in the passive design analysis.

To enable a baseline for comparison to be established, a 'standard building' should be modelled with fabric performance equivalent to that of the local building regulations notional building (or for Scotland, an equivalent compliant building) and without the passive design measures (where feasible, i.e. building orientation is likely to be fixed). The glazing areas specified in the 'standard building' should be the same as those required by the Building Regulations Notional building.

This 'standard building' should be modelled as equivalent to the proposed building with the exception of any changes to account for passive design measures and fabric performance as seen in the table below.

Table 6.3 Modelling the 'standard' and 'proposed' building to account for passive deign measures

Measure	'Standard Building'	'Proposed Building'
External shading devices	As notional	As designed
Fabric performance	As notional	As designed
Fabric proportions (i.e. window size, location)	As notional	As designed
Thermal Mass	As notional	As designed
Daylighting	As notional	As designed
Ventilation	As notional	As designed

Any savings in energy demand or CO_2-eq emissions should then be calculated by comparing the respective Building Emission Rate (BER) outputs from two building models representing the 'proposed building' specification (fixed at a point as agreed by the project team and assessor), and the 'standard building' specification.
These calculations should be carried out by a building services engineer who is a member of the Chartered Institute of Building Services Engineers (CIBSE) or by an accredited energy assessor (see Definitions).

Low and zero carbon technologies (one credit from LZCTFS)

- 9 An energy specialist (see Definitions) completes a feasibility study (see Low and zero carbon feasibility study) by the end of Concept Design.
- 10 Establish the most appropriate recognised local (on-site or near-site) low and zero carbon (LZC) energy sources for the building or development (see Scope of LZC systems and how they are assessed), based on the feasibility study.
- 11 Specify local LZC technologies for the building or development in line with the feasibility study recommendations.
- 12 Quantify the reduced regulated carbon dioxide (CO_2-eq) emissions resulting from the feasibility study.

The low and zero carbon feasibility study should cover as a minimum:
1. Energy generated from LZC energy source per year
2. Carbon dioxide savings from LZC energy source per year
3. Life cycle cost of the potential specification, accounting for payback
4. Local planning criteria, including land use and noise
5. Feasibility of exporting heat or electricity from the system
6. Any available grants
7. All technologies appropriate to the site and energy demand of the development
8. Reasons for excluding other technologies
9. If appropriate:
    a. The building is connected to an existing local community CHP system or
    b. the building is connected to an existing source of waste heat or power OR
    c. a building or site CHP system is specified with the potential to export excess heat or power via a local community energy scheme or
    d. a source of waste heat or power is specified with the potential to export excess heat or power via a local community energy scheme
10. Energy storage.

The reduction in regulated carbon dioxide (CO_2-eq) emissions can be demonstrated by comparing regulated carbon dioxide (CO_2-eq) emissions with LZC technologies to the actual building-regulated emissions without LZCs. When the CO_2-eq savings are compared for different technologies, they may be estimated separately from the building energy model where appropriate, e.g. by using manufacturers' data, simple hand calculations or spreadsheets. For the specified technologies, any CO_2-eq savings are estimated using dynamic simulation modelling. The energy supply used for the base case is mains gas and grid electricity. If mains gas is not available on site, then oil may be used instead. The base case includes any passive design or free cooling measures adopted for the first two credits. The actual building energy demands are calculated as for the passive design analysis. The carbon dioxide emissions factors used for the building regulations calculations are then applied.

Technologies eligible to contribute to achieving the criteria must produce energy from renewable sources and meet all other ancillary requirements as defined by Directive 2009/28/EC[1].
The following requirements must also be met:
1. There must be a direct supply of energy produced to the building under assessment.
2. Technologies under 50 kWe or 45 kWth must be certified by a Microgeneration Certification Scheme (MCS), or equivalent, and installed by MCS (or equivalent) certified installers.
3. Combined heat and power (CHP) schemes above 50 kWe must be certified under the CHPQA standard. CHP schemes fuelled by mains gas are eligible to contribute to performance against this issue.
4. Heat pumps can only be considered as a renewable technology when used in heating mode. Refer to Annex VII of Directive 2009/28/EC and supporting document 2013/114/EU for more detail on accounting for energy from heat pumps.
5. Where MCS or CHPQA certification is not available, the design team must investigate the availability of alternative accreditation schemes in line with the Directives listed above, or an equivalent country or regional directive or standard. Where an accreditation scheme exists, it should be used for the purpose of verifying compliance of the specified LZC technology. If no accreditation scheme exists in the country, the design team must demonstrate they have investigated the competence of the installer selected and are confident that they have the skill and competence to install the LZC technology appropriately.

This BREEAM issue seeks to encourage the installation of on-site and near-site LZC technologies. 'Local' does not have to mean on site; community schemes (near site) can be used as a means of demonstrating compliance.
LZCT feasibility report
IES output showing LZCT reductions in CO2
IES output showing passive design feature reductions in energy & CO2
Energy specialist
An individual who has acquired substantial expertise or a recognised qualification for undertaking assessments, designs and installations of low and zero carbon solutions in the commercial buildings sector, and is not professionally connected to a single low and zero carbon technology or manufacturer.

6.3 ENE 5 Energy Efficient Cold Storage

Credits targeted	Basis of claiming targeted credits
2	• Refrigeration energy consumption (one credit) • Indirect greenhouse gas emissions (one credit)

Refrigeration energy consumption

- 1 Design, install and commission the refrigeration system:
    - 1.a: In accordance with the Code of Conduct for carbon reduction in the refrigeration retail sector[1] (see Additional information) and BS EN 378-2:2016[2].
    - 1.b: Using robust and tested refrigeration systems or components included on the Enhanced Capital Allowance (ECA) Energy Technology Product List (ETPL)[3] or an equivalent list (see Components on the ECA Energy Technology Product List for a list of components).
- 2 Commission the refrigeration plant in compliance with the commissioning criteria in BREEAM issue Man 04 Commissioning and handover.

Cold store plan & supplier feedback

Indirect greenhouse gas emissions

- 3 Achieve criteria 1 and 2.
- 4 Demonstrate a saving in indirect greenhouse gas emissions (CO_2-eq) from the installed refrigeration system over the course of its operational life.

6.4 ENE 6 Energy Efficient Transportation

Credits targeted	Basis of claiming targeted credits
2	• Energy consumption (one credit) • Energy efficient features (two credits)

Energy consumption

- 1 For specified lifts, escalators or moving walks (transportation types):

- 1.a: Analyse the transportation demand and usage patterns for the building to determine the optimum number and size of lifts, escalators or moving walks
- 1.b: Calculate the energy consumption in accordance with BS EN ISO 25745 Part 2[1] or Part 3[2] for one of the following:
  - 1.b.i At least two options for each transportation type (e.g. for lifts, hydraulic, traction or machine room-less (MRL)) OR
  - 1.b.ii At least two options considering different system arrangements and control strategies.
- 1.c: Consider the use of regenerative drives, subject to the requirements in Regenerative drives
- 1.d: Specify the transportation system with the lowest energy consumption.

Energy efficient features

- 2 Achieve criterion 1.

One credit - Lifts

- 3 Specify the following three energy efficient features for each lift:
  - 3.a: A standby condition for off-peak periods
  - 3.b: The lift car lighting and display lighting provides an average luminous efficacy across all fittings in the car of > 70 luminaire lumens per circuit Watt
  - 3.c: Use of a drive controller capable of variable speed, variable-voltage, and variable-frequency (VVVF) control of the drive motor.
- 4 Specify regenerative drives where their use is demonstrated to save energy.

Pre-assessment Stage Evidence

6.5 ENE 7 Energy Efficient Laboratory Systems

Credits targeted	Basis of claiming targeted credits
2+	• Design specification (one credit) • Best practice energy efficient measures (up to four credits) - building type dependent.

Design specification

- 1 Engage with the client during the preparation of the initial project brief to determine occupant requirements and define laboratory performance criteria. Performance criteria will include, but not be limited to:
  - 1.a: Description of purpose
  - 1.b: Occupant or process activities
  - 1.c: Containment requirements and standards
  - 1.d: Interaction between systems
  - 1.e: Flexibility and adaptability of laboratory facilities.
  - 1.f: Any other specific requirements (for example, requirements relevant to ventilation, heating or cooling).
- 2 Size the services system equipment (including ventilation supply and extract) correctly (see Definitions).
- 3 Demonstrate the minimised energy demand of the laboratory facilities resulting from the achievement of the defined design performance criteria.

Laboratory containment devices and containment areas (criteria only applicable to buildings containing these facilities)

- 4 For ducted fume cupboards specified:
  - 4.a: Demonstrate that the average design air flow rate is no greater than $0.16m^3/s$ per linear metre (internal width) of fume cupboard workspace
  - 4.b: Measure the volume flow rate in the exhaust duct (at the boundary of the laboratory) to take account of reductions in (inward) volume flow rate from fume cupboard leakage
  - 4.c: Demonstrate that a reduction in air flow does not compromise the defined performance criteria and does not increase the health and safety risk to future building occupants.

…for the purpose of assessing this BREEAM issue, the definition of laboratory areas excludes any laboratory support areas such as:

1. Write up or offices
2. Meeting rooms
3. Storage
4. Ancillary and other support areas with lower servicing requirements.

Right-sizing

Right-sizing principles encourage the use of better estimates in equipment loads from which services equipment is sized in comparison to traditional methods of estimates based on 'rated' data obtained from manufacturers' literature or design assumptions from previous projects. This can result in construction cost savings in addition to life cycle cost benefits, while taking account of the need for appropriate contingency.

Best practice energy efficient measures

If the laboratory area accounts for at least 10% of the total building floor area (see Definitions):

- 5 Achieve criteria 1 to 4 (or criteria 1 to 3 where there are no ducted fume cupboards).
- 6 Design, specify and install laboratory plant and systems to promote energy efficiency. Demonstrate compliance with items in Table 6.4 (see 6.a and 6.b for credits available).
- 6.a: Up to 2 credits: laboratory areas (see Definitions) account for at least 10% (but less than 25%) of the total building floor area OR
- 6.b: Up to 4 credits: laboratory areas account for 25% or more of the total building floor area.
- 7 Demonstrate by calculations or modelling that the chosen measures have a reasonably significant effect on the total energy consumption of the laboratory, i.e. 2% reduction or greater.
- 8 Demonstrate that the energy efficient measures specified do not compromise the defined performance criteria, and do not increase the health and safety risk to future building occupants.

Table 6.4 Best practice energy efficient measures in laboratories

Item description	Credits [1]
Fume cupboard volume flow rates (further reduction)	
An average design air flow rate of < $0.12m^3/s$ per linear metre (internal width) of fume cupboard workspace.	0.5
Grouping or isolation of high filtration or ventilation activities	
Minimisation of room air change rates and overall facility ventilation flows by grouping together or isolating activities and equipment with high filtration or ventilation requirements.	0.5
Energy recovery - heat	
Heat recovery from exhaust air (where there is no risk of cross-contamination) or via refrigerant or water cooling systems.	0.5
Energy recovery - cooling	
Cooling recovery via exhaust air heat exchangers (where there is no risk of cross-contamination) or via refrigerant or water cooling systems.	0.5
Grouping of cooling loads	
Grouping of cooling loads to enable supply efficiencies and thermal transfer.	0.5
Free cooling	
Specification of free cooling coils in chillers or dry air coolers related to laboratory-specific activities.	0.5
Load responsiveness	
Effective matching of supply with demand through modularity, variable speed drives and pumps, and other mechanisms.	0.5
Clean rooms	
~~Specification of particle monitoring systems, linked to airflow controls~~.	0.5
Diversity	
Achievement of high levels of diversity in central plant sizing and laboratory duct sizing, where compatible with safety.	0.5
Room air changes rates	
Reducing air change rates by matching ventilation airflows to environmental needs and demands of containment devices.	0.5

Fan power	
Specification and achievement of best practice fan power figures (as shown below) for all air handling units, laboratory extract systems, local extract ventilation, containment area extracts (where applicable) and fume cupboard extracts (where applicable).	1
Laboratory system	**Best practice specific fan power (W/(L/s))**
General laboratory supply air handling unit (AHU) with heating and cooling	1.5
General laboratory extract systems	1.2
Laboratory local extract ventilation – ducted	1.0
Containment area extract, without high efficiency particulate absorption (HEPA) filtration	1.5
Containment area extract, with HEPA filtration	2.5
Fume cupboard extract	1.5
Only whole credits can be awarded in BREEAM. Therefore to achieve a credit for items with partial credits, the laboratory must comply with at least two of the items. In an instance where, for example, three and half credits are achieved this would need to be rounded down to three credits.	

6.6 WAT 1 Water Consumption

Credits targeted	Basis of claiming targeted credits
3	1 Use the BREEAM Wat 01 calculator to assess the efficiency of the domestic water-consuming components. 2 Use the standard Wat 01 method (see Methodology) to compare the water consumption (litres/person/day) for the assessed building against a baseline performance. Award BREEAM credits based upon Table 8.1. Where it is not possible to use the standard method, complete the assessment using the alternative Wat 01 method (see Methodology). Table 8.1 BREEAM Credits available for percentage improvement over baseline building water consumption

No. of BREEAM credits	% improvement
1	12.5%
2	25%
3	40%
4	50%
5	55%
1 Exemplary performance credit	65%

For some building types an alternative approach to compliance must be used to award credits (for further information please refer to Methodology and the BREEAM Wat 01 calculator).

~~3 If a greywater or rainwater system (see Definitions) is specified, use its yield in L/person/day to offset potable water demand from components.~~
~~4 If a greywater or rainwater system is specified and installed:~~
~~4.a: Greywater systems in compliance with BS 8525-1:2010 Greywater systems - Part 1 Code of Practice[3].~~
~~4.b: Rainwater systems in compliance with BS EN 16941-1:2018[4].~~
~~Achieve Wat 02 Water monitoring: Criterion 6 , if you intend to pursue a post occupancy stage certification.~~
~~Additionally for Healthcare building types only:~~
~~If applicable, the flushing control for each WC or urinal must be suitable for operation by patients with frail or infirm hands or activated by electronic sensors (see 2.0).~~
~~Additionally for Prison building types only:~~
~~6 Sanitary components specified within a prison cell have a volume controller specified on the individual fittings or water supply to each cell (see Definitions).~~
Exemplary level criteria
To achieve an exemplary performance credit:
7 Achieve criteria 1 to 4 (and if applicable 5 or 6).
8 The water consumption (litres/person/day) for the assessed building achieves the 65% improvement described as exemplary performance in Table 8.1.

BREEAM Wat 01 calculator

T Squared (M&E) have confirmed that the internal water fittings will be low flow.

The intended sanitary ware fit out design specification that will be provided to the tenants will include:
- dual flush toilets (4 and 2.6 litre)
- low flow showers (6 litres per minute)
- low flow taps (4 litres in bathrooms and 6 in kitchen areas)

6.7 WAT 2 Water Monitoring

Credits targeted	Basis of claiming targeted credits
1	• 1 Specify a water meter on the mains water supply to each building. This includes instances where water is supplied via a borehole or other private source. • 2 For water-consuming plant or building areas consuming 10% or more of the building's total water demand: ○ 2.a: Fit easily accessible sub-meters OR ○ 2.b: Install water monitoring equipment integral to the plant or area. • 3 For each meter (main and sub): ○ 3.a: Install a pulsed or other open protocol communication output AND ○ 3.b: Connect it to an appropriate utility monitoring and management system, e.g. a building management system (BMS), for the monitoring of water consumption. If there is no BMS system in operation at Post-Construction stage, award credits provided that the system used enables connection when the BMS becomes operational. • ~~4 In buildings with swimming pools, or large water tanks and aquariums, fit separate sub-meters on the water supply of the above and any associated changing facilities (toilets, showers etc.) irrespective of their water consumption levels.~~ • 5 In buildings containing laboratories, fit a separate water meter on the water supply to any process or cooling loop for 'plumbed-in' laboratory process equipment, irrespective of their water consumption levels. **Additionally for those pursuing a post occupancy stage certification:** • The water monitoring strategy used enables the identification of all water consumption for sanitary uses as assessed under Wat 01 (litres/person/day), if a post occupancy stage certification is sought.

6.8 WAT 3 Major Leak Detection

Credits targeted	Basis of claiming targeted credits

2	• Leak detection system (one credit) • Flow control devices (one credit)

Leak detection system

- 1 Install a leak detection system capable of detecting a major water leak:
  - 1.a: On the utilities water supply within the buildings, to detect any major leaks within the buildings AND
  - 1.b: Between the buildings and the utilities water supply, to detect any major leaks between the utilities supply and the buildings under assessment.
- 2 The leak detection system is:
  - 2.a: A permanent automated water leak detection system that alerts the building occupants to the leak OR an inbuilt automated diagnostic procedure for detecting leaks
  - 2.b: Activated when the flow of water passing through the water meter or data logger is at a flow rate above a pre-set maximum for a pre-set period of time. This usually involves installing a system which detects higher than normal flow rates at meters or sub-meters. It does not necessarily require a system that directly detects water leakage along part or the whole length of the water supply system
  - 2.c: Able to identify different flow and therefore leakage rates, e.g. continuous, high or low level, over set time periods. Although high and low level leakage rates are not specified, the leak detection equipment installed must have the flexibility to distinguish between different flow rates to enable it to be programmed to suit the building type and owner's or occupier's usage patterns.
  - 2.d: Programmable to suit the owner's or occupier's water consumption criteria
  - 2.e: Where applicable, designed to avoid false alarms caused by normal operation of large water-consuming plant such as chillers.
- Where there is physically no space for a leak detection system between the utilities water meter and the building, alternative solutions can be used, provided that a major leak can still be detected.

Flow control devices

- 3 Install flow control devices that regulate the water supply to each WC area or sanitary facility according to demand, in order to minimise undetected wastage and leaks from sanitary fittings and supply pipework.

6.9 WST 5 Adaption to Climate Change

Credits targeted	Basis of claiming targeted credits
1	• 1 Conduct a climate change adaptation strategy appraisal using: ○ 1.a: A systematic risk assessment to identify the impact of expected extreme weather conditions arising from climate change on the building over its projected life cycle. The assessment covers the installation of building services and renewable systems, as well as structural and fabric resilience aspects and includes (see Methodology): ▪ 1.a.i Hazard identification ▪ 1.a.ii Hazard assessment ▪ 1.a.iii Risk estimation ▪ 1.a.iv Risk evaluation ▪ 1.a.v Risk management. • 2 Develop recommendations or solutions based on the climate change adaptation strategy appraisal, before or during Concept Design, that aim to mitigate the identified impact. • 3 Provide an update during Technical Design demonstrating how the recommendations or solutions proposed at Concept Design have been implemented where practical and cost effective. Omissions have been justified in writing by the assessor.

climate change adaptation strategy

6.10 POL 1 Impact of refrigerants

Credits targeted	Basis of claiming targeted credits
1	• ~~Impact of refrigerants (two credits)~~ • Leak detection (one credit)

Leak detection

PREREQUISITE:

- 2 All systems with electric compressors comply with the requirements of BS EN 378:2016[1] (parts 2 and 3). Refrigeration systems containing ammonia comply with the Institute of Refrigeration Ammonia Refrigeration Systems code of practice[2].

ONE CREDIT

- 6 All systems are hermetically sealed or only use environmentally benign refrigerants (see Leak detection and Hermetically sealed systems).
- OR
- 7 Where the systems are not hermetically sealed:
  - 7.a: Systems have:
    - 7.a.i A permanent automated refrigerant leak detection system, that is robust and tested, and capable of continuously monitoring for leaks.
- OR
    - 7.a.ii An inbuilt automated diagnostic procedure for detecting leakage is enabled.
  - 7.b: In the event of a leak, the system must be capable of automatically responding and managing the remaining refrigerant charge to limit loss of refrigerant (see Automatic isolation and containment of refrigerant).

Hermetically sealed systems

Hermetically sealed plant (as defined in the F Gas regulations) can be awarded the Leak Detection credit by default. The Regulations' definition of hermetically sealed plant only allows systems to have a tested leakage rate of less than 3 grams per year. This results in the risk of a large refrigerant leak due to system failure being minimised.

6.11 POL 2 Local Air Quality

Credits targeted	Basis of claiming targeted credits
2	Up to 2 credits • 1 All heating and hot water is supplied by non-combustion systems. For example, only powered by electricity.

heating and hot water supply

Back-up space or water heating systems can be excluded from assessment, provided they are excluded from SBEM or SAP calculations used to assess Ene 01 Reduction of energy use and carbon emissions. This is on the basis that these systems will only be used in an emergency so their impact will be limited.

If the systems are included in the Ene 01 calculations, then it must be assumed they will be used outside emergency situations, and as such they must meet the emission benchmarks for Pol 02 credits to be awarded.

6.12 POL 4 Reduction of night-time light pollution

Credits targeted	Basis of claiming targeted credits
1	• 1 External lighting pollution has been eliminated through effective design that removes the need for external lighting. This does not adversely affect the safety and security of the site and its users. OR alternatively, where the building does have external lighting, one credit can be awarded as follows: • 2 The external lighting strategy has been designed in compliance with Table 2 (and its accompanying notes) of the Institution of Lighting Professionals (ILP) Guidance notes for the reduction of obtrusive light, 2011[1]. • 3 All external lighting (except for safety and security lighting) can be automatically switched off between 23:00 and 07:00. • 4 If safety or security lighting is provided and will be used between 23:00 and 07:00, this part of the lighting system complies with the lower levels of lighting recommended during these hours in Table 2 of the ILP guidance notes. • 5 Illuminated advertisements are designed in compliance with ILP PLG05 The Brightness of Illuminated Advertisements[2].

6.13 POL 5 Reduction of noise pollution

Credits targeted	Basis of claiming targeted credits

1	• 1 There are no noise-sensitive areas within the assessed building or within 800 m radius of the assessed site.
	OR
	• 2 Where there are noise-sensitive areas within the assessed building or noise-sensitive areas within 800 m radius of the assessed site, a noise impact assessment compliant with BS 4142:2014[1] is commissioned. Noise levels must be measured or determined for:
	  ○ 2.a: Existing background noise levels:
	    ▪ 2.a.i at the nearest or most exposed noise-sensitive development to the proposed assessed site
	    ▪ 2.a.ii including existing plant on a building, where the assessed development is an extension to the building
	  ○ 2.b: Noise rating level from the assessed building.
	• 3 The noise impact assessment must be carried out by a suitably qualified acoustic consultant.
	• 4 The noise level from the assessed building, as measured in the locality of the nearest or most exposed noise-sensitive development, must be at least 5dB lower than the background noise throughout the day and night.
	• 5 If the noise sources from the assessed building are greater than the levels described in criterion 4, measures have been installed to attenuate the noise at its source to a level where it will comply with the criterion.

XX notes	
XX notes	

Head Office
Optimus Building,
2 Robroyston Oval,
Glasgow,
G33 1AP

Sheffield Office
Dunston Innovation Centre
Dunston Road
Chesterfield
Derbyshire
S41 8NG

Basingstoke Office
Devonshire House
Wade Road
Aviary Court
Basingstoke
RG24 8PE

Swindon Office
Unit 25
Basepoint Business Centre
Rivermead Drive, West Lea
Swindon
SN5 7EX

T-SQUARED